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Climate Risk and Financial Intermediaries

Regulatory Framework, Transmission
Channels, Governance and Disclosure



Elisabetta Gualandri · Paola Bongini ·
Maurizio Pierigè · Marina Di Janni

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*Dedicated to Phil Molymoux, series editor for the Palgrave Macmillan
Studies in Banking and Financial Institutions series, who left us far too
soon.*

DISCLAIMER

The Book is based on selected Chapters (1, 2, and 8) of the AIFIRM’s Position Paper n. 39 “Climate Stress Test—Un primo passo verso una gestione integrata dei rischi climatici ed ambientali”. The Editors of the Book took care of all updates, additions, revisions, and translations of the AIFIRM’s Position Paper n. 39 selected chapters.

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Climate Risk Scenario

Over the last decade, within the broad topic of Environmental Social and Governance (ESG) factors and risks, consideration of climate risks has taken a leading role toward a sustainable economy, as climate change and environmental degradation are causing structural changes and impacts on the economy worldwide. Extreme events, such as floods and droughts, are causing disruptions in supply and production chains and damage to property. Furthermore, risks related to changing regulations in some sectors have a strong impact on business models.

UN Climate Change Conference (COP21) of December 2015 adopted the Paris Agreement to set out a global accord to avoid dangerous climate change impacts by limiting global warming to well below 2 °C and pursuing efforts to limit it to 1.5 °C above pre-industrial levels. The global accord also aimed to strengthen countries' ability to deal with the impacts of climate change and support them in their efforts.

In November 2021, the UK hosted the “COP26” conference where leaders of over 42 countries:

- updated the commitments given in the Paris Agreement;
- accelerated their ambitions for a resilient, net-zero future;
- subscribed to long-term strategies (Net-Zero Standard) to guide their common approach to climate issues.

In November 2022, the “COP 27” held in Egypt stressed the criticalities of the climate crisis, as well as highlighted the consequences of Russia’s war against Ukraine, which aggravated the climate and energy crisis.

The achievement of these targets needs huge investments: the limited public financial resources require relevant private investments. The financial sector is expected to play a key role in financing the transition to a greener and more sustainable economy and in reorienting capital to more sustainable investments. This task requires a comprehensive shift in how the financial system works.

While climate change is certainly spurring new business opportunities, the financial sector is facing new risks due to its exposure to the risks stemming on the one hand from the transformation of the economy and the worsening of physical conditions and on the other from the amplification of negative consequences of adverse events related to climate change and green transition.

Consequently, new risks need to be mapped, analyzed, quantified, integrated into the existing risk categories, and managed: a comprehensive view is required to embrace business strategies and models, risk management, governance, and disclosure.

Supervisors and supervised entities are therefore increasingly focusing on the consequences of climate risk, as it could affect the profitability and the capital strength of individual intermediaries and, on a larger scale, interfere with the stability of the financial system, the working of monetary policy transmission channels and the maintenance of price stability, as well as raising sustainability financing issues (ECB, 2021a, 2021b; ESRB, 2021).

Within this evolving scenario, the book focuses on the climate-related risks (as part of the broader theme of ESG risks and sustainability), with the aim of analyzing the following main aspects:

- the evolution of the overall regulatory framework in the European Union (EU) and at the international level, to contribute to the safety and soundness of the financial sector and to ensure an adequate preparation to manage climate-related risks;
- the climate risk transmission channels, i.e., the mechanisms through which climate risk factors affect individual counterparties and assets of financial institutions, with potential climate-related financial risks

for the financial institutions themselves and for the whole financial system;

- the peculiarities of climate risk transmission channels with reference to specific business models of financial intermediaries, with a focus on commercial banking;
- the governance and disclosure implications of climate risks, which contribute to the financial sector resilience and unlock opportunities.

Chapter 2, “The Regulatory Framework for the Financial Sector”, analyzes the evolution of the regulatory and supervisory frameworks in the EU and internationally for the topic of climate-related risks from a dual perspective: financing sustainable growth on the one hand and integrating climate risk assessment into the risk management framework of intermediaries on the other.

The chapter introduces the state of the art of the regulatory framework and its evolution for managing climate-related risks in the financial sector, with reference to:

- the European context, outlining the role of the European Commission (EC), of the three European Supervisory Authorities, ESA (the European Banking Authority, EBA, the European Securities and Markets Authority, ESMA, and the European Insurance and Occupational Schemes Authority, EIOPA), and the European Central Bank (ECB);
- the broader international context, with a specific reference;
- at the supranational level, to the Basel Committee in Banking Supervision (BSBS), the Task Force on Climate-related Financial Disclosures (TCFD), and the Network of Central Banks and Supervisors for Greening the Financial System (NGFS);
- at the national level, to the UK and US.

A specific focus is given to the climate stress test exercises, indeed one of the most important instruments of the supervisory climate risk tool kit, with a forward-looking perspective.

Chapter 3, “Transmission channels of the climate risk”, explores the transmission channels through which climate risk finds concrete materialization in the “traditional” risks.

To this end, the two main climate risk drivers affecting financial institutions' risks via micro and macroeconomic transmission channels are introduced: transition risk and physical risk.

The mentioned environment and climate-related risk factors do not yet widely constitute an ad hoc risk category in risk management practices, but they are universally considered through traditional risk categories:

- Credit risk: credit risk increases if climate risk drivers reduce borrowers' ability to repay and service debt or banks' ability to fully recover the value of a loan.
- Market risk: market risk arises due to the reduction in financial asset values, including the potential to trigger large, sudden, and negative price adjustments, where climate risk is not yet incorporated into prices. Climate risk could also lead to a breakdown in correlations between assets or a change in asset market liquidity, undermining risk management assumptions.
- Liquidity risk: liquidity risk refers to the reduction in banks' access to stable funding sources as market conditions change. Climate risk drivers may cause banks' counterparties to draw down deposits and credit lines as well as increase the risk arising from the depreciation of collaterals.
- Operational risk: operational risk emerges with the increasing legal and regulatory compliance risk associated with climate-sensitive investments and businesses due to adverse acute or chronic climate-related events.
- Reputational risk: reputational risk of the banks increases as market and consumer sentiment change.

Further analysis of climate risk transmission channels is developed in Chapters 4 and 5, according to an innovative "business perspective", considering the specific characteristics of different business models of financial intermediaries. Critical data foundation/governance aspects are analyzed, such as the acquisition of granular historical data to measure counterparty risk exposure and the integration of forecast information and scenario analysis, as it is necessary to associate future projections functional to support the evolution of the business dynamics overseen by the various business functions. More specifically, Chapter 4, "Integrating climate risk into commercial banks operations", deals with climate

risks, their impact on commercial bank operations, and the potential products and mechanisms by which these actors can mitigate them. After an initial section on how climate risks are incorporated into classical banking processes, the focus shifts to the following areas related to the “commercial banking” business:

- Credit Process;
- Finance and treasury;
- Wealth and asset management.

In Chapter 5, “Insurance companies”, a deep dive into Insurance Companies is presented, exploring business-specific definitions, how climate change transmission channels affect insurance companies, and what kind of impacts on business these kinds of Financial Institutions will face due to Climate change.

Chapter 6, “Governance implications: the challenge of disclosure”, deals with the theme of market disclosure, a key feature of governance for financial intermediaries. Regulators recommend that financial institutions define and set up proportionate governance arrangements to ensure a sound and comprehensive approach to incorporating climate risks into business strategy, business processes, and risk management.

Practices may be different and have not yet fully responded to the major challenges that climate risks have brought to the financial sector. Nevertheless, it is widely acknowledged that governance can play a critical role in helping financial institutions adapt to new climate requirements and contribute to climate objectives.

The chapter analyzes the impact of the main governance arrangements that financial intermediaries will adopt to properly consider climate-related risks. A key point addressed is the challenge of disclosure and transparency for managerial purposes, as well as for communication with the market and investors that institutions must face due to regulatory reasons (e.g., adherence to new standards). Regarding the first point, the chapter analyzes the essential information that the Board of Directors and the management body must have to be able to address and manage the climate risk challenges. In this regard, although it is impossible to determine standardized reporting, financial intermediaries and, in particular, banks are moving toward including KPIs and KRIs through which it is possible to monitor and assess the exposures to climate risks.

As far as the market and investor communication is concerned, it is highlighted how disclosure and transparency play an important role in allowing intermediaries to show the greenness of their activities (e.g., Green asset ratio—GAR and banking book taxonomy alignment ratio—BTAR) or the adherence to net-zero programs.

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CHAPTER 2

Regulatory Framework, Standards, and Best Practices for the Financial Sector

The key role the financial sector is playing in financing the transition to a greener and more sustainable economy and redirecting capital to more sustainable investments involves taking on new risks and redefining risks already considered. Climate risks could individually affect the profitability and capital strength of financial intermediaries and, on a broader scale, interfere with the stability of the financial system, monetary policy transmission channels, and price stability.

In the area of financial regulation, central banks, and supervisory authorities are at the forefront in taking a comprehensive and forward-looking view, as well as early, proactive actions to strengthen the resilience of the banking and financial sector with respect to climate risks.

It is important to notice that the landscape of climate risk regulation and initiatives is continually evolving worldwide with the target to develop strategies, guidelines, and regulations to address climate risks for financial institutions.

This chapter aims to define a broad picture of the present date and outlines the evolution of the regulatory and supervisory framework for managing climate-related risks in the financial sector: the state of the art is presented mainly with reference to the European Union (EU) context, also taking a broader look to the international context. The specific focus regards the banking sector.

2.1 THE EUROPEAN UNION (EU) CONTEXT

The strategy of the European Union for financing the sustainable growth has its roots in two historic intergovernmental agreements signed in 2015: the United Nations 2030 Agenda (UN, 2015a) and the Paris Agreement on Climate Change (UN, 2015b).

The first is an action plan for people, planet, and prosperity aiming at strengthening universal peace, freedom, and inclusiveness. The Agenda defines 17 Sustainable Development Goals, divided into 169 targets, that concern all aspects of sustainability: social, environmental, economic, and ethical; it also stimulates actions over the next fifteen years in areas of critical importance for humanity and the planet, such as people, planet, prosperity, peace, partnership.

The Paris Agreement constitutes the first universal global climate agreement to adapt and strengthen resilience to climate change and to limit global warming to well below 2 °C above pre-industrial levels, recognizing that this could significantly reduce the risks and effects of climate change, by also pursuing the objective of making financial flows consistent with a pathway toward low greenhouse gas emissions and climate-resilient development.

Accordingly, the European Union was, and is, strongly committed to developments and actions that meet the needs of present and future generations while opening up new opportunities for employment and investment and ensuring economic growth. In the European vision, the financial sector is called to play a leading role in guiding the transition to a sustainable economy that balances economic growth with the protection of social, environmental, and ethical aspects. The financial system can be part of the solution toward a greener and more sustainable economy: reorienting private capital to more sustainable investments requires a comprehensive shift in how the financial system works. This is necessary if the EU is to develop more sustainable economic growth, ensure the stability of the financial system, promote greater transparency, and foster long-termism in the economy.¹

¹ For a review of regulatory and supervisory initiatives taken by the European Authorities in the first phase, to foster the green transition, to enhance the role of finance and to promote the management of climate risks by financial intermediaries, see: Mikkelsen D. et al. (2022), Gualandri E. and Nobili M. (2022).

Finance supports the economy by funding economic activities and, ultimately jobs and growth. Investment decisions are typically based on several factors, but those related to environmental and social considerations are often not sufficiently accounted for since such risks are likely to materialize over a longer time horizon.

As part of broader efforts to connect finance with the specific needs of the European and global economy for the benefit of the planet (EC, 2017), in 2018, the European Commission published the “Action Plan: Financing Sustainable Growth” (EC, 2018) setting the EU strategy on sustainable finance and a roadmap for future work across the financial system. The action plan set specifically the following three goals:

1. reorient capital flows toward sustainable investment to achieve sustainable and inclusive growth;
2. manage financial risks stemming from climate change, resource depletion, environmental degradation, and social issues;
3. foster transparency and long-termism in financial and economic activity.

Table 2.1 summarizes the goals and actions proposed by the Commission.

The Commission’s Action Plan called for the European Supervisory Authorities (ESAs) to provide direct support to its implementation by performing specific tasks and producing guidance on how sustainability considerations can be effectively considered in relevant EU financial services legislation and help to identify existing gaps.

In the field of investment services and financial markets, the European Union has identified the need to reduce practices aimed at obtaining short-term performance in economic and financial decisions, acting on transparency, to allow investors, companies, or retail investors, to be better informed and make more accurate investment decisions.

In 2019, the European Commission proposed a “European Green Deal” which is a comprehensive and ambitious plan to make Europe the world’s first climate-neutral continent by 2050, encompassing various policy initiatives and targets across different sectors, aiming to foster sustainable growth, reduce greenhouse gas emissions, protect biodiversity, and improve the overall quality of life for EU citizens.

Table 2.2 shows the state of the art of the initiatives undertaken to date to implement the European green deal.

Table 2.1 European Commission “Action Plan: Financing Sustainable Growth”

<i>Goals</i>	<i>Actions</i>
1. Reorient capital flows toward sustainable investment in order to achieve sustainable and inclusive growth	Action 1: Establishing an EU classification system for sustainable activities Action 2: Creating standards and labels for green financial products Action 3: Fostering investment in sustainable projects Action 4: Incorporating sustainability when providing financial advice Action 5: Developing sustainability benchmarks
2. Mainstreaming sustainability into risk management	Action 6: Better integrating sustainability in ratings and market research Action 7: Clarifying institutional investors’ and asset managers’ duties Action 8: Incorporating sustainability in prudential requirements
3. Fostering transparency and long-termism	Action 9: Strengthening sustainability disclosure and accounting rule-making Action 10: Fostering sustainable corporate governance and attenuating short-termism in capital markets

Source “Communication from The Commission. Action Plan: Financing Sustainable Growth” (2018)

The European Commission’s 2018 Action Plan did not contain any hypotheses for regulatory action, other than a possible change in the guidelines on rating agencies; however, it included a number of activities of a technical, study and in-depth analysis, under the objective “Mainstreaming sustainability into risk management” (see Table 2.1) and with reference to actions 6, 7, and 8.

These activities have been entrusted to the three European Supervisory Authorities, which are competent for the different sectors of financial intermediation:

- European Banking Authority (EBA);
- European Securities and Markets Authority (ESMA);

Table 2.2 Timeline of the European green deal

-
- 26 April 2023: The European Parliament and the Council reach a political agreement on the ReFuelEU Aviation proposal
 - 25 April 2023: “Fit for 55”: Council adopts key pieces of legislation delivering on 2030 climate targets
 - 25 April 2023: EU Energy Platform: Commission launches first call for companies to jointly buy gas
 - 21 April 2023: The Commission proposes to revise the existing marketing standards of agri-food products
 - 28 March 2023: Ambitious new law agreed to deploy sufficient alternative fuels infrastructure
 - 23 March 2023: Agreement reached on cutting maritime transport emissions by promoting sustainable fuels for shipping
 - 22 March 2023: Consumer protection: enabling sustainable choices and ending greenwashing
 - 22 March 2023: Right to repair: the Commission adopts a new proposal on common rules promoting the repair of goods
 - 16 March 2023: The Commission proposes the Critical Raw Materials Act
 - 16 March 2023: The Commission proposes the Net-Zero Industry Act
 - 16 March 2023: The Commission launches the New European Bauhaus capacity building program for the reconstruction of Ukraine
 - 14 March 2023: The Commission proposes reform of the EU electricity market design to boost renewables, better protect consumers and enhance industrial competitiveness
 - 10 March 2023: The EU agrees on stronger rules to boost energy efficiency
 - 21 February 2023: The Commission is presenting a package of measures to improve the sustainability and resilience of the EU’s fisheries and aquaculture sector
 - 14 February 2023: The Commission proposes a 2030 zero emissions target for new city buses and 90% emissions reductions for new trucks by 2040
 - 13 February 2023: The Commission sets out rules for renewable hydrogen
 - 1 February 2023: The Commission presents a Green Deal Industrial Plan to enhance the competitiveness of Europe’s net-zero industry and support the fast transition to climate neutrality
 - 24 January 2023: Presentation of a ‘A New Deal for Pollinators’ to tackle the alarming decline in wild pollinating insects in Europe
 - 18 December 2022: EU agrees to strengthen and expand emissions trading, and creates a Social Climate Fund to help people in the transition
 - 9 December 2022: New rules on applying the EU emissions trading system in the aviation sector
 - 6 December 2022: EU agrees to law to fight global deforestation and forest degradation driven by EU production and consumption
 - 30 November 2022: Circular Economy: Packaging and Packaging Waste Regulation and Proposal for a first EU-wide voluntary framework to reliably certify high-quality carbon removals
 - 15 November 2022: EU Algae Initiative
-

(continued)

Table 2.2 (continued)

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- 10 November 2022: Proposal for new Euro 7 standards to reduce pollutant emissions from vehicles and improve air quality and Biodiversity: Stronger measures against wildlife trafficking
 - 27 October 2022: The Council and the European Parliament reach a provisional political agreement on stricter CO₂ emission performance standards for new cars and vans
 - 26 October 2022: Commission proposes stronger rules for cleaner air and water
 - 15 September 2022: Proposal for an emergency market intervention to reduce energy bills for Europeans
 - 20 July 2022: “Save gas for a safe winter” proposal
 - 22 June 2022: Nature protection package
 - 18 May 2022: REPowerEU plan: affordable, secure, and sustainable energy for Europe
 - 22 April 2022: The European Commission joins the European Climate Pact and pledges to make its operations climate-neutral by 2030
 - 5 April 2022: Proposals to phase down fluorinated greenhouse gases and ozone-depleting substances
 - 5 April 2022: Proposals to modernize EU industrial emissions rules to steer large industry in long-term green transition
 - 30 March 2022: Proposals to make sustainable products the norm in the EU, boost circular business models, and empower consumers for the green transition
 - 23 March 2022: Options to mitigate high energy prices with common gas purchases and minimum gas storage obligations
 - 8 March 2022: REPowerEU: Joint European action for more affordable, secure, and sustainable energy
 - 15 December 2021: Proposal of a new EU framework to decarbonize gas markets, promote hydrogen and reduce methane emissions
 - 15 December 2021: Commission proposals to remove, recycle, and sustainably store carbon
 - 14 December 2021: New transport proposals target greater efficiency and more sustainable travel
 - 17 November 2021: Proposals to stop deforestation, innovate sustainable waste management, and make soils healthy
 - 15 September 2021: New European Bauhaus: new actions and funding
 - 14 July 2021: Delivering the European Green Deal
 - 17 May 2021: Sustainable blue economy
 - 12 May 2021: Zero pollution Action Plan
 - 25 March 2021: Organic Action Plan
 - 24 February 2021: New EU strategy on adaptation to climate change
 - 18 January 2021: New European Bauhaus
 - 10 December 2020: European Battery Alliance
 - 9 December 2020: European Climate Pact
 - 19 November 2020: Offshore renewable energy
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(continued)

Table 2.2 (continued)

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- 14 October 2020: Renovation wave, Methane Strategy, Chemicals strategy for sustainability
 - 17 September 2020: Presentation of the 2030 Climate Target Plan
 - 8 July 2020: Adoption of the EU strategies for energy system integration and hydrogen to pave the way toward a fully decarbonized, more efficient, and interconnected energy sector
 - 20 May 2020: Presentation of the EU Biodiversity Strategy for 2030 to protect the fragile natural resources on our planet and of the “Farm to fork strategy” to make food systems more sustainable
 - 11 March 2020: Proposal of a Circular Economy Action Plan focusing on sustainable resource use
 - 10 March 2020: Adoption of the European Industrial Strategy, a plan for a future-ready economy
 - 4 March 2020: Proposal for a European climate law to ensure a climate-neutral European Union by 2050
 - 14 January 2020: Presentation of the European Green Deal Investment Plan and the Just Transition Mechanism
 - 11 December 2019: Presentation of the European Green Deal
-

Source European Commission’s Website

- European Insurance and Occupational Pensions Authority (EIOPA).

The European Commission has entrusted ESMA with the task of launching an in-depth study on ESG rating systems (Action 6: Better integrating sustainability in ratings and market research), which to date has produced the following documents:

- Technical Advice to the European Commission on sustainability considerations in the credit rating market (ESMA, 2019a);
- Guidelines on disclosure requirements applicable to credit rating agencies (ESMA, 2019b).

In the same field, the European Commission’s Directorate-General for Financial Stability, Financial Services and Capital Markets Union published the “Study on sustainability-related ratings, data and research” (EC, 2021) to describe the state of the play of the sustainability-related products and services market and establishes an inventory and classification of market actors, sustainability products and services available in the market and to explore how the reliability and quality of assessment of

sustainability-related data, ratings and research by third-party providers can be enhanced and provides recommendations to stimulate demand and improve the quality of supply.

The European Commission has also initiated a public discussion to gather further input to develop a regulatory framework for the disclosure of environmental, social, and governance considerations by credit rating agencies.

Concerning Action 7, “Clarifying institutional investors’ and asset managers’ duties”, in 2018 the European Commission requested technical advice from the ESAs on potential amendments to Delegated Acts regarding the integration of risks and sustainability factors into procedures and organization, product oversight, and governance by certain financial entities (including asset managers and institutional investors, insurance companies, investment advisors, and insurance product advisors).

Technical advice provided by ESMA and EIOPA on 21 April 2021 led the European Commission to adopt Delegated Acts on fiduciary duties and insurance advice that require financial firms (e.g., advisors, asset managers, and insurers) to include sustainability in their procedures and activities.

Concerning Action 8 “Incorporating sustainability in prudential requirements”, the European Commission mandated the EBA to assess the riskiness of activities or assets exposed to social and/or environmental risks (physical and transition risks) by June 2025. The EBA also received a mandate to assess, by June 2021, the inclusion of environmental, social, and governance risks in the review and assessment carried out by the supervisory authority, resulting in the publication in 2021 of the “EBA Report on management and supervision of ESG risks for credit institutions and investment firms” (EBA, 2021), which will be discussed in more detail below.

As far as the insurance sector is concerned, the European Commission also requested a technical opinion from EIOPA on the integration of sustainability risks into the prudential framework for insurance companies.

In the next paragraph, a deep dive on European Banking Authority’s initiative is provided.

2.1.1 *The European Banking Authority (EBA)*

The European Commission’s Action Plan on financing sustainable growth aimed to redirect financial flows to sustainable investments, to mainstream sustainability in risk management, and to enhance transparency and long-termism. Specifically for the banking sector, the European Banking Authority was given several mandates to assess how ESG risks can be incorporated into the three pillars of prudential regulation and supervision: prudential requirements, supervision, and market discipline.

In 2019, the European Banking Authority published the “EBA Action Plan on Sustainable Finance” (EBA, 2019), superseded by the “EBA Roadmap on ESG Risks and Sustainable Finance” published in 2022 (EBA, 2022c), which explained the EBA’s approach and objectives and describes the mandates and tasks received from the EU legislators and directly from the European Commission, together with the EBA’s associated planned activities and timelines.

The EBA’s work on ESG risks primarily covered the three pillars of the banking regulatory and supervisory framework (prudential requirements, supervision, and market discipline), as well as other related areas and the monitoring and assessment of risks in five main areas (EBA, 2022c, point 21):

1. fostering transparency and market discipline (Pillar 3);
2. maintenance of a safe and resilient banking sector (Pillar 2), also ensuring a robust management of ESG risk;
3. reflections on potential changes to the prudential treatment of exposure under Pillar 1;
4. identification of additional ESG standards or labels and possible measures to address emerging risks, such as greenwashing;
5. developments around data and metrics to assess and monitor ESG risk and sustainable finance on an ongoing basis, with the tools of scenario analysis and stress testing, particularly important tools in the coming years.

Among these areas, eight key objectives are identified (Fig. 2.1). In the roadmap, the EBA addressed these topics in a comprehensive and sequential manner by progressively updating and enhancing all relevant parts of the supervisory and regulatory framework.



Fig. 2.1 Key objectives of the EBA's roadmap on sustainable finance (Source EBA Roadmap on ESG Risks and Sustainable Finance [2022c])

The scope of work in each of the key objectives varied encompassing in some cases all elements of ESG risks, in others focusing in the first place on the environmental, or even more narrowly, climate-related risks, following a sequential approach. Similarly, the spectrum of addressees may vary between the various mandates: while some of them cover the broader financial sector including credit institutions and investment firms, others apply only to specific institutions and/or their supervisory authorities. In addition, some of the mandates touched upon the aspects related to consumer protection, which may also be covered in line with the EBA's scope of activities.

In addition to the specific working areas specified in the roadmap, the EBA together with other ESMA and EIOPA has the task of seeking to incorporate ESG dimensions in the promotion of financial education as

part of the ESAs' mandates to review and coordinate financial education and literacy initiatives of the National Competent Authorities (NCAs).

Figure 2.2 summarizes the status of the work done so far by the EBA, as well as further mandates granted to the EBA on ESG risks and sustainable finance.

Within the action plan of the initiatives planned by the roadmap, EBA published in 2021 the “Report on management and supervision of ESG risks for credit institutions and investment firms” (EBA, 2021).

The objective of the Report is the implementation of ESG factors within the prudential framework referring to banks and investment firms in compliance with the overall EU regulatory framework.

The Report:

- defines ESG factors and risks with particular attention to climate change that leads to the identification of physical and transition risks that manifest themselves in a current and prospective key;
- proposes the available metrics, qualitative and quantitative criteria, and assessment methods necessary for potential effective management of ESG risks by identifying issues and challenges for banks and supervisors over medium- to long-term time horizon;
- points to a series of recommendations to encourage banks and investment firms to set up management strategies over time aimed at measuring and controlling these risks;
- presents methodologies and approaches to test the long-term resilience of institutions under ESG stress;
- suggests a step-by-step approach to including these elements in the business model and governance of the company and supervision.

With the aim of linking the established Climate Change milestones with the business processes of banks, EBA also published the “Guidelines on loan origination and monitoring” (EBA, 2020), indicating guidelines for the lending process of financial intermediaries.

Among other principles related to more familiar areas of lending processes, specific reference is made to ESG factors, particularly the need to incorporate ESG factors into institutions' credit risk appetite, risk management policies, and procedures, adopting a holistic approach. Reference is made to the potential impact of climatic and environmental factors, specifically the physical risk due to acute climate change events



Fig. 2.2 Key milestone for the EBA's work on sustainable finance (Source EBA Roadmap on ESG Risks and Sustainable Finance [2022c])

and the transition risk that could arise from transitioning to a low-carbon and climate-resilient economy.

Of particular interest is the section suggesting how to supplement lending policies and procedures with specific details on climate change. In particular, the following passage is reported for the purposes of this text:

In cases of lending to enterprises, the process should include [...] collecting information about the climate-related and environmental or otherwise sustainable business objectives of the borrowers. (Guidelines on loan origination and monitoring [EBA, 2020])

The need for financial intermediaries to equip themselves with data collection, historicization, and processing tools is a critical issue for integrating ESG into the business processes of financial institutions; data collection, and consequently, assessment that integrates climate variables when granting new loans has already begun, and banks are equipping themselves with increasingly sophisticated data collection and processing tools, but obtaining and managing ESG data will certainly be one of the most significant challenges that banks will face in the future.

In 2022, the European Banking Authority published the final draft of the “ITS (Implementing Technical Standards) on Pillar 3 disclosures on ESG (Environmental, Social, and Governance) risks”, providing tables, templates, and completion instructions, as mandated by Article 449a of Regulation (EU) No 575/2013 (Capital Requirements Regulation—CRR). This regulation requires financial institutions to provide information regarding environmental, social, and economic risks, including transition and physical risks.

In the document, the objectives of the regulation are clearly and unequivocally defined: “*The Pillar 3 disclosure framework promotes transparency as a main driver of market discipline in the financial sector, to reduce the asymmetry of information between credit institutions and users of information, and to address uncertainties on potential risks and vulnerabilities faced by institutions. The Pillar 3 framework on prudential disclosures on ESG risks is intended to allow investors and stakeholders to compare the sustainability performance of institutions and of their financial activities and will support institutions in the public disclosure of meaningful and comparable information on how ESG-related risks and vulnerabilities, including transition and physical risks, may exacerbate other risks in*

their balance sheet. In addition, it will help institutions in providing transparency on how they are mitigating those risks, including information on how they are supporting their customers and counterparties in the adaptation process to e.g. climate change and in the transition towards a more sustainable economy” (ITS on Pillar 3 disclosure on ESG risks [EBA, 2022a]).

The initiative holds significant relevance in the landscape of integrating ESG concepts into financial institutions, as it represents a regulatory obligation for banks in the ESG matter, whereas most other publications merely offer guidelines, expectations, and recommendations.

The EBA planned, as usual when issuing new regulatory requirements for banks, for a gradual adaptation to the various requirements outlined in the document. In addition, the EBA reserved the right to potentially amend the document’s contents during 2024, in line with developments in the European and international ESG environment.

Another important initiative taken by EBA was the publication of the discussion paper (DP) “The role of environmental risks in the prudential framework” (EBA, 2022b) with the aim to initiate *“the discussion on the appropriateness of the current prudential framework to address environmental risk drivers and considers the potential justification for a dedicated prudential treatment of exposures substantially associated with environmental and/or social objectives and those subject to environmental and/or social impacts”*.

The discussion paper analyzed the key elements to consider to incorporate climate risks in the Pillar 1 prudential framework for credit institutions and investment firms, such as time horizon, inclusion of forward-looking elements in the prudential framework, and the overall calibration of own funds requirements.

Following the DP, a series of reports are expected to be delivered by EBA in the near future (in accordance with CRR3) with the aim to incorporate ESG risks, specifically environmental risk, in the present regulatory framework, as foreseen in its “Roadmap on ESG risks and sustainable Finance (EBA, 2022c). These reports are considered complements of past and ongoing EBA initiatives in this field.

The first report was delivered in October 2023 (EBA, 2023), as the outcome of the discussion started in the DP on the appropriateness of the current Pillar 1 framework to address those new risks.

First of all, the report recognizes the need for a holistic approach among the three pillars of the prudential framework in addressing environmental and social risks. Within this approach, a major role is played by Pillar 3 (market transparency) and Pillar 2 (risk management and supervision). As regards the current Pillar 1, the report proposes targeted enhancements and amendments to the existing prudential regime rather than dedicated treatments such as supporting or penalizing factors. Targeted amendments can be implemented in the short term to accelerate the integration of E&S-related risks across the Pillar 1 framework, while preserving its integrity and purpose. While more comprehensive revisions could be envisaged in the medium term by reassessing potential changes to the prudential framework, the main priority remains for institutions to develop techniques to identify how and to what extent E&S risks translate into financial risks.

2.1.2 *The European Central Bank (ECB)*

At the end of 2020, the European Central Bank published the “Guide on climate-related and environmental risks. Supervisory expectations relating to risk management and disclosure” (ECB, 2020), a step that officially engaged European banks supervised within the Single Supervisory Mechanism (SSM) in the Euro area in assessing their exposure to climate risks. The ECB recognized climate-related risks as a key risk driver within the SSM Risk Map and as a pertinent focal point among supervisory priorities for the banking system in the euro area. This perspective led the ECB to advocate that financial institutions adopt a strategic, forward-looking, and comprehensive approach to incorporating climate-related and environmental risks in their risk management frameworks.

One of the most relevant aspects of the guide was the breakdown of climate-related and environmental risks (C&E) into two main risk drivers:

- *Physical risk refers to the financial impact of a changing climate, including more frequent extreme weather events and gradual changes in climate, as well as of environmental degradation, such as air, water and land pollution, water stress, biodiversity loss and deforestation. Physical risk is therefore categorised as “acute” when it arises from extreme events, such as droughts, floods and storms, and “chronic” when it arises from progressive shifts, such as increasing temperatures, sea-level rises, water stress, biodiversity loss, land use change,*

habitat destruction and resource scarcity. This can directly result in, for example, damage to property or reduced productivity, or indirectly lead to subsequent events, such as the disruption of supply chains.

- *Transition risk refers to an institution's financial loss that can result, directly or indirectly, from the process of adjustment towards a lower-carbon and more environmentally sustainable economy. This could be triggered, for example, by a relatively abrupt adoption of climate and environmental policies, technological progress or changes in market sentiment and preferences.*

The breakdown of climate-related and environmental risks into two main risk drivers is relevant because of its influence on the frequency of occurrence and the consequences of the risk itself:

- the physical risk stems from the expected increase in the frequency and intensity of natural disasters in the coming decades. Clearly, the geographical location of companies becomes a crucial factor, along with their positioning in regions prone to extreme weather events such as floods, inundations, and droughts. Consequently, companies located in areas designated “at risk” may find themselves particularly exposed to more severe damage due to the incidence of extreme weather events. This scenario can potentially lead to prolonged disruptions in production processes of varying duration and severity, resulting in insolvencies or similar conditions of intermediate severity for companies located in those regions;
- transition risk is influenced by government policies that address climate issues and aim to reduce CO₂ emissions. There is also a significant factor that determines variations in the manifestation of this risk. In this context, the determining factor is the industrial sector. The methods by which this transition is defined or is imposed differ between sectors with high energy consumption and substantial CO₂ emissions (such as the mining, cement, and steel industries), which are undeniably predisposed to experience the most pronounced negative repercussions. For instance, implementing measures like elevated carbon emission tax rates could elevate production expenditures and diminish profitability within these sectors.

Although not binding for institutions, the Guide delineated the ECB's interpretation of the responsible and prudent management of climate-related and environmental risks through 13 expectations (see Table 2.3) that significant institutions (SI) must meet when formulating and executing their business strategies, as well as in their governance and risk management frameworks.

The main focus of the ECB's climate risk expectations is the integration of climate and environmental considerations into various aspects of financial institutions' operations. This includes the following key areas:

- Business model and strategy (expectations 1 and 2): the ECB encourages institutions to incorporate climate-related and environmental considerations into their business strategies. This involves assessing the impact of these risks on various business activities and aligning strategies with the transition to a more sustainable economy;
- Governance and Risk appetite (expectations from 3 to 6): financial institutions must establish clear lines of responsibility for the management of climate-related risks at a board and senior management level. This means ensuring that climate risk oversight is integrated into decision-making processes. Furthermore, financial institutions must engage with stakeholders, including customers, investors, and regulators, to facilitate a broader understanding of their approach to managing climate-related risks;
- Risk management (expectations from 7 to 12): the ECB anticipates that institutions will seamlessly integrate climate-related and environmental risks within their comprehensive risk management procedures. This entails proficiently identifying, evaluating, and effectively mitigating these risks to ensure alignment with the institutions' established risk tolerance levels. Institutions are also urged to conduct scenario analyses, evaluating potential outcomes arising from diverse climate-related scenarios. This enables a deeper understanding of the potential impact of various climate trajectories on portfolios and business endeavors. Furthermore, institutions are encouraged to enhance their capacities for collecting, analyzing, and modeling climate-related data. This empowers them to make well-informed decisions and accurately gauge the influence of climate risks on their operational landscape. The ECB underscores the significance of cultivating internal proficiency and capabilities to adeptly handle and navigate climate-related risks. In alignment with this,

Table 2.3 Overview of ECB supervisory expectations

#	<i>Expectations</i>
1	Institutions are expected to understand the impact of climate-related and environmental risks on the business environment in which they operate, in the short, medium, and long term, in order to be able to make informed strategic and business decisions
2	When determining and implementing their business strategy, institutions are expected to integrate climate-related and environmental risks that impact their business environment in the short, medium, or long term
3	The management body is expected to consider climate-related and environmental risks when developing the institution's overall business strategy, business objectives, and risk management framework, and to exercise effective oversight of climate-related and environmental risks
4	Institutions are expected to explicitly include climate-related and environmental risks in their risk-appetite framework
5	Institutions are expected to assign responsibility for the management of climate-related and environmental risks within the organizational structure in accordance with the three lines of defense model
6	For the purposes of internal reporting, institutions are expected to report aggregated risk data that reflect their exposures to climate-related and environmental risks with a view to enabling the management body and relevant sub-committees to make informed decisions
7	Institutions are expected to incorporate climate-related and environmental risks as drivers of existing risk categories into their existing risk management framework, with a view to managing, monitoring and mitigating these over a sufficiently long-term horizon, and to review their arrangements on a regular basis. Institutions are expected to identify and quantify these risks within their overall process of ensuring capital adequacy
8	In their credit risk management, institutions are expected to consider climate-related and environmental risks at all relevant stages of the credit-granting process and to monitor the risks in their portfolios
9	Institutions are expected to consider how climate-related and environmental events could have an adverse impact on business continuity and the extent to which the nature of their activities could increase reputational and/or liability risks
10	Institutions are expected to monitor, on an ongoing basis, the effect of climate-related and environmental factors on their current market risk positions and future investments, and to develop stress tests that incorporate climate-related and environmental risks
11	Institutions with material climate-related and environmental risks are expected to evaluate the appropriateness of their stress testing with a view to incorporating them into their baseline and adverse scenarios

(continued)

Table 2.3 (continued)

#	<i>Expectations</i>
12	Institutions are expected to assess whether material climate-related and environmental risks could cause net cash outflows or depletion of liquidity buffers and, if so, incorporate these factors into their liquidity risk management and liquidity buffer calibration
13	For the purposes of their regulatory disclosures, institutions are expected, to publish meaningful information and key metrics on climate-related and environmental risks that they deem to be material, with due regard to the European Commission's Guidelines on non-financial reporting: Supplement on reporting climate-related information

Source ECB Guide on climate-related and environmental risks. Supervisory expectations relating to risk management and disclosure, November 2020

the ECB recommends that institutions incorporate climate-related scenarios into their stress testing protocols. This practice facilitates an assessment of the robustness of institutions' balance sheets and their capital sufficiency under varied climate-induced stress conditions;

- Disclosure (expectation 13): financial institutions are expected to enhance their disclosure and reporting practices related to climate risks. This includes providing transparent and comprehensive information to stakeholders about the exposure, management, and mitigation of climate-related risks.

Significant institutions (SI) were expected to use the guide, considering the materiality of their exposure to climate-related and environmental risks: they were to assess the extent to which their current management and disclosure practices for climate-related and environmental risks align with the expectations outlined in the guide. Since the guide was aimed at ensuring the consistent application of high supervisory standards across the euro area, National Competent Authorities (NCAs) were also recommended to apply the expectations set out in this guide in their supervision of less significant institutions (LSIs) in a manner that is proportionate to the nature, scale, and complexity of the activities of the institution in question.

Following the publication of the Guide in 2021, the ECB requested 112 significant institutions:

- to conduct a self-assessment of their current practices against the 13 supervisory expectations;
- to submit implementation plans detailing how and when they would bring their practices into line with the Guide.

The report “*The state of climate and environmental risk management in the banking sector*” (ECB, 2021d) sets the benchmark for encouraging the dissemination of best practices in the sector.

At the time of the Report’s publication, only 23% of banks had begun the process of incorporating climate and environmental (C&E) risks into their stress tests and sensitivity analyses. The report points out that institutions are primarily focusing on the realm of physical risk, which includes losses attributed to natural disasters such as droughts, fires, and floods. A limited subset of institutions has undertaken internal stress tests involving ecological transition scenarios, to quantify the potential impact of carbon taxation on the economy.

Although some institutions had taken significant steps toward reflecting C&E risks in their practices, most were still in the early stages. Materiality assessments indicated that nearly all institutions expected C&E risks to materially impact their risk profile in the next three to five years. Approximately half anticipated material impacts in the short-to-medium term, especially within credit, operational, and business model risks.

While progress was noted in adapting policies and procedures, few institutions had fully integrated climate and environmental risk practices into their strategies and risk profiles. Some measures were initiated, like formalizing management bodies’ responsibility for C&E risk management, yet pertinent risk reports for these bodies were lacking. Few institutions have assessed the necessary data to identify and internally report climate and environmental risks.

Moreover, transition risks received more attention than physical risks and other environmental factors, such as biodiversity loss and pollution. Institutions generally began data collection and capability development for transition risks. However, few accounted for additional environmental risk drivers, indicating a general blind spot in addressing such concerns.

Noteworthy, good practices emerged across various expectations, demonstrating institutions’ capabilities for sound C&E risk management. Though many institutions developed implementation plans, their quality varied. The pace of progress remained slow in most cases and expected

completion timelines suggested challenges in near-term alignment with ECB expectations.

Given the evolving nature of C&E risk management, the ECB recognized the potential difficulties posed by data and methodological gaps. The ECB expects institutions to adopt a strategic approach and take intermediate steps to address shortcomings. Through supervisory feedback and dialogue, the ECB aims to drive improvements in institutions' C&E risk management practices.

Referring to the specific section for details on the stress test exercises conducted by the ECB, it is worth mentioning the other following important publications of the ECB:

- “Supervisory assessment of institutions’ climate-related and environmental risks disclosures” (ECB, March [2022b](#)), which aimed to evaluate the climate-related and environmental risk disclosure practices within significant institutions and gauge their progress in relation to the ECB’s expectations. The publication presents the ECB’s primary observations on these practices, areas warranting improvement, and noteworthy approaches;
- “Walking the talk—Banks gearing up to manage risks from climate change and environmental degradation Results of the 2022 thematic review on climate-related and environmental risks” (ECB, November [2022e](#)). The report presents findings from the 2022 thematic review focused on climate-related and environmental risks within the banking sector. The report highlights banks’ proactive efforts to effectively manage risks arising from climate change and environmental degradation. Through this review, the report sheds light on how banks are aligning their actions with their commitment to addressing climate and environmental risks and emphasizes that banks are not only recognizing these risks but are also taking tangible steps to integrate risk management strategies that account for the impact of climate change and environmental factors;
- “Report. Good practices for climate-related and environmental risk management. Observations from the 2022 thematic review” (November [2022d](#)), a key supervisory publication, which offers insights and examples of good practices to illustrate the different ways in which significant institutions can align their approaches with the supervisory expectations presented in the ECB’s “Guide on

climate-related and environmental (C&E) risks. Supervisory expectations relating to risk management and disclosure” (ECB, 2020a, 2020b). The document complements the ECB’s report on the results of the Thematic Review on Climate and Environmental Risks (2022a, 2022b, 2022c, 2022d, 2022e, and 2022f) and responds to the sector’s desire for valuable information on best practices. It is important to note that the best practices described serve as illustrative examples that can help institutions move forward in managing climate and environmental risks. These practices may not be universally replicable, nor do they guarantee direct alignment with supervisory expectations. Furthermore, institutions should assess the applicability of these good practices in the context of their overall approach to managing climate and environmental risks. The ECB emphasizes that good practices are dynamic and will mature over time.

- “Report on good practices for climate stress testing” (ECB, 2022f), to be read in conjunction with the report on good practices from the 2022 thematic review, which serves as a guide to assist banks in adhering to ESG guidelines. The document aims to be a guide for designing a robust stress testing framework, which should generally include three key elements: the framework’s scope, scenarios, and choices of balance sheet assumptions (Fig. 2.3).

In the document, reference is made to another central theme in the context of climate stress testing: the data required for measurements. Figure 2.4 presents the information necessary for the reporting required within the framework of the Climate Stress Test 2022, serving as a starting point for the future.

2.2 THE INTERNATIONAL CONTEXT

At the international level, several organizations have carried out analyses, defined principles, and guidelines. proposed actions and tool kits for climate risk management and supervision. In this paragraph, a selection of initiatives most relevant for the purposes of this book is presented, referring to:

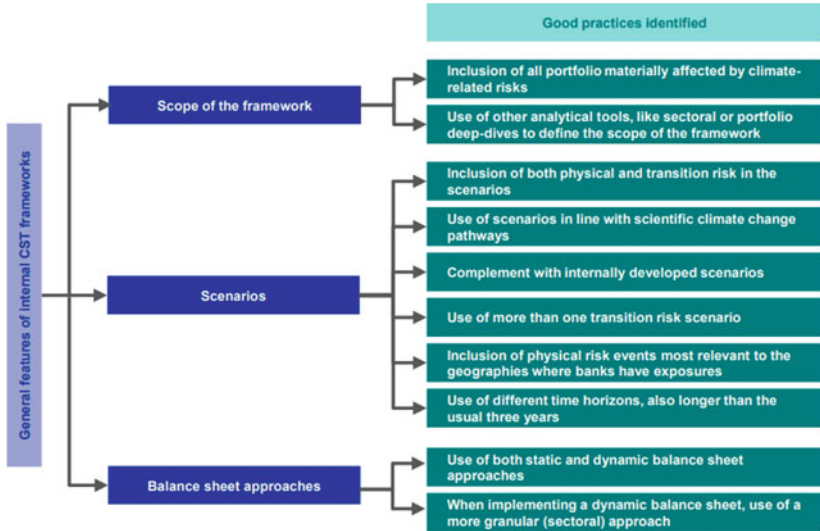


Fig. 2.3 Good practices in the design of internal CST frameworks (Source ECB Report on good practices for climate stress testing [2022f])

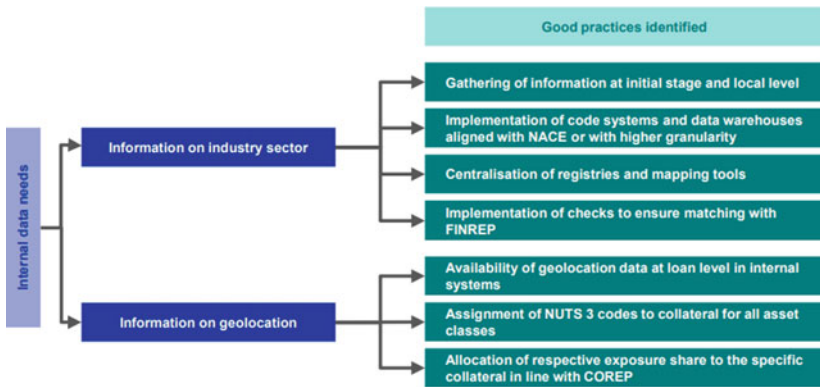


Fig. 2.4 Data requirements for climate stress testing (Source ECB Report on good practices for climate stress testing [2022f])

- Supranational organizations, as the Basel Committee on Banking Supervision (BCBS), the Financial Stability Board (FSB), the Task Force on Climate-related Financial Disclosures (TCFD), the Network of Central Banks and Supervisors for Greening the Financial System (NGF), and the United Nations Environment Programme Finance Initiative (UNEP FI);
- National competent authorities, with a focus on the UK and the US. A specific section is dedicated to the most relevant forward-looking tool introduced: climate risk stress testing.

2.2.1 *Supranational Organizations*

Basel Committee on Banking Supervision—BCBS

Since 2020, the Basel Committee has been working with a holistic approach to addressing climate-related financial risks to the global banking system. The first step was to establish a high-level Task Force on Climate-related Financial Risks (TFCR) to contribute to the Committee’s mandate of enhancing global financial stability by strengthening the regulation, supervision, and practices of banks. The report “Climate-related financial risks: a survey on current initiatives (BCBS, 2020)” presents the first main results of the assessment of the Task Force:

- on the one hand, it suggests that the existing regulatory and supervisory frameworks are appropriate means to address climate-related financial risks;
- on the other hand, it points out that, to date, most members have not yet incorporated or considered the mitigation of such risks within the prudential capital framework.

Further initiatives of the Basel Committee had specific targets to:

- explore how climate-related financial risks can arise from the exposition to climate change through macro and microeconomics transmission channels that arise from two different drivers: physical and transition risks (Report on “Climate-related risk drivers and their transmission channels” BCBS, 2021a);

- identify measurement methodologies to be introduced and implemented by banks and supervisors. The report “Climate-related financial risks—measurement methodologies” (BCBS, 2021b) has provided a first overview of conceptual issues related to climate-related financial risk measurement and methodologies, as well as practical implementation by banks and supervisors.

A further step, based on all the results of previous analyses, was the report “Principles for the effective management and supervision of climate-related financial risks” (BCBS, 2022) aiming to improve risk management and supervisory practices referring to climate-related financial risks, within a principle-based supervisory approach.

The report presents 18 high-level principles (Table 2.4) to provide a common basis for banks and supervisors to improve their practices for managing climate-related financial risks. In general, the principles are intended for large internationally active banks and supervisors within the jurisdictions of the members of the Basel Committee, while leaving flexibility in implementation to different member countries.

The report aims to strike a balance by improving practices and establishing a common baseline for internationally active banks and supervisors. It does so while maintaining enough flexibility and proportionality to account for variations in the morphology of various banking systems, the size and complexity of banks under its authority, and their risk profiles. Additionally, it takes into consideration the heterogeneity in the development of practices in this field.

Principles cover corporate governance, internal controls, risk assessment, management, and reporting and are conceptually organized in two blocks:

- principles 1–12 provide banks with guidance on effective management of climate-related financial risks;
- principles 13–18 provide guidance for prudential supervisors.

The first 12 principles are aimed at banks and cover corporate governance, internal controls, risk assessment, management and reporting, capital and liquidity adequacy, and other elements of risk management, including scenario analysis.

Table 2.4 BCBS's principles for the effective management and supervision of climate-related financial risks

#	
1	Banks should develop and implement a sound process for understanding and assessing the potential impacts of climate-related risk drivers on their businesses and on the environments in which they operate. Banks should consider material climate-related financial risks that could materialize over various time horizons and incorporate these risks into their overall business strategies and risk management frameworks
2	The board and senior management should clearly assign climate-related responsibilities to members and/or committees and exercise effective oversight of climate-related financial risks. Further, the board and senior management should identify responsibilities for climate-related risk management throughout the organizational structure
3	Banks should adopt appropriate policies, procedures, and controls that are implemented across the entire organization to ensure effective management of climate-related financial risks
4	Banks should incorporate climate-related financial risks into their internal control frameworks across the three lines of defense to ensure sound, comprehensive, and effective identification, measurement, and mitigation of material climate-related financial risks
5	Banks should identify and quantify climate-related financial risks and incorporate those assessed as material over relevant time horizons into their internal capital and liquidity adequacy assessment processes, including their stress testing programs
6	Banks should identify, monitor, and manage all climate-related financial risks that could materially impair their financial condition, including their capital resources and liquidity positions. Banks should ensure that their risk appetite and risk management frameworks consider all material climate-related financial risks to which they are exposed and establish a reliable approach to identifying, measuring, monitoring, and managing those risks
7	Risk data aggregation capabilities and internal risk reporting practices should account for climate-related financial risks. Banks should seek to ensure that their internal reporting systems are capable of monitoring material climate-related financial risks and producing timely information to ensure effective board and senior management decision-making
8	Banks should understand the impact of climate-related risk drivers on their credit risk profiles and ensure that credit risk management systems and processes consider material climate-related financial risks
9	Banks should understand the impact of climate-related risk drivers on their market risk positions and ensure that market risk management systems and processes consider material climate-related financial risks
10	Banks should understand the impact of climate-related risk drivers on their liquidity risk profiles and ensure that liquidity risk management systems and processes consider material climate-related financial risks

(continued)

Table 2.4 (continued)

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11	Banks should understand the impact of climate-related risk drivers on their operational risk and ensure that risk management systems and processes consider material climate-related risks. Banks should also understand the impact of climate-related risk drivers on other risks and put in place adequate measures to account for these risks if material. This includes climate-related risk drivers that might lead to increasing strategic, reputational, and regulatory compliance risk, as well as liability costs associated with climate-sensitive investments and businesses
12	Where appropriate, banks should make use of scenario analysis to assess the resilience of their business models and strategies to a range of plausible climate-related pathways and determine the impact of climate-related risk drivers on their overall risk profile. These analyses should consider physical and transition risks as drivers of credit, market, operational, and liquidity risks over a range of relevant time horizons
13	Supervisors should determine that banks' incorporation of material climate-related financial risks into their business strategies, corporate governance, and internal control frameworks is sound and comprehensive
14	Supervisors should determine that banks can adequately identify, monitor, and manage all material climate-related financial risks as part of their assessments of banks' risk appetite and risk management frameworks
15	Supervisors should determine the extent to which banks regularly identify and assess the impact of climate-related risk drivers on their risk profile and ensure that material climate-related financial risks are adequately considered in their management of credit, market, liquidity, operational, and other types of risk. Supervisors should determine that, where appropriate, banks apply climate scenario analysis
16	In conducting supervisory assessments of banks' management of climate-related financial risks, supervisors should utilize an appropriate range of techniques and tools and adopt adequate follow-up measures in case of material misalignment with supervisory expectations
17	Supervisors should ensure that they have adequate resources and capacity to effectively assess banks' management of climate-related financial risks
18	Supervisors should consider using climate-related risk scenario analysis to identify relevant risk factors, size portfolio exposures, identify data gaps, and inform the adequacy of risk management approaches Supervisors may also consider the use of climate-related stress testing to evaluate a firm's financial position under severe but plausible scenarios. Where appropriate, supervisors should consider disclosing the findings of these exercises

Source BCBS's Principles for the effective management and supervision of climate-related financial risks, June 2022

In detail:

- principles 1–3 refer to corporate governance:
 - principle 1 represents a general recommendation for banks to develop and implement a robust process for assessing the potential impact of climate risk on their activities and the business environment in which they operate. Banks should consider relevant climate-related financial risks that may materialize over several years.
 - principle 2 clarifies that the board and senior management are in charge of assigning climate-related responsibilities to members and/or committees, exercising effective oversight of climate-related financial risk, and also of identifying responsibilities for climate-related risk management throughout the organizational structure.
 - principle 3 suggests that banks adopt appropriate policies, procedures, and controls to ensure effective management of climate-related financial risks.
- principles 4–7 frame the climate-related financial risk management for banks in the broader context of the internal control systems, capital and liquidity adequacy, risk management process, and monitoring and reporting processes and procedures, emphasizing the need for banks to identify and quantify climate-related financial risks in their internal capital and liquidity adequacy assessment processes, including stress testing programs. Banks should strive to ensure that their internal reporting systems are able to monitor climate-related financial risks and produce timely information to ensure effective decision-making within the board of directors;
- while identifying and monitoring risks is crucial, the minimum requirements for implementing proper management of credit, liquidity, operational, and other risks are described in principles 8–11;
- principle 12 addresses a final recommendation to banks to make appropriate use of scenario analysis to assess the resilience of their business models and strategies and to determine the impact of climate-related risk factors on their overall risk profile.

The remaining six principles (13–18) focus on financial supervisors and regulators, outlining their duty to ensure that banks can “*adequately identify, monitor and manage all material climate-related financial risks*” (BCBS’s Principles for the effective management and supervision of climate-related financial risks). Supervisors are expected to know the extent to which banks identify and assess their climate-related risks and, if needed, to “utilize an appropriate range of techniques and tools and adopt adequate follow-up measures in case of material misalignment with supervisory expectations”.

Particularly:

- principles from 13 to 15 state that supervisors should ensure that:
 - banks integrate climate-related material financial risks into their business strategies.
 - climate-related material financial risks are adequately considered in the management of credit risk, market risk, liquidity risk, operational risk, and other risk by determining the extent to which banks regularly identify and assess the impact of climate-related risk factors on their risk profile.
- principles from 16 to 18 address responsibilities, powers, and functions supervisors will need to consider, including the use of climate-related stress tests, to assess banks’ management of climate-related financial risks. Supervisors should incorporate a range of techniques, including follow-up measures, establishing expectations, and sharing information with other supervisors. Similarly, supervisors must have adequate resources and expertise. The Committee also encourages supervisors to collaborate with the climate science community to stay informed on risks and to help develop best practices in scenario design for banks.

Financial Stability Board (FSB) and Task Force on Climate-Related Financial Disclosures (TCFD)

As an international body that plays a crucial role in promoting global financial stability and coordinating the regulation and supervision of the international financial system, the Financial Stability Board (FSB) launched in 2015 the Task Force on Climate-related Financial Disclosures (TCFD), to address the increasing concerns regarding climate change

and its potential impact on financial markets, businesses, and the global economy.

The TCFD's primary objective was to develop a set of voluntary, consistent, and decision-useful recommendations and guidance (Fig. 2.5) for companies and financial institutions to disclose information about their climate-related financial risks and opportunities and to increase market transparency on climate-related risks and opportunities. In 2017, the TCFD released climate-related financial disclosure recommendations designed to help companies provide better information to support informed capital allocation.

Since its establishment, the TCFD has gained widespread support from various stakeholders, including governments, financial regulators, investors, and companies. To provide investors with more comprehensive information on climate-related risks and opportunities, many large corporations and financial institutions have started to include TCFD-aligned climate disclosures in their financial and sustainability reports. Overall, the TCFD has become a significant driver for improved climate-related disclosure and is playing a crucial role in promoting greater awareness and



Fig. 2.5 Task Force recommendations and guidance (*Source* TCFD, “Recommendations of the Task Force on Climate-related Financial Disclosures”, June 2017)

understanding of climate risks within the financial industry. In Chapter 6, the contents of the TCDF's actions will be deepened in detail.

After the launch of the TCDF, the Financial Stability Board (FSB) deemed it appropriate to formalize a comprehensive roadmap to address the need for coordinated actions in terms of Climate-Related Financial Risks with the large and growing number of international initiatives underway by outlining key actions to be taken by standard-setting bodies and other international organizations over a multi-year period. Consequently, in 2021, the FSB published the “FSB Roadmap for Addressing Climate-Related Financial Risks” which focused on four key policy areas (Fig. 2.6):

- firm-level disclosures, as the basis for the pricing and management of climate-related financial risks at the level of individual entities and market participants;
- data, using consistent metrics and disclosures, provide the raw material for the diagnosis of climate-related vulnerabilities;
- vulnerabilities analysis, which provides the basis for the design and application of regulatory and supervisory frameworks and tools;

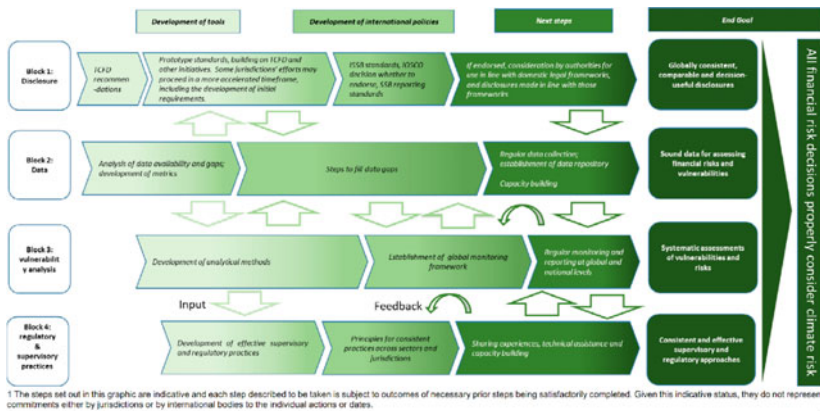


Fig. 2.6 Overview of the FSB's roadmap for addressing climate-related financial risks (*Source* FSB Roadmap for Addressing Climate-Related Financial Risks, July 2021)

- regulatory and supervisory practices and tools that allow authorities to address the identified climate-related risks to financial stability in an effective manner.

The G20 asked the FSB to deliver annual progress reports on the roadmap (FSB, 2022). In the last release of the progress report available (FSB, 2023), the FSB stated that the understanding of the financial risks arising from climate change and the policy approaches needed to address them remains at an early stage, notwithstanding encouraging progress has been made across all four blocks of the roadmap:

- *Firm-level disclosures: A substantial achievement has been the publication on 26 June of the International Sustainability Standards Board (ISSB)'s final standards, IFRS S1 on general sustainability-related disclosures and IFRS S2 on climate-related disclosures. The FSB welcomes the publication of the final standards, which will serve as a global framework for sustainability disclosures and, when implemented, will enable disclosures by different companies around the world to be made on a common basis. A key priority is now the swift consideration by the International Organization of Securities Commissions (IOSCO) of endorsement of the standards for authorities to adopt, apply or otherwise utilise in a robust and timely manner, reflecting each jurisdiction's circumstances. The FSB will work with the ISSB, IOSCO and other relevant bodies to promote the timely and wide use of the standards. The FSB also asks the ISSB to take over from the Task Force on Climate-related Financial Disclosures (TCFD) the monitoring of the adoption of climate-related disclosures by firms. Interoperability of the ISSB standards with jurisdictional frameworks is necessary in order to achieve global comparability of climate-related disclosures. In this context, the FSB strongly welcomes initiatives that aim to promote interoperability between those disclosure frameworks, such as the ISSB's Jurisdictional Working Group, and welcomes bilateral discussions on interoperability between the ISSB and individual jurisdictions to avoid firms' double reporting. Finally, encouraging progress has been made on the development of a global assurance framework for sustainability related corporate reporting to drive reliability of the disclosures.*
- *Data: Work in 2022–2023 has continued to focus on improving the availability, quality and cross-border comparability of climate data.*

An important goal is to develop global repositories that provide open access to data and would facilitate the use of metrics that reflect climate-related risks consistently and reliably across sectors and jurisdictions. There is a continuing need for enhancing climate data and improving its accuracy, consistency and quality, in order to support climate risk assessment and scenario analysis exercises. Further work is needed to develop metrics that measure climate related risks in a forward-looking manner;

- *Vulnerabilities analysis: Progress is being made on development of conceptual frameworks and metrics for monitoring climate-related vulnerabilities. Further work is needed to embed climate scenarios into monitoring of financial vulnerabilities and to develop understanding of the cross-border and cross-sectoral transmission of climate shocks in order to obtain financial stability insights;*
- *Regulatory and supervisory practices and tools: Initiatives on embedding climate related risk into risk management and prudential frameworks are ongoing and capacity building remains an important focus. As work on regulatory and supervisory approaches.*

Network of Central Banks and Supervisors for Greening the Financial System (NGFS)

The NGFS—Network of Central Banks and Supervisors for Greening the Financial System—was established at the Paris “One Planet Summit” in December 2017, by eight central banks and supervisors. Afterward, the membership of the Network has grown dramatically worldwide (<https://www.ngfs.net/en>).

The group works on a voluntary basis, to exchange experiences with the purpose of defining and promoting best practices, enhancing the role of the financial system to manage risks, and mobilizing capital for green and low carbon in order to support the transition toward a sustainable economy.

Activities are organized into six dedicated workstreams and task forces: Supervision, Scenario Design and Analysis, Monetary Policy, Net-Zero for Central Banks, Nature-Related Risks, Capacity Building, and Training.

For the purpose of this chapter, it is interesting to introduce the workstreams “Supervision” and “Scenario Design and Analysis”, since the

relevance of the scenario analysis for stress testing as a key tool for supervisory authorities and institutions themselves in the field of climate risk management, in a forward-looking perspective.

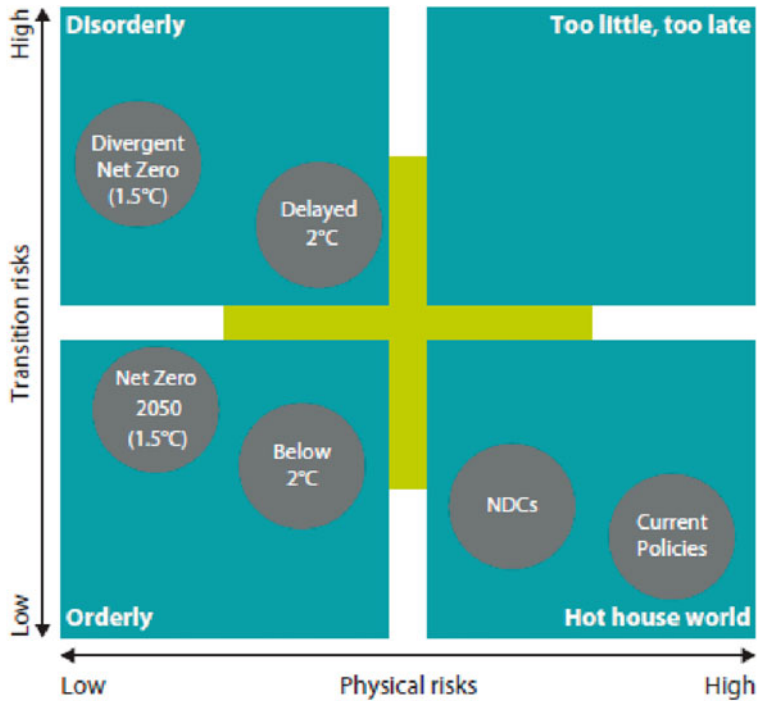
The objective of the workstream “Supervision” is to foster progress among NGFS members toward incorporating climate-related and environmental risks within their supervisory frameworks and practices, by sharing good practices in supervision and prudential regulation. Key contributions regard: the integration of climate-related risks into financial monitoring and micro-supervision; the bridging of data gaps and the support of internationally consistent climate-related and environmental disclosure.

The objective of the workstream “Scenario Design and Analysis” is to help NGFS members in the complex task of undertaking climate scenario analysis and promote its use within the financial system more broadly, with the aim of providing a common reference framework. While developed primarily for use by central banks and supervisors, this instrument may also be useful to the broader private sector, government, and academia. Since 2019 NFGS recommendations and iteration of subsequent sets of climate scenarios have been significantly contributing to dealing with two critical aspects of climate stress tests that cause difficulties in applying standard risk modeling methodologies: the forward-looking nature of climate-related risks and the inherent uncertainty about future events.

NGFS Climate Scenarios for central banks and supervisors (2022 September) is the output of different interactions since 2019, covering three dimensions and exploring a set of six scenarios, chosen to show a range of lower and higher-risk outcomes (Fig. 2.7).

Dimensions are defined as follows:

- Orderly scenarios: the assumption is that climate policies are introduced early and become gradually more stringent. Both physical and transition risks are relatively subdued.
- Disorderly scenarios: they explore higher transition risk due to policies being delayed or divergent across countries and sectors (e.g., carbon prices would have to increase abruptly after a period of delay).
- Hothouse world scenarios: the assumption is that some climate policies are implemented in some jurisdictions, but global efforts are insufficient to halt significant global warming. The scenarios result in severe physical risk including irreversible impacts like sea-level rise.



Positioning of scenarios is approximate, based on an assessment of physical and transition risks out to 2100.

Fig. 2.7 NGFS scenario framework (*Source* NGFS Climate Scenarios for central banks and supervisors [September 2022], <https://www.ngfs.net/en/ngfs-climate-scenarios-central-banks-and-supervisors-september-2022>)

Although NGFS is not a regulatory authority, several banks have been and are using NGFS scenarios as a reference to construct their own climate simulations to integrate such measurements into assessment exercises like ICAAP 2023.

United Nations Environment Programme Finance Initiative (UNEP FI)

The United Nations Environment Programme Finance Initiative (UNEP FI) is the leading global authority on the environment, the result of a strategic partnership between the United Nations and over 450 banks, insurers, and investors. UNEP's mission is to inspire, inform, and enable nations and peoples to improve their quality of life and to shape and drive the international sustainable finance agenda setting global standards and growing a global network of leading financial institutions. Through its workstreams, UNEP FI promotes sustainable finance and helps the financial industry align with and contribute to the Paris Agreement and Sustainable Development Goals.

Since 2018, UNEP FI has been running a Climate Risk Programme to support banks, investors, and insurers in identifying, measuring, disclosing, and managing climate-related risks. Within its Programme, UNEP FI has conducted a series of piloting exercises and has also developed publications to include physical and transition risk assessment tools.

The start of the piloting series, known as Phase I, was aimed at designing an approach for evaluating corporate lending portfolio exposure to transition and physical risks under different climate scenarios (UNEP FI, 2018).

In 2019, UNEP FI designed Phase II to help financial institutions expand their toolkit for climate risk assessment and disclosure, exploring climate scenarios, data and methodologies, and reporting and governance issues (UNEP FI, 2020).

Following the finalization of Phase II, UNEP FI has continued to contribute to the climate risk assessment universe through in-depth research and publications. The UNEP FI's "The Climate Risk Landscape" report of 2021 (UNEP FI, 2021a) aims to inform financial institution members about the similarities and distinctions among current climate risk assessment tools. It elaborates on the types of climate-related risk evaluated by these tools, their analysis level, and their focus sectors. Furthermore, in 2021, UNEP FI launched the Net-Zero Banking Alliance (NZBA), committing to align greenhouse gas emissions arising from its credit and investment for its own account activities with the path required to achieve a net-zero economy by 2050. The Alliance was launched by 43 Founding Members and has since grown to represent over 40% of global banking assets.

In June 2023, UNEP FI's Climate Risk and TCFD Program published a Climate Risk Tool Dashboard (UNEP FI, 2023) to support financial institutions in navigating through the ever-evolving climate risk tool universe. This database aims to enhance climate risk tools' readability by providing a comprehensive overview of more than 40 tools' features, metrics, methodology, assumptions, and common use cases.

2.2.2 *The UK and the US Authorities*

The UK Authorities

In the UK, several initiatives have been taken by the financial authorities regarding the theme of climate risk. Notably, the Prudential Regulation Authority (PRA), as part of the Bank of England (BoE-PRA) has taken significant steps. The PRA is responsible for prudential regulation and supervision, overseeing approximately 1500 banks, building societies, credit unions, insurers, and major investment firms. These initiatives represent a coordinated set of interventions aimed at incorporating climate risk into risk measurement frameworks, primarily for banks and insurance companies. Additionally, within the financial services industry, the Financial Conduct Authority (FCA) is responsible for conducting relevant prudential regulation of businesses, setting standards, and ensuring the integrity of the financial market and customer protection.

On the specific theme of climate risk, in March 2019, the authorities established the Climate Financial Risk Forum (CFRF). CFRF is an industry group, co-chaired by the FCA and Bank of England, to build capacity and share best practices across industry and financial regulators to advance the financial sector's responses to the financial risks from climate change. It brought together senior representatives from across the financial sector, including banks, insurers, and asset managers to produce in working groups practical guidance incorporating best practices in areas such as risk management, scenario analysis, disclosure and innovation, and the transition to net-zero.

BoE-PRA

In April 2019, the Bank of England and the Prudential Regulation Authority set supervisory expectations for banks and insurers on the management of climate-related financial risks, covering governance, risk management, scenario analysis, and disclosure. The "Supervisory Statement 3/19 (SS3/19)—Enhancing banks' and insurers' approaches to

managing the financial risks from climate change” (BoE-PRA, 2019) set out the Central Bank’s expectations that firms take a strategic approach to managing climate-related financial risks, identifying current risks and those that can plausibly arise in the future, and appropriate actions to mitigate those risks.

Following the publication of the statement in 2020 (BoE, 2020a), a “Dear CEO letter” was published by the BoE in July 2020 (BoE, 2020b), which provided observations on good practice and set out the next steps for implementation.

In October 2021, the BoE published the Report “PRA Climate Change Adaptation Report 2021 Climate-related Financial Risk Management and the role of Capital Requirements” (CCAR) (BoE, 2021) which set out the progress the regulated firms have made in managing climate-related risks and the supervisory strategy for the next years and the potential role of capital requirements for banking and insurance.

From 2022 onwards, the Bank of England moved toward actively supervising regulated firms against supervisory expectations set out in the Supervisory Statement 3/19 (SS3/19).

The new 2022 “Dear CEO letter” (BoE, 2022) provided thematic feedback to firms on their progress on embedding SS3/19 and undertaking the Climate Biennial Exploratory Scenario (CBES).

In March 2023, a revised CCAR was published with an update of key findings from the 2021 report on climate-related risks and the regulatory capital frameworks. It does not set out any policy changes but sets out the Central Bank’s latest thinking on the extent to which climate-related risks might be captured by the regulatory capital frameworks and identifies areas for future work (BoE, 2023).

FCA

Since January 2021, the Financial Conduct Authority has brought in new rules on climate-related disclosures for listed companies, asset managers, and FCA-regulated asset owners with the commitment to holding the industry to the same standards of reporting and to playing our part in supporting the Government’s commitment to achieving a net-zero economy by 2050. Under the FCA’s ESG rules, firms are expected to publish a TCFD report either within its annual financial report for its financial year starting on or after 1 January 2022, or as a standalone which is cross-referred to in its annual financial report. Types of regulated firms expected to report in accordance with the TCFD framework are:

- Asset managers, specifically portfolio managers and UK UCITS managers
- Asset owners who are insurers or pure reinsurers, specifically providers of insurance-based investment products, personal pension scheme operators, and self-invested personal pension operators (SIPP) operators (but only those which contain insurance-based investment products provided by the firm)
- Other asset owners are other than insurers or pure reinsurers, specifically personal pension scheme operators and SIPP operators containing units, interest in closed-ended investment funds, and predefined investment portfolios.

The first climate-related disclosure report was published in July 2022, setting out the FCA's approach to managing climate-related risks and opportunities. It is aligned with the recommendations of the Taskforce on Climate-related Financial Disclosures (TCFD) and covers both its regulatory and corporate activities (FCA, [2022](#)).

CFRF

On 29 June 2020, the Climate Financial Risk Forum published its first guide to help the financial industry approach and address climate-related financial risks. The guide aims to help financial firms understand the risks and opportunities that arise from climate change, and support firms as they adapt their risk, strategy, and decision-making processes to reflect climate-related financial risks.

In October 2021, the CFRF published a second round of guides to help the financial sector develop best practices to manage climate-related financial risks and opportunities focusing on risk management, scenario analysis, disclosure, innovation, and climate data and metrics. In particular, the risk-appetite statements, scenario analysis guide, disclosure case studies, and the climate data and metrics dashboard were designed to support firms in overcoming the significant challenges that they have encountered so far in embedding climate risk management in their organizations.

The CFRF's third round of guides and other materials, such as webinars and metrics dashboard, were published in two tranches, in December 2022 and March 2023. Written by industry, for industry, the materials build on the CFRF's previous publications, and aim to continue to support the financial sector in developing its approach to addressing

climate-related financial risks and opportunities with a focus on the following areas: scenario analysis, climate disclosure, data and metrics and the findings from a new working group focusing on the transition to net-zero.

The US Authorities

In 2021–2022, the Office of the Comptroller of the Currency [OCC, 2021]), the Federal Reserve System (FED), and the Federal Deposit Insurance Corporation (FDIC) published their first own proposals of “*Principles for Climate-Related Financial Risk Management for Large Banks*” to support the identification and management of climate-related financial risks by banks with more than \$100 billion in total consolidated assets.² The proposed principles promote consistency in the supervision of large banks and are designed to help financial institutions’ boards of directors and management make progress toward incorporating climate-related financial risks into financial institutions’ risk management frameworks in a manner consistent with safe and sound practices.

The proposed principles address both the physical risks and transition risks associated with climate change and would cover 7 areas:

- governance;
- policies, procedures, and limits;
- strategic planning;
- risk management;
- data, risk measurement, and reporting;
- scenario analysis;
- management of risk areas, including credit, liquidity, other financial risks, operational, legal/compliance, and other non-financial risks.

Regarding scenario analysis, the proposals highlight the importance of financial institutions tailoring climate-related scenario analysis frameworks

² For the last updating of the proposals see “Principles for Climate-Related Financial Risk Management for Large Financial Institutions”, Notice by the Comptroller of the Currency, the Federal Reserve System, and the Federal Deposit Insurance Corporation on 10/30/2023. Retrieved from <https://www.federalregister.gov/documents/2023/10/30/2023-23844/principles-for-climate-related-financial-risk-management-for-large-financial-institutions>.

to their size, complexity, business activities, and risk profile. These frameworks should have well-defined goals aligned with the overall strategies for managing climate-related financial risks. These goals may include:

- evaluating how climate risks might affect the institution’s strategy and business model;
- recognizing and quantifying vulnerability to pertinent climate-related financial risk factors such as physical and transition risks;
- assessing exposures to climate-related factors and potential losses across various scenarios, even extreme yet plausible ones.

This climate-related scenario analysis framework also helps management recognize constraints and uncertainties related to data and methodologies in managing climate-related financial risks. Additionally, it allows for the evaluation of the adequacy of the institution’s risk management framework.

To ensure the quality of climate-related scenario analyses, oversight, validation, and quality control standards should be applied. The outcomes of these analyses should be communicated transparently and consistently to the board and relevant individuals within the financial institution. This communication should provide sufficient detail to effectively convey assumptions, limitations, and uncertainties associated with the results.

In relation to credit risk, the proposals highlight that management should include climate-related financial risks in the assessment and continuous monitoring of portfolios. Effective practices for managing credit risk might involve tracking climate-related credit risks by analyzing concentrations within sectors, geographic regions, and individual entities. This analysis should encompass credit risk concentrations arising from both physical and transition risks. While conducting a concentration risk analysis, management should evaluate possible alterations in correlations among exposures or asset classes. Aligned with the financial institution’s risk-appetite statement, management should establish tolerances for credit risk and lending limits connected to these risks.

In October 2020, the State of New York— Department of Financial Services (DFS) issued an Industry Letter outlining its expectations related to addressing the financial risks from climate change to all New York-regulated banking organizations, branches and agencies of foreign banking organizations, mortgage bankers and servicers, and limited

purpose trust companies, as well as New York-regulated non-depositories (other than New York-regulated mortgage bankers, mortgage servicers, and limited purpose trust companies), including New York-regulated money transmitters, licensed lenders, sales finance companies, premium finance agencies, and virtual currency companies. The letter outlined the following DFS’s expectations for New York-regulated banking organizations:

- DFS expects that all Regulated Organizations:
 - start integrating the financial risks from climate change into their governance frameworks, risk management processes, and business strategies. This should include an enterprise-wide risk assessment to evaluate climate change and its impacts on risk factors, such as credit risk, market risk, liquidity risk, operational risk, reputational risk, and strategy risk and
 - start developing their approach to climate-related financial risk disclosure and consider engaging with the Task Force for Climate-related Financial Disclosures framework and other established initiatives;
- DFS expects that all Regulated Non-Depositories:
 - conduct a risk assessment of the physical and transition risks of climate change;
 - start developing strategic plans, including an outline of such risks, the impact on their balance sheets, and steps to be taken to mitigate such risks.

On 15 November 2021, DFS issued the final “Guidance for New York Domestic Insurers on Managing the Financial Risks from Climate Change”, detailing DFS’s expectations related to insurers’ management of the financial risks from climate change. After issuing a proposed version of the guidance in March, DFS received comments from a broad range of stakeholders, including insurers, trade groups, consumer advocates, climate experts, rating agencies, and other financial regulators.

In 2021 The Financial Stability Oversight Council (FSOC or Council) published the “Report on Climate-Related Financial Risk” to set its recommendations to strengthen the financial system and make it more resilient to climate-related shocks and vulnerabilities, summarized in Table 2.5

Table 2.5 Council recommendations

<i>Scope</i>	<i>#</i>	<i>Recommendations</i>
Building capacity and expanding efforts to address climate-related financial risks	1.1	The new staff-level committee, the Climate-related Financial Risk Committee (CFRC), will identify priority areas for assessing and mitigating climate-related risks to the financial system and serve as a coordinating body, where appropriate, to share information, facilitate the development of common approaches and standards, and facilitate communication across FSOC members and interested parties
	1.2	The Council will form a Climate-related Financial Risk Advisory Committee (CFRAC) which will help the Council gather information on and analysis of climate-related financial risks from a broad array of stakeholders
	1.3	The Council recommends that consistent with their budget processes and mandates, FSOC members should prioritize internal investments to expand their respective capacities to define, identify, measure, monitor, assess, and report on climate-related financial risks and their effects on financial stability
	1.4	The Council recommends that FSOC members include descriptions of their activities related to climate-related financial risks in their annual reports and consider incorporating climate-related financial risks in relevant risk reports that they publish, as appropriate
	1.5	The Council recommends that FSOC members make climate-related data for which they are the custodians freely available to the public, as appropriate and subject to any applicable data confidentiality requirements
	1.6	The Council recommends that its members, where applicable, coordinate the analyses of climate-related financial risks conducted in the supervisory and regulatory functions of their agencies and organizations

(continued)

Table 2.5 (continued)

<i>Scope</i>	<i>#</i>	<i>Recommendations</i>
Filling climate-related data and methodological gaps	1.7	The Council recommends that the Federal Insurance Office (FIO) should act expeditiously to analyze the potential for climate change to affect insurance and reinsurance coverage, particularly in regions of the country affected by climate change
	1.8	The Council recommends that its members, consistent with their mandates and authorities, evaluate climate-related impacts and the impacts of proposed policy solutions on financially vulnerable populations when assessing the impact of climate change on the economy and the financial system
	1.9	The Council recommends that the Treasury Department engage other members of the Financial Literacy and Education Commission (FLEC) to analyze and understand the impact of climate change on the financial well-being of financially vulnerable populations
	2.1	The Council recommends that its members promptly identify and take the appropriate next steps toward ensuring that they have consistent and reliable data to assist in assessing climate-related risks
	2.2	The Council recommends that its members use existing authorities to implement appropriate data- and information-sharing arrangements to facilitate the sharing of climate-related data across FSOC members and non-FSOC member agencies to assess climate-related financial risk, consistent with data confidentiality requirements
	2.3	The Council recommends that FSOC work with its members through the CFRC to coordinate efforts, as appropriate, to address data gaps, including prioritizing data sets and coordinating data acquisition

(continued)

Table 2.5 (continued)

<i>Scope</i>	<i>#</i>	<i>Recommendations</i>
	2.4	The Council recommends that the Office of Financial Research (OFR), in coordination with the CFRC, provide data services—including identifying, hosting, and procuring data—and analytical tools to facilitate members’ assessment of climate-related financial risks, including scenario analysis
	2.5	The Council recommends that its members, coordinating through the CFRC, move expeditiously to develop consistent data standards, definitions, and relevant metrics, where possible and appropriate, to facilitate common definitions of climate-related data terms, sharing of data, and analysis and aggregation of data
	2.6	The Council recommends that its members continue to coordinate with their international regulatory counterparts, bilaterally and through international bodies, as they identify and fill data gaps, address data issues, and develop definitions, data standards, metrics, and tools
Enhancing public climate-related disclosures	3.1	The Council recommends that its members review their existing public disclosure requirements
	3.2	The Council recommends that its members, consistent with their mandates and authorities, consider enhancing public reporting requirements for climate-related risks in a manner that builds on the four core elements of the Task Force on Climate-Related Financial Disclosure (TCFD), to the extent consistent with the US regulatory framework and the needs of US regulators and market participants

(continued)

Table 2.5 (continued)

<i>Scope</i>	#	<i>Recommendations</i>
	3.3	The Council recommends that its members, consistent with their mandates and authorities, evaluate standardizing data formats for public climate disclosures to promote comparability, such as the use of structured data using the same or complementary protocols, where appropriate and practicable
	3.4	The Council understands that information on greenhouse gas (GHG) emissions promotes a better understanding of the exposures of companies and financial institutions to climate-related financial risks
	3.5	The Council recommends that its members continue to coordinate with their international regulatory counterparts, bilaterally and through international bodies, as they assess requirements for climate-related disclosures
	3.6	Public Issuer Disclosures—The Securities and Exchange Commission (SEC) staff are developing a proposal on disclosure requirements for public issuers related to climate-related risks for the SEC’s consideration. The Council is encouraged by the SEC’s work on this critical issue and supports its efforts to consider enhanced climate-related <i>disclosures to provide investors with information that is consistent, comparable, and decision-useful</i>
	3.7	Banks—The Council recommends that federal banking regulators, consistent with their mandates and authorities, continue to review banks’ public regulatory reporting requirements to assess whether enhancements are needed to provide market participants with information on institutions’ climate-related financial risks, taking into account a bank’s size, complexity, and activities

(continued)

Table 2.5 (continued)

<i>Scope</i>	<i>#</i>	<i>Recommendations</i>
Assessing and mitigating climate-related risks that could threaten the stability of the financial system	3.8	Insurers—The Council supports continued efforts by FIO and insurance regulators to work together to enhance the existing climate-related disclosures for the insurance sector
	3.9	Asset Managers—The SEC staff are evaluating requirements for registered funds and investment advisers related to Environmental, Social, and Governance (ESG) factors, including ESG claims and related disclosures, for the SEC’s consideration. The Council is encouraged by the SEC’s work on this issue and supports its efforts in this area
	3.10	State and Local Finance—The Council encourages its members to review their authorities to consider how disclosure of climate-related risks related to municipal securities can be enhanced
	3.11	Accounting and Audit Standards—The Council welcomes the work of the International Financial Reporting Standards (IFRS) Foundation Trustees in laying <i>the foundation for the formation of an international sustainability standards board (ISSB) to promote the development of sustainability reporting standards focused on enterprise value creation that could lead to consistent and comparable disclosures that can be used as building blocks across jurisdictions</i>
	4.1	The Council recommends that its members collaborate with external experts to identify climate forecasts, scenarios, and other tools necessary to better understand the exposure of regulated entities to climate-related risks and how those risks translate into economic and financial impacts

(continued)

Table 2.5 (continued)

<i>Scope</i>	<i>#</i>	<i>Recommendations</i>
	4.2	FSOC members should continue to coordinate with their international regulatory counterparts, bilaterally and through international bodies, as they assess climate-related financial stability risks
	4.3	The Council recommends that its members use scenario analysis, where appropriate, as a tool for assessing climate-related financial risks, taking into account their supervisory and regulatory mandates and the size, complexity, and activities of regulated entities
	4.4	The Council recommends that its members should, consistent with their mandates and authorities, consider using common scenarios that build on existing work, including scenarios developed by the Network of Central Banks and Supervisors for Greening the Financial System (NGFS) and work at the Financial Stability Board (FSB), as appropriate for the institutions and markets under consideration
	4.5	The Council recommends that to help inform interagency assessments of the system-wide effects of climate change, the CFRC should serve as a forum for FSOC members to share data and methodologies and leverage the expertise needed to perform scenario analysis and share results
	4.6	FSOC members should continue their efforts to consider the incorporation of climate-related risks into their regulatory and supervisory programs and update those programs as necessary, consistent with their mandates and authorities

(continued)

Table 2.5 (continued)

<i>Scope</i>	<i>#</i>	<i>Recommendations</i>
	4.7	FSOC members, consistent with their mandate and authorities, should review existing regulations, guidance, and regulatory reporting relevant to climate-related risks, including credit risks, market risks, counterparty risks, and other financial and operational risks, to assess whether updates are necessary to appropriately address climate-related financial risks
	4.8	FSOC members should evaluate whether additional regulations or guidance specific to climate-related risks is necessary to clarify expectations for regulated or supervised institutions regarding the management of climate risks, taking into account an institution's size, complexity, risk profile, and existing enterprise risk management processes

Source Elaboration by the Authors from the Financial Stability Oversight Council's "Report on Climate-Related Financial Risk", 2021

2.3 STRESS TEST EXERCISES AT A GLANCE

A relevant aspect of the climate risk framework and toolkit is the stress test exercises. As pinpointed by UN Environment Programme Finance Initiative in its "Comprehensive Good Practice Guide to Climate Stress Testing" (UNEP-FI, December 2021b) "*a climate stress test is a forward-looking exercise designed to measure a financial institution's exposure to climate risks, using scenario analysis including severe climate risks, to assess the potential impact of climate change on the institution's business model. Climate stress tests may leverage significant elements of traditional capital stress testing, but also contain a number of important differences. Institutions can and should leverage the knowledge and skills developed through years of post-GFC stress testing, but will also need to adapt to meet the emerging challenges of conducting a climate stress test*".

As already underlined by EBA (2021) in its "Report on management and supervision of ESG risks for credit institutions and investment firms", at the beginning, climate stress tests were mainly run in the form of pilot exercises, since the experience was lacking, and the design of climate stress

tests is very complex and faces several issues and challenges for supervisors and supervised entities.

As pinpointed, among others, by the Financial Stability Institute (FSI) of the Bank for International Settlements (BIS) in July 2021, the main challenges arise from adapting traditional stress tests to climate-related risks as, for example:

- assumptions made about the different climate scenarios;
- uncertainties about climate developments themselves;
- environmental policies adopted by national and international governments/bodies and the actual implication for financial and economic factors and how these are modeled;
- choosing appropriate time horizons (which are longer for climate stress tests than for normal stress tests);
- considering transition or physical risk, accounting for changes in technology and consumer preferences;
- data availability.

Globally, an increasing number of supervisors have conducted, are conducting, or announced to conduct a climate stress test.

There are two approaches (see Table 2.6) for performing a stress test:

- a top-down approach, performed by supervisory authorities using their own framework (assumptions, scenarios, and models, ...) to apply uniform methodologies among financial institutions that are accompanied by a lower cost of resources;
- a bottom-up approach performed directly by financial institutions using their own framework as part of a system-wide or supervisory exercise and their own data.

Several regulators have undertaken a top-down analysis to quantify climate-related risks to financial stability, focusing mainly on their local jurisdictions and with limited scopes. Most stress testing exercises consider a 30-year horizon, in line with the Paris Agreement and the commitment to achieve net-zero emissions by 2050. Sometimes, to capture extreme physical risks, the time frame is extended beyond 30 years; other times the exercises provide for a shorter scenario to improve the significance of the results and align with existing supervisory stress tests.

Table 2.6 Overview of top-down and bottom-up stress testing

<i>Top-Down</i>	<i>Bottom-up</i>
<ul style="list-style-type: none"> • Conducted by regulatory authorities or central banks • The supervisory authority can define the exercise and estimate the magnitude of the impact from a climate shock • Participating firms may be asked to map the effects of the shock on their assets <p>Not as resource-intensive as a bottom-up approach for participating financial institutions</p> <p>Premise and constraints of the test are based on aggregate, macroeconomic assumptions & climate scenarios are adapted to be applicable toward domestic firms</p> <ul style="list-style-type: none"> • Data is obtained from aggregate sources that are generally less granular to cover a wide range of participants • Physical risk data is usually collected by geography by either using country databases to determine their vulnerability to physical risks or using an authority's own estimates for their jurisdiction <p>Transition risk data is collected using official sector datasets and survey data from financial institutions</p> <p>Methodologies of a top-down approach can result in difficulties linking sectors and firms, to the degree to which the action of one sector or firm might affect the risks faced by others</p>	<ul style="list-style-type: none"> • Conducted by the firms themselves • Firms estimate their exposure to potential climate risks • It is possible for a regulator to provide guidance and direction on the scenarios to use, with the institution then running the scenario analysis and translating them for their counterparties <p>Highly resource-intensive, requiring firms to use models and collect data at the firm-level</p> <p>Where appropriate, the premise and constraints of the test can be based on a firm's own assumptions about what shocks may affect them & their business model</p> <p>Data originates from own firm and possibly third parties, resulting in the use of more granular data for analysis</p> <ul style="list-style-type: none"> • Firms may have to use their own models to estimate their exposure to climate risks as a financial variable, which may require institutions to develop internal quantitative models <p>Disparity in the availability of resources and capital, as well as access to modeling systems, between financial institutions, can result in a skewed assessment of the financial system as a whole</p>

(continued)

Table 2.6 (continued)

<i>Top-Down</i>	<i>Bottom-up</i>
<p>Test results can be compared firm-to-firm due to standardized nature of methodologies</p> <ul style="list-style-type: none"> • Individual firms may be less convinced of top-down test results & therefore less likely to implement recommendations based on the outputs of the exercise • Generalized results present difficulties in linking relevant climate risks to specific firms, resulting in difficulties in taking appropriate action by institutions <p>Results may give rise to static estimates that may give limited insight into how risks may change in the future and therefore can result in risks being under or over-estimated</p>	<p>Test results cannot be compared across firms since test methodologies can differ between firms</p> <ul style="list-style-type: none"> • Better at capturing firm-specific dynamics due to firms' own estimates of exposure which increases confidence in the usefulness of the results and its implementation in addressing climate risks by firms • Provides individual firms with the opportunity to underestimate climate risks in order to avoid undesirable outcomes

Source UNEP FI's Comprehensive Good Practice Guide to Climate Stress Testing, December 2021

In terms of assumptions underlying the development of balance-sheet items, although a dynamic approach would increase the realism of the exercises, the majority of exercises adopt a static approach, easier to implement and which allows not to underestimate the financial impacts as any management actions to mitigate risk are not considered. Some exercises use a hybrid approach.

The NGFS scenarios are a common starting point for assessments: their use therefore increases the possibilities of comparing results, even in the presence of different economic and policy conditions. In this regard, authorities that have already completed the first stress tests show the need to develop and standardize methodologies for climate risk assessment and improve the availability of climate-related data.

In October 2021, the Network for Greening the Financial System published a technical document “Scenarios in Action A progress report on global supervisory and central bank climate scenario exercises” to set out how 31 NGFS members use climate scenarios to identify, assess, and understand climate risks in their economies and financial systems. As a rapidly growing number of central banks and supervisors are conducting climate scenario analysis, the report took stock of the state of play to date. Nevertheless, the report provides a fundamental starting point for further

in-depth exploration and a comprehensive picture of the climate scenario exercises that NGFS members are undertaking. Figure 2.8 provides an overview of climate stress testing announcements and initiatives by the country members of the NGFS.

A comparison table of eight major climate stress test exercises by supervisory authorities, developed by the UN Environment Programme Finance Initiative (UNEP FI), can provide a concise view of the main methodological characteristics of regulatory stress test exercises (Table 2.7).

2.3.1 *Climate Stress Test Exercises Performed by the ECB*

Within the above landscape of regulatory exercises, ECB plays a pivotal role having completed, to date, the following two climate risk stress tests (CST):

- the Economy-wide climate stress test, launched in 2021 to assess the resilience of non-financial corporates (NFCs) and euro area banks to climate risks, under various assumptions in terms of future climate policies;
- the SSM Climate risk stress test launched in 2022 as a learning exercise aimed at enhancing both banks' (not corporates) and supervisors' capacity to assess climate risk.

The ECB Economy-Wide Climate Stress Test

The exercise, described in “ECB economy-wide climate stress test. Methodology and results” (ECB, 2021a) referred to (Fig. 2.9):

- a very comprehensive dataset which encompassed 4 million corporates worldwide, as well as 1600 consolidated banking groups in the euro area with projections over a period of 30 years;
- a novel set of climate-specific models to capture the direct and indirect transmission channels of climate risk drivers for firms and banks developed by ECB staff;

The objective was to test the resilience of banks and non-financial companies according to the three climate scenarios proposed by the Network for Greening the Financial System—NGFS (orderly scenario, disorderly

Member	Expected end date of the exercise	Balance sheet assumption	Approach	Level of granularity	Risk coverage	Time horizon
Autorité de contrôle prudentiel et de résolution (ACPR)/Banque de France	Concluded (May 2021)	Hybrid	Bottom-up	Sector	Physical, transition	30 years
Australian Prudential Regulation Authority (APRA)	Early 2022	Static, hybrid	Bottom-up, Top-down	Counterparty, macroeconomic, sector	Physical, transition	30 years
Banca d'Italia	Concluded	N/A	Micro-founded approach	Sector	Transition	0 year
Banco Central de Chile	Q2 2022	Static, dynamic	Bottom-up, Top-down	Macroeconomic, sector	Transition	5 years
Banco de España	Dec-21	Static	Top-down	Macroeconomic, sector	Transition	3 years
Banco de la República (Colombia)	Dec-21	Static	Top-down, other	Macroeconomic, sector	Physical, transition	30 years, 80 years for GDP effects
Banco de México	Dec-21	Static, dynamic	Top-down	Counterparty, macroeconomic, sector	Physical, transition	3 years / 20 – 30 years (tbd)
Bangko Sentral ng Pilipinas (Philippines)	Mid-2022	Static	Bottom-up	TBD	TBD	TBD
Bank Al-Maghrib (Morocco)	Planning phase	Dynamic	Other	Macroeconomic, sector	Physical, transition	30 years
Bank of Canada	Autumn 2021	Static	Bottom-up, Top-down	Counterparty, macroeconomic, sector	Transition	30 years
Bank of England (UK)	May 2022 (sooner if the Bank decides not to ask for a second round of submissions)	Static	Bottom-up	Counterparty, macroeconomic, sector	Physical, transition, litigation	30 years for transition 60 years for physical
Bank of Korea	Dec-22	Static	Top-down	Sector	Physical, transition	30 years
Bundesbank (Germany)	First part: Nov-21	Hybrid	Top-down	Macroeconomic, sector, entity-level	Physical, transition	5 – 30 years
De Nederlandsche Bank (Netherlands)	Q4 2021	Static	Top-down	Counterparty	Physical, transition	1 year for flooding risk 10 years for transition
European Banking Authority	Concluded (May 2021)	Static	Top-down	Counterparty	Physical, transition	30 years
European Central Bank	Concluded (September 2021)	Static	Top-down	Counterparty	Physical, transition	30 years
Hong Kong Monetary Authority	Dec-21	Static	Bottom-up	Counterparty, sector	Physical, transition	5 – 30 years
Japan Financial Services Agency/ Bank of Japan	June-22	Static	Bottom-up	Counterparty, macroeconomic, sector	Physical, transition	30 years for transition 80 years for physical
Malta Financial Services Authority	Q2 2022	Static	Top-down	Sector	Transition	Short-term horizon
Monetary Authority of Singapore	H2 2022	Static	Bottom-up	Counterparty, macroeconomic, sector	Physical, transition	30 years

Fig. 2.8 List of announcements and exercises by countries for climate scenario and climate stress testing exercises (*Source* NGFS, “Scenarios in Action A progress report on global supervisory and central bank climate scenario exercises”, October 2021)

Oesterreichische Nationalbank (Austria)	Autumn 2021	Static	Top-down	Sector	Transition	5 years
People's Bank of China	H1 2022	Static	Bottom-up, Top-down	Counterparty, sector	Transition	10 years, 40 years for macro
Reserve Bank of New Zealand	Late 2023	TBD	Other	Counterparty, macroeconomic, sector	Physical, transition	30 years
Seðlabanki Íslands (Central Bank of Iceland)	Dec-21	Static	Top-down	Macroeconomic, sector	Physical, transition	Not yet decided
South African Reserve Bank	November 2021 for the current exercise, 2022-3 for a future exercise	Dynamic	Bottom-up	Sector	Physical	3 years
Suomen Pankki (Bank of Finland)	End-2021	Static	Top-down	Sector	Transition	5 years
Superintendencia Financiera de Colombia	Oct-2021	Static	Top-down	Sector	Physical, transition	10 years for transition 60 years for physical
Sveriges Riksbank (Sweden)	The exercise is in planning phase and details are not determined yet					
Swiss National Bank / FINMA	First part: end September 2021 Rest: TBD	Static	Top-down	Counterparty, macroeconomic, sector	Transition	5 – 40 years

Blue indicates "concluded," yellow indicates "in progress" and grey indicates "in planning."

Fig. 2.8 (continued)

scenario, hothouse world scenario) that represent possible future climatic conditions, in which the elements generating physical and transition risk (for example taxes on carbon emissions) are inserted. The inclusion in the scenarios of factors generating transition risk and physical risk allows to measure and express the degree of interconnectedness of both and also makes it possible to examine the impact and extent of physical and transition risk depending on the content and timeliness of climate policies, assessing the exposure of euro area banks to the risks considered by analyzing the state of their counterparties. The result obtained is very important as it is useful for understanding and quantifying the impact of climate risks on the economic and financial stability of the Eurozone.

The scenarios and the large data set made it possible to identify and quantify the exposures to transition risk and physical risk referred to many companies worldwide.

The stress test shows the relevance of climate policies; in fact, the costs of coping with the effects of extreme weather events are significantly higher than those to be incurred to proceed gradually toward an adequate ecological transition.

Similarly, climate policies that provide for timely action to control extreme weather events entail short-term adjustment costs which, in any

Table 2.7 Overview of practices on climate stress testing (December 2021)

<i>Authority</i>	<i>PRA</i>	<i>ACPR</i>	<i>DNB</i>	<i>APRA</i>	<i>ECB—Economy-Wide Test</i>	<i>Danmarks National-bank</i>	<i>HKMA</i>	<i>ECB—Supervisory SSM Test</i>
Scope	Largest banks and insurers	Banks and insurers	Banks, insurers, pension funds	Banks	Banks and companies	Banks	Banks	Banks
Inclusion	Mandatory	Voluntary	Voluntary	Mandatory	Mandatory	Not applicable	Voluntary	Mandatory
Balance-sheet reference Period	End-2020 30 years (to 2050) for transition risk and 60 years for physical risk	End-2019 30 years (to 2050)	End-2017 5 years (to 2023)	Not disclosed 30 years (to 2050)	End-2020 30 years (to 2050)	Not disclosed 9 years	Not available 5–30 years	End-2021 Up to 30 years (to 2050), depending on the scenario

<i>Authority</i>	<i>PRA</i>	<i>ACPR</i>	<i>DNB</i>	<i>APRA</i>	<i>ECB—Economy-Wide Text</i>	<i>Danmarks HKMA National-bank</i>	<i>ECB—Supervisory SSM Text</i>
Balance-sheet assumption	Static	Static until end-2025; dynamic from 2026	Static	Static and proportional	Static (allows for feedback loop)	Not disclosed	Static and dynamic, depending on the scenario
Focus of exposures	Lending book and large corporate counterparties	Business loans, equity, corporate credit spreads, sovereign credit spreads, commodities, and interest rate	Bond and equity holdings and corporate rate loans	Mortgages and businesses	Corporates from credit and market portfolios	Corporate loans and mortgages	Mortgages and corporate exposure
Counterparty-level analysis	Yes	Yes	No	Yes	Yes	No	Yes
Type of risks	Physical, transition, and litigation	Physical and transition	Transition	Physical and transition	Physical and transition	Transition and transition	Physical and transition

(continued)

Table 2.7 (continued)

<i>Authority</i>	<i>PRA</i>	<i>ACPR</i>	<i>DNB</i>	<i>APRA</i>	<i>ECB—Economy-Wide Test</i>	<i>Danmarks National-bank</i>	<i>HKMA</i>	<i>ECB—Supervisory SSM Test</i>
Number of NGFS scenarios	Three	Four	Four	Two	Three	One	Not disclosed	Five
	Built on NGFS scenarios	NGFS scenarios used as a starting point	Not applicable	Built on NGFS scenarios	Built on NGFS scenarios	Not applicable	Based on NGFS Scenarios	Based on NGFS scenarios
Calculation	Uses internal models (bottom-up approach)	Uses internal models (bottom-up approach)	Top-down stress model approach	Bottom-up, top-down approach	Top-down approach	Top-down approach	Uses internal models (bottom-up approach)	Uses internal models (bottom-up approach)
Results due	May 2022	Published in May 2021	Published in 2018	Early 2022	Assessment to be undertaken in 2022	Published in November 2020	Assessment to be taken in 2021	Will be conducted from March to July 2022
Public disclosures	Yes, in aggregate; not at firm-level	Yes, in aggregate; not at firm-level	Yes, in aggregate; not at firm-level	Yes, in aggregate; not at firm-level	Yes, in aggregate; not at firm-level	Yes, in aggregate; not at firm-level	Not stated	Not stated

<i>Authority</i>	<i>PRA</i>	<i>ACPR</i>	<i>DNB</i>	<i>APRA</i>	<i>ECB—Economy-Wide Text</i>	<i>Danmarks HKMA National-bank</i>	<i>ECB—Supervisory SSM Text</i>
Scope	Largest banks and insurers	Banks and insurers	Banks, insurers, pension funds	Banks	Banks and companies	Banks	Banks
Inclusion	Mandatory	Voluntary	Voluntary	Mandatory	Mandatory	Not applicable	Mandatory
Balance-sheet reference Period	End-2020 30 years (to 2050) for transition risk and 60 years for physical risk	End-2019 30 years (to 2050)	End-2017 5 years (to 2023)	Not disclosed 30 years (to 2050)	End-2020 30 years (to 2050)	Not disclosed 9 years	End-2021 Up to 30 years (to 2050), depending on the scenario
Balance-sheet assumption	Static	Static until end-2025; dynamic from 2026	Static	Static and proportional	Static (allows for feedback loop)	Not disclosed	Static and dynamic, depending on the scenario

(continued)

Table 2.7 (continued)

<i>Authority</i>	<i>PRA</i>	<i>ACPR</i>	<i>DNB</i>	<i>APRA</i>	<i>ECB—Economy-Wide Text</i>	<i>Danmarks Nationalbank</i>	<i>HKMA</i>	<i>ECB—Supervisory SSM Text</i>
Focus of exposures	Lending book and large corporate counterparties	Business loans, equity, corporate credit spreads, sovereign rate credit spreads, commodities and interest rate	Bond and equity holdings and copo-rate loans	Mortgages and businesses	Corporates from credit and market portfolios	Corporate loans and mortgages	Sectoral exposures	Mortgages and corporate exposure
Counterparty-level analysis	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Type of risks	Physical, transition, and litigation	Physical and transition	Transition	Physical and transition	Physical and transition	Transition	Physical and transition	Physical and transition
Number of scenarios	3	4	3	2	3	1	Not disclosed	5
NGFS scenarios	Built on NGFS scenarios	NGFS scenarios used as a starting point	Not applicable	Built on NGFS scenarios	Built on NGFS scenarios	Not applicable	Based on NGFS scenarios	Based on NGFS scenarios

<i>Authority</i>	<i>PRA</i>	<i>ACPR</i>	<i>DNB</i>	<i>APRA</i>	<i>ECB—Economy-Wide Text</i>	<i>Danmarks Nationalbank</i>	<i>HKMA</i>	<i>ECB—Supervisory SSM Test</i>
Calculation	Uses internal models (bottom-up approach)	Uses internal models (bottom-up approach)	Top-down stress model approach	Bottom-up, top-down approach	Top-down approach	Top-down approach	Uses internal models (bottom-up approach)	Uses internal models (bottom-up approach)

Source UNEP FI's "Comprehensive Good Practice Guide to Climate Stress Testing", December 2021

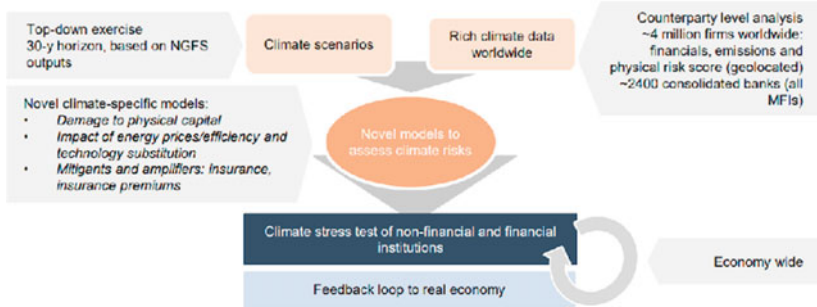


Fig. 2.9 Main elements of the ECB economy-wide climate stress test (Source ECB's Occasional Paper Series ECB economy-wide climate stress test. Methodology and results, September 2021)

case, are lower than the costs to be incurred in the absence of such policies and because of an increase in extreme weather events.

This analysis is very relevant to highlight a peculiarity of climate change that banks cannot ignore. The analysis of the costs that companies must bear either for the manifestation of risks or for adaptation to the transition, in fact, highlights how climate change is potentially a real variable generating systemic risk. Banks exposed to climate change as systemic risk are those that have portfolios of assets concentrated by sectors and/or geographies most exposed to climate risks.

It also shows that the increase in physical risk can become particularly critical in the 30-year project, leading to an increase in expected losses related to the loan portfolio. This situation is even more marked for a hothouse world scenario than for an orderly transition one.

If an analysis is carried out by portfolio types, it is evident that the portfolios most exposed to climate risk are particularly exposed to default in the case of a hothouse world scenario.

Climate Risk Stress Test

The exercise was aimed at enhancing both banks' and supervisors' capacity to assess climate risk: a so-called learning exercise. 104 European SSM significant participating in the 2022 climate risk stress test exercise were

subject to Module 1 and Module 2 (see below) while only a subset (41) of participating banks was expected to conduct Module 3.³

The climate risk stress test covered 3 modules to test the banks' capabilities to assess climate risk:

- Module 1: Qualitative questionnaire, aimed to assess banks' climate risk stress testing framework;
- Module 2: Climate risk metrics focused on benchmarking banks across two common climate risk metrics designed to shed light on banks' analytical and data capabilities regarding climate risk:
 - Metric 1: Interest, fee, and commission income from greenhouse gas intensive industries which represents a proxy of the sensitivity of banks' business models to greenhouse gas (GHG) intensive sectors and to transition risk;
 - Metric 2: Financed greenhouse gas emissions, which measures exposure to carbon-intensive industries in the bank's non-financial corporations' portfolio;
- Module 3: Bottom-up stress test projections which require banks to provide starting points and ST projections based on a common methodology:
 - Bottom-up stress test methodology anchored as much as possible to the (simplified) EBA EU-wide stress test templates.
 - New elements include disaggregation by industry for corporates, by EPC1 for mortgages, and within-country disaggregation of physical risks and a methodology represented in Fig. 2.10:

As can be seen, the definition of climate and environmental risk factors was aimed at assessing their impact with respect to traditional risks (credit, market, operational, and reputational).

Similar to what happened for the first exercise, the scenarios for CST 2022 refer to those provided by the NGFS with the 2021 revision,

³ For insights into the ECB 2022 CST, see: (ECB, 2021b) "Climate risk stress test—SSM stress test 2022"; (ECB, 18 October 2021c) "Dear CEO Letter. Information on participation in the 2022 ECB Climate Risk Stress Test"; (ECB, 2022a) "Macro-financial scenarios for the 2022 climate risk stress test 2022"; (ECB, July 2022c) Climate Risk Stress Test 2022.

	Exposures	Scenario	Projections ¹	Horizon	Credit risk	Market risk	Operational risk
Transition risk	Global	Short-term stress	Baseline	3 years (2022-2024)	Corporate loans (incl. SME, CRE) + mortgages	Bonds + stocks issued by NFCs? (incl. accounting and economic hedges)	Operational and reputational risks to be assessed via a qualitative questionnaire
			Stress				
		Long-term paths	Orderly	30 years (2030, 2040, 2050)	Corporate loans (incl. SME, CRE) + mortgages		
			Disorderly				
	Hot house						
Physical risk	EU countries	Drought & heat risk	Baseline	1 year (2022)	Corporate loans (incl. SME)	1. All projections with the exception of the long-term paths will be based on a static balance sheet. 2. The parent company needs to be an NFC, e.g. bonds issued by car financing company X are in scope.	
			Stress				
		Flood risk	Baseline	1 year (2022)	Mortgages + CRE loans		
			Stress				

Fig. 2.10 Module 3 scenarios and risk dimensions (Source ECB, climate risk stress test 2022, methodology, October 2021)

in which, while maintaining the same classification of the scenarios, six possible outcomes or sub-scenarios have been used, which allow to differentiate the various different levels of risk, more or less high. There is therefore an improvement in the scenarios compared to those underlying the first stress test exercise in 2020.

The 2022 CTS has been considered by the ECB as a joint learning exercise for both banks and supervisors to enhance their capacity to assess climate risk, with the knowledge of the challenges and limitations banks were facing at the time of the exercise. The exercise has been intended to help create awareness of climate risk among supervised banks along with identification of their vulnerabilities to the materialization of this risk and building their resilience against it. No direct capital implications for the supervised institution had been envisaged for 2023: the outcomes of the CST have been feeding the annual SREP assessments, supported also by a thematic review on climate risk conducted on all supervised banks. Due to the SREP evaluations, possible qualitative measures were envisaged with consequent impact on scores and therefore indirect capital impact.

Following this approach, the CST 2022 exercise has been less intrusive regarding the quality assurance process than with the regular solvency stress tests; the proportionality principle was applied to banks' participation in the various modules.

2.4 CONCLUSIONS

This chapter has analyzed the evolution of the regulatory framework envisaged for managing climate-related risks in the financial sector. A broader international view was considered, not limited to the European Union context but also including the activities undertaken by supranational authorities, like the Basel Committee in Banking Supervision (BCBS), the Task Force on Climate-related Financial Disclosures (TCFD), or national supervisors in the UK and the US.

Central banks and supervisory authorities are at the forefront of taking a comprehensive and forward-looking view and early, proactive actions to develop strategies, guidelines, and regulations to help the financial system address climate-related risks.

Considering the requirements in Europe and other jurisdictions compliant with the Basel Committee, there is an ongoing consideration on modifying prudential regulation to address climate risks. The central issue is whether and how to assess the necessity and means of incorporating environmental and climate risks into the prudential treatment of the first pillar (Pillar I) of Basel III standards. Caution must be exercised in this regard: banks using a standard rating model may face more significant challenges in measuring these risks than those using an internal rating model. Therefore, high-quality data, appropriate models for risk measurement and prediction, and increased sensitivity to certain types of loans will be necessary to better identify the level of an intermediary's solvency and, in this case, reward those already working to address climate change and its implications.

Evaluating the approach taken by supervisory authorities so far, it is evident that there has not yet been a strong move in this direction. Instead, the focus has been on assessing the actual dimension of these risks, which are becoming increasingly tangible and evident, and the potential extent of the effects and consequences in terms of overall financial stability, both in the presence and absence of adequate climate measures/policies by governments and competent authorities.

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Transmission Channels of Climate Risk

The objective of this chapter is to explore the transmission channels through which ESG risks, and climate-related risks in particular, can affect the "traditional" risks of banking, financial, and insurance activities and, consequently, the specific balance sheet items influenced by them.

In this introduction, it is useful to remember that sustainable finance, despite being grown as one of the most relevant areas of interest by the main market players of the financial sector at a global level, can still be considered a new subject, in Europe where its application must still take into account some significant difficulties:

- gathering granular data about counterparties and assets exposed to climate risks. Intermediaries usually do not have all the data that should be needed to measure the risk exposure of counterparties (for example: the geographical location of a company's production plants, which determines its exposure to physical risk or the time series of EPC scores of the collaterals of the mortgages portfolios that could help investigate the dependency relation of energy efficiency of the buildings and borrowers's probability of default).
- integrating scenario dependencies and scenario analysis based on a probabilistic perspective. This task can require deep knowledge of modeling of relevant risk factors that can be integrated into the traditional risk factors monitored by risk managers and financial planners,

on the generation of multiple scenarios based on different climate transition views, and, finally, on building up a model network that allows to transfer the climate risk factors volatility to counterparty risk through the credit risk parameters.

All following considerations have been therefore developed with the awareness that the first major challenge for intermediaries will be the careful selection, enrichment, and treatment of data to support the methodological framework definition and application to the managerial use cases (such as the phases of origination, granting, and monitoring of a credit portfolio and the strategic asset allocation of a portfolio of financial instruments).

Referring to Chapter 2 for the definition of climate risk and the deep dive of the regulatory references, in this chapter we will focus, with regard to transition risk, on the elements that could influence the process and speed of adaptation to a sustainable economy and that are the most important to identify, draw and understand the transmission mechanisms to the more traditional risks, such as:

- climate and environmental transition policies;
- technological breakthrough;
- reputational impacts of climate-related behaviors of non-financial corporations;
- changes in consumers and investors preferences on climate / ESG-related topics.

As regards the first aspect, the speed and intensity in the introduction of policies functional to the environmental conversion of the sectors that are the most impacted by the ecological transition will determine in a more significant way the characteristics of the economic shock that the real economy should face and, consequently, the potential impacts on the banks' balance sheets which are investing on them. This can be easily tracked just by analyzing the different impacts generated by the different transition paths proposed by the Network for Greening the Financial System (NGFS 2021, 2022) on the default probabilities and provisions generated by the most affected sectors (ranging from immaterial to very severe according to the different narrative underlying the transition process).

The second factor is represented by the introduction of new technologies allowing a significant reduction in counterparties' GHG emissions, which will make the current production processes obsolete and will consequently require significant investments for the adaptation of the plants and demand financial resources to support the transition.

On the other hand, the possible unavailability of such innovative technologies that make it possible to convert certain production activities toward a low-carbon economy would put at risk the business sustainability of some sectors' business in the long run (e.g., disruptive improvements in the energy efficiency of the plants of the competitors that shouldn't be applicable to the firm, could generate cost inefficiencies impacting on the cost/income ratio, putting margins under pressure and pushing products out-of-the market).

The third risk factor is related to the growing public awareness of environmental issues and the changes in the expectations of consumers who are turning their consumption strategies and preferences toward the choice of sustainable products and companies. (e.g., adverse selections of the customers who could prefer more "aligned" companies or products, worsening the creditworthiness of these counterparties and decreasing the willingness of the financial system to sustain their businesses).

This is why this chapter is dedicated to understanding in depth the transmission channels through which these new risk factors can be reflected on traditional risks (credit, market, operational, liquidity, real estate business and strategic risk, ...), in order to help banks to drive business innovation and introduce the necessary management actions for mitigation and seizing opportunities.

This chapter is structured as follows. The first paragraph traces the transmission mechanisms of climate-related events on the traditional Pillar 1 (P1) and Pillar 2 (P2) risks characterizing the activity of a bank, with a particular focus on the potential impact of physical hazards and transition risks (see Sect. 3.2 and 3.3 respectively) on the most important risk drivers affecting the business processes (credit, finance and wealth management, including in the perimeter the banking book, the trading portfolio and asset management) and finally on the balance sheet and P&L items of the bank.

The fourth paragraph is dedicated to the main implications that such transmission mechanisms can engage in the development of risk factors transmission methodologies with a particular focus on credit and counterparty risk modeling.

3.1 TRANSMISSION CHANNELS AND MECHANISMS

From what has been said so far, climate change represents one of the main challenges of the coming decades. A challenge that is certainly up to the Governments that will have to direct the legislation to respect the objectives set by the various institutional bodies and aimed at reducing global warming.

As Central Authorities are aimed at the stability of the financial system—the banking sector being the main engine of the real economy—they are also expected to play a leading role in the implementation of these structural changes. This is not only to be able to pursue the objective of a more resilient and sounder financial (banking and insurance) environment but, also, to enable the adoption of modern technological choices that non-financial corporations and households will make to modernize assets to avoid their depreciation or write-downs caused by "climate-related" obsolescence, contributing together with Government Institutions to the achievement of the general objectives of the climate improvement.

Finally, the mitigation of the consequences of global warming leaves banks a fundamental leading role to sustain (through proper asset allocation and customer selection, dedicated financial product structuring, pricing policies, and delivery of dedicated financial advisory and services...) the non-financial corporations and households both in the transition and in the mitigation of physical hazards.

This challenge will require them to expand the risk management framework, adapt their IT systems and databases, evolve their measurement and monitoring methodologies, and, above all, create a risk culture that can also be transferred to business processes and customer relationship management.

In this broad framework, the financial sector, which is exposed to climate change due to both macro and microeconomic transmission channels deriving from two distinct types of risk factors, physical and transitional (Fig. 3.1), is called to identify and understand the interdependencies that link climate risk factors to their business results, in terms of impact on balance sheet items, income statement, capital, and liquidity adequacy positions.

With regard to physical risk factors, financial intermediaries may suffer the economic costs and financial losses deriving from the manifestation of "physical" climatic risk events (e.g., from the increasing severity and

Risks affected	Physical		Transition	
	Climate-related	Environmental	Climate-related	Environmental
	<ul style="list-style-type: none"> • Extreme weather events • Chronic weather patterns 	<ul style="list-style-type: none"> • Water stress • Resource scarcity • Biodiversity loss • Pollution • Other 	<ul style="list-style-type: none"> • Policy and regulation • Technology • Market sentiment 	<ul style="list-style-type: none"> • Policy and regulation • Technology • Market sentiment

Fig. 3.1 Examples of climate-related and environmental risk drivers (*Source* ECB 2020 Guide on climate-related and environmental risks, Table 1)

frequency of adverse climatic events). The impact on the bank's performance can occur both directly, due to damage suffered by physical assets booked in their real estate portfolios, and indirectly, due to damage suffered by counterparties present in their investment/lending portfolio. Typically, the damages suffered by assets owned by these counterparties can subsequently translate into a worsening of their economic and financial conditions (e.g., a decrease in turnover and margins and/or increases in the capital losses) which for the bank generates a worsening of the risk parameters of the entrusted counterparties (PD and LGD), a loss in value of the guarantees represented by damaged physical assets and/or a loss of fair value of the financial instruments issued (debt and/or equity) and held in the investment portfolio.

With regards to transition risk factors, as global economic systems will seek to reduce carbon dioxide emissions, which make up a large part of greenhouse gas (GHG) emissions, the relevant risk factor is represented by the discontinuity that economic players should face if policies and regulation should be disruptive (too fast, severe, and /or disordered). These risks are strictly connected to changes in government policies, technological developments, or investor and consumer sentiment. Regarding physical risk, the main identified risk drivers are acute or chronic events related to climate change.

Transition and physical risk events described above can generate significant costs and losses for the banking system in the absence of an adequate assessment and measurement framework as well as projection methodologies aimed at forecasting the potential impacts of climate risk on the banks' most relevant KPI.

Even if climate risk factors, do not represent an ad hoc risk category according to the European Regulation approach embedded into the

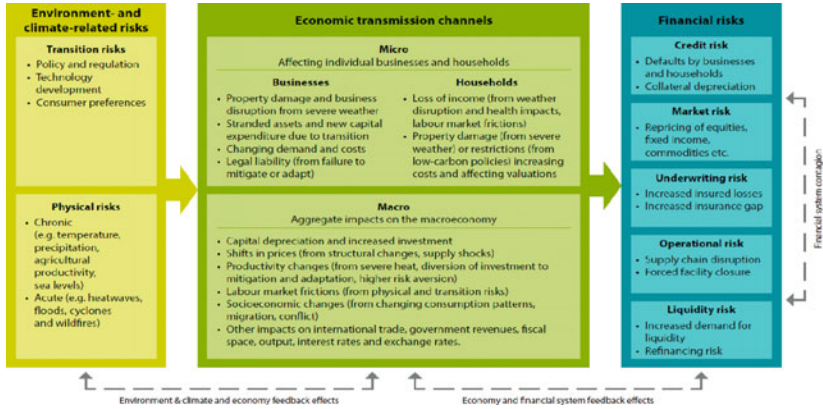


Fig. 3.2 Transmission channels—Environmental and climate-related risks to financial risks (*Source* NGFS “Overview of the environmental risk analysis by financial institutions» September 2020”, Figure 1)

SREP (Supervisory Review and Evaluation Process) as well as the most common risk management practices within the financial sector, they can generate effects that can be classified crosswise to risk areas already monitored in the risk management taxonomy. The diagram shown in Fig. 3.2 can help in wrapping up how climate risk factors are expected to transfer uncertainty to financial risks due to the different micro/macroeconomic transition mechanisms mapped by the NGFS.

As can be seen in Fig. 3.2, the interrelations between physical and transition risk, the micro- and macroeconomic impacts, and the feedback on individual risks can be very complex and not always easy to model.

3.2 THE TRANSMISSION CHANNELS OF PHYSICAL RISKS

In the case of physical risk, the main transmission channels of the related impact to the traditional risks of banking activity are represented by the following (Basel Committee on Banking Supervision 2021):

- Credit risk: the damage to operating assets could lead companies to the impossibility of assembling and selling goods and services on the market (facing a potential reduction of the overall turnover or a decline in margins due to an increase in the operational costs to

restore the damaged assets and on-top financial costs deriving to the origination of new debt). Damages impacting physical assets used as collateral for credit exposures can affect the loss-given default (LGD) by reducing the expected recovery rates. On the household side, the value of the immovable property could be reduced as a result of severe weather events or chronic flooding occurring in certain geographical regions. The same also occurs in coastal areas in case of rising sea levels and repeated flooding. As recent river flooding events occurred in Italy (in the north-eastern Emilia Romagna region) these effects should then be netted by the counterbalancing effects of the mitigation / supporting actions put in place by both local and central authorities and local banks (e.g., recovery funds, suspension of mortgage payments, ...). Again, in this sense, LGD impacts could be nearly offset by the presence of insurance products that can protect the customers, generating the cash flows necessary to restore the assets' viability. Also, the estimation of default probabilities of the affected counterparties can be affected by particular physical risk events, as the immovable property owners of hardly damaged buildings could show an accrued propensity to repay loans if the asset depreciation should be significant.

Physical risk events could also impact the disposable income as they can have an impact through the channels of taxation and public expenditure on the balance sheet of sovereign entities and public institutions (e.g., companies which—due to climatic events—experience interruptions in business continuity, should enter in a phase of unproductiveness due to the deterioration of production or because they are subject to a scaling-down of demand attributable to the lower consumption propensity, could generate lower tax revenues.

Also, an increase in government spending is likely to occur in an attempt to address—and partially offset—negative economic impacts and to cover adaptation costs. The direct costs, in response to such events, would include social transfers to affected households and explicit contingent liabilities, such as insurance schemes backed by state guarantees. Indirect costs could lead to reductions in tax revenues, an increase in healthcare spending, and liquidity problems due to the reallocation of the budget toward recovery and reconstruction.

Discretionary costs arising from adaptation and mitigation policies, such as public investments in climate-proof infrastructure or public subsidies for the clean energy transition, would further aggravate the balance between expenditure and revenues, making the situation even worse. Ultimately, public debt sustainability depends on the evolution of the debt stock and flow in relation to the country's GDP over time. If the origination of new debt to support additional financing needs exceeds a certain stock level, the total debt could become unsustainable in the long run.

Debt stock and flows will also depend on the debt financing interest rates, the amortization of past debt, the primary budget balance, and the GDP growth rate, which are variables impacted by climate change and resulting risks through the channels described. As a result, governments could face limited access to debt markets, thus increasing the risk of insolvency and increasing the spread over the risk-free rate. This, in turn, could give rise to recursive second-round effects of increased sovereign risk with a direct impact on the value of government bonds and related entities (with a subsequent decline in the fair value of bond portfolios held by banks).

More in general, both bank's projections on credit risk parameters, which are often based on satellite models (or reviewed expectations on the customers' creditworthiness), could significantly be reviewed (in particular in the long run expectation) in light of the increased volatility of the typical explicative variables as well as the introduction of new explanatory variables that could be more appropriated to describe assets' value sensitivity to climate-related events).

- **Financial risks:** The occurrence of climatic events could affect market expectations and market assessment of the creditworthiness of listed companies or companies that have debt instruments issued on regulated markets, which would lead to a sudden re-assessment of their risk parameters due to higher volatility and potential losses on expected net income flows and asset values in some markets. Concerning this type of risk— it is not easy to separate the impacts between physical risk and transition risk, as market risk is summarized by an unexpected volatility of returns which could be fueled (even simultaneously and with inter-dependent effects) from both types of climate risk. A plurality of situations can also coexist (such as the need for investment to renew the technological production

processes and reduce carbon and energy consumption, significant exposure to physical events that can affect labor productivity, major exposure or vulnerability to medium/long-term "green" expectations, the possibility that certain products and services may become anti-economic because of intense GHG emissions, negative investor sentiment due to the market policies and communication strategies) the final interaction of which could lead to greater variability in share prices or their depreciation compared to the securities of companies that are perceived to be more sound and resilient to these potential scenarios. For banks to manage and mitigate this type of risk, the methodological approach to the measurement of climate risks may require the introduction of important changes. In particular, internal market risk models that have been developed so far (typically based on VaR and Expected Shortfall methodologies) may require changes or enrichments to the information and methodologies analysis (e.g., availability of time series of returns differentiated between the various types of green vs. non-green instruments and/or information available on the sensitivities of the fair values of the various types of financial assets to physical risk events). More simplified models (as in the case of the standardized regulatory approach) should also be adjusted in terms of taxonomy and asset classifications to associate them with different haircuts, which could be differentiated depending on the differences in historical sensitivities (with data breakdowns by countries, economic sector) to physical hazards. A potential change to the structure of correlations between financial assets—which is an important element of market risk measurement metrics—should also be considered as correlations could change and express different relationships than in the past, especially if we investigate the relationship between portfolios made up of assets classified as "green" and "brown". Finally, the risk hedging method must also consider these new structural phenomena that can generate losses asymmetrically in the short and long run.

- **Liquidity risks:** Climate risk factors may also impact banks' liquidity risk both in terms of their ability to raise funds and, indirectly, through extra liquidity outflows from customers and/or decreases in the market value of assets held as collateral (Bonagura et al., 2021). In fact, it has been observed that the occurrence of a natural disaster constitutes an element of potential liquidity outflow. Non-financial corporations and households located in the geographical

areas involved usually require greater financial resources to tackle the damage emerging from the climatic event; this translates into a greater propensity to draw down credit lines and a consequent increase in outflows for the bank; at the same time, following the damage that occurred, the market could re-price downwards the value of financial instruments that have been provided by the bank as collateral in the context of financing transactions with the Central Authorities. These effects, among others, can impact not only a single reference date but also generate effects in the months immediately following the event's occurrence. Furthermore, these events have also proved to be significant from a systemic point of view (remember, for example, the earthquake in Japan in 2011), having generated an increase in the precautionary demand for liquidity by financial institutions, households, and businesses, also requiring interventions to be by central banks to preserve financial stability.

- Operational and reputational risks: the impact of operational risks deriving from physical risks is easily understood in the banking reality. Physical risks can generate different effects on people, systems, and processes necessary for the operational viability of financial institutions. For example, potential damages to the physical buildings of the distribution network and, more generally, to the real estate properties included in the property portfolio and/or to possible disservices or interruptions of the telecommunications infrastructures could cause momentary interruptions or malfunctioning of the collection and payment services, treasury management, access to digital and remote banking and/or transport services, making access to bank premises difficult or impossible for customers and/or employees. Risks of a legal and reputational nature can also be potentially triggered since, if the event is of such a magnitude as to significantly damage even the sites used for disaster recovery that become out of order, the lack of access by customers to banking operations can be the cause of complaints and legal disputes that could ease potential charges and operating losses.

3.3 THE TRANSMISSION CHANNELS OF TRANSITION RISKS

Concerning transition risk, we can highlight that it impacts "traditional" risks as follows:

- **Credit and Counterparty risk:** even if they could be less significant in the short term, green-transition-related changes in policies, technology, and consumer behaviors can result not negligible. In fact, as a result of more or less gradual changes in current regulations, consumer trends, or production technologies and processes, companies operating in some of the most exposed economic sectors are called to a strategic "reaction" of adaptation to these changes, a reaction which may lead to higher investments and costs (therefore lower margins and more intense recourse to debt and the weakening of the balance sheet structure); if the company's production is subject to the application of restrictive tax policies based on GHG emissions (e.g., carbon tax) and/or energy resource consumption policies, the potential business impacts can be represented by a reduction of turnover and/or margins (for example, if the company, to avoid deteriorating its competitive positioning, shouldn't be able to apply a pass-through policy of the higher costs on the unit revenues of the products sold). Any business difficulties would affect employees and other companies in the supply chain. In the medium/long term, the ecological transition could lead these companies operating in the economic sectors with the highest emission intensity to a gradual but progressive deterioration of their solvency until determining their gradual exit from the market. The lower profitability and the progressively higher debt /capital ratio could worsen the PD with an increase in the defaults of individual banks' commercial counterparties. On the other hand, assessing transition risk for individuals, a climate transition would result in more restrictive regulations on building efficiency that implies future costs of retrofitting for real estate properties and higher costs for energy and gas; first effects will be observed in collaterals values directly affecting LGDs, the second one refers to the available income of individuals that means a potential increase in PDs.

- Market risks: companies belonging to the most exposed sectors will materialize the impact of ESG factors on the fair value of the portfolio of financial instruments, causing:
 - an increase in the return required by the market for the purchase of financial instruments issued by companies that do not comply with the criteria of environmental and social sustainability;
 - an increase in the volatility of the returns on the financial instruments issued by them. The price of such instruments may be more severely affected by a tightening of regulatory and economic policy actions in the ESG area;
- Liquidity risks: Transition risk factors can affect the economic profitability and sustainability of specific business lines and lead to increasing strategic risk for certain business models, in the absence of the necessary adjustment or diversification opportunities. For example, due to the sudden repricing of securities, the value of a bank's high-quality liquid assets could be reduced, adversely affecting liquidity reserves. As already enlightened on physical risks transmission channels, significant exposure to transition risks can also increase the mismatch between outflows and inflows. On the loans side, non-financial corporations could show a greater propensity to draw down credit lines, activating a consequent increase in outflows for the bank (e.g., via investment decisions finalized to substitute production plants and machinery to reduce carbon emissions and energy consumption). On the funding side, households could change their portfolio allocation strategies (e.g., increasing their propensity to allocate more savings and liquid resources to wealth management products that are compliant with ESG principles and reducing at-sight or time deposit components).
- Operational risk and reputational risk: the evolution of consumers' sensitivity toward climate issues can lead to reputational and legal liability risks for the bank due to scandals caused by the financing of environmentally controversial activities. For example, financing the development of activities of companies that extract fossil fuels could be the subject of public controversy with a negative impact on the reputation of the lending bank. Reputational risks and the consequent negative effects on the bank's brand can, therefore, also be fueled through transition risk channels, as in the case the

market and the financial community should find inconsistent the strategic asset allocation policies (loans and securities) of the bank, with particular reference to the selection of finance companies that will not comply with the ESG principles and/or specific targets declared to the market (as in the case of adherence to portfolio decarbonization initiatives).

3.4 NEW “CLIMATE-DRIVEN” TRANSMISSION CHANNELS: IMPACT ON RISK MODELING

One of the most relevant steps that is mandatory to complete the transmission chain is related to the adjustment of credit risk parameters; this means being able to re-shape default probabilities and loss-given default projections models to reflect both market scenarios and climate-specific risk factors.

Many market players within the financial services industry are showing increasing interest and dedicating significant organizational efforts as well as economic resources to improve risk modeling methodologies and processes to capture new climate-related risk factors and incorporate transmission channel modeling into their risk measurement frameworks.

The implementation of the transmission channels into credit risk parameters models needs for an extension of existing scenarios (acquired by third providers, regulators, or other institutional bodies or developed by internal research departments if available) to the relevant explanatory variables mentioned above. The extension should also be related to the time series of the scenarios as climate-related events (both physical and transitional) should be displayed and analyzed according to a long-term (30Y) time horizon.

The explanatory variables long list should be extended to cover also sectoral variables (e.g., turnover, gross value added, costs, investments, EBITDA net revenues, ...) that are relevant to project impacts on the credit risk parameters for non-financial corporations and other specific variables for the households (e.g., % of energy costs on the total expenses, real estate price indexes with a breakdown by country, geolocation, and EPC).

Credit risk parameters modeling techniques and approaches will be impacted as the banks must select an appropriate approach depending on counterparties' characteristics and the soundness of a bank's internal

measurement frameworks (data, scenarios, methodologies, and tools). The adoption of the most advanced approaches is enabling significant banks to work at a granular level (single name), developing climate scores and/or scenario-dependent analytics which can be integrated into the existing models (e.g., the traditional rating models) to get climate-adjusted credit risk parameters.

3.5 CONCLUSIONS

The nature of climate change introduces some key medium-term challenges. Climate-related events and risks are uncertain and may be subject to non-linearities. To size climate-related financial risks, banks and regulators require plausible ranges of scenarios to assess the potential impacts of both physical risk and transition risk drivers on their exposures. These scenarios need to be combined with sufficiently granular data that capture the climate sensitivity of banks' exposures.

The chapter explores the transmission channels of physical and transition risks and also examines their impact on credit, market, operational, liquidity, real estate, and strategic risks by emphasizing the need for financial institutions to understand and model these risks for effective risk management and business innovation.

Even if the stress test and scenario analysis framework for environmental and climate risks is rapidly evolving, it is possible to highlight some common features in the most recent development that represent the current state of the art in this area:

- Risks covered: the most comprehensive stress test exercises cover both physical and transition risks and, concerning physical risk, allow to include both acute and chronic risks;
- Scenario design: the most common solution adopted for the stress test exercises is to rely on scenarios provided by the Network for Greening the Financial System (NGFS);
- Time horizon: usually, the time horizon considered is quite extended to assess also the long-term effects of climate and environmental risk and, in particular, the transition risk;

The transmission channels of risk and their impact are not yet fully understood or incorporated into climate scenario analysis and stress

testing exercises. Further research and investigation into how risk influencing factors and their transmission mechanisms between risk categories could provide the banking industry valuable insights into how climate risk factors affect banks' exposures.

The main challenges that banks will face in the coming years concern:

- Data availability and granularity: the main challenge currently faced by banks is the availability of data with a sufficient level of granularity for both transition and physical risk.
- More detailed scenarios: an increase in the level of detail of the scenario for transition risk can be obtained by taking into consideration the different climate policies taken or announced at the country and regional levels;
- Internalization of the scenario design and the translation into economic impacts: a further step to correctly incorporate the climate and environmental risk in the stress test framework for managerial purposes should be the internalization by the banks of the scenario design and of the translation of scenarios into economic impacts. In this way, the banks could generate a greater number of scenarios to have a wider range of possible future evolutions;
- Adjustment of credit risk parameters to reflect climate-specific risk factors and to improve risk modeling methodologies: the adoption of advanced approaches for granular analysis, climate scoring, and scenario analysis will be a way for banks to integrate climate considerations into their existing risk models.

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Integrating Climate Risk into Commercial Banks Operations

The challenges posed by climate change instigate a rapid and profound evolution within Europe's economic structure and policies. The financial and banking systems are not exempt from this transformation; they are undergoing extensive changes because of the widespread influence of Environmental, Social, and Governance (ESG) factors. As examined in Chapter 3, it becomes clear that climate risk applies an overarching influence on all facets of these financial operators. Traditional risks that have historically defined their operations, such as credit, market, and operational risks, now intersect with and are fundamentally reshaped by the complexities and uncertainties introduced by climate risk. Consequently, European financial institutions and banks find themselves at a pivotal juncture, compelled to recalibrate their strategies, risk management frameworks, and investment decisions to navigate these new challenges and align with the imperative of fostering sustainability and resilience in a rapidly evolving global landscape.

This chapter focuses on commercial banks and how climate risk themes are reaching into the classical operations. On the one hand, there is certainly a need to update risk analysis methodologies in a long-term perspective, considering, as already mentioned, the mechanisms of climate risk transmission. On the other hand, commercial banks will have to deal with several opportunities in terms of “green” products and transition investments.

After an initial section dealing with the definition of climate scenarios and the process of climate risk integration into typical banking operations, the focus shifts to an in-depth look at the two areas in which commercial banks typically operate: lending and finance. For both, the discussion will be on the governance of climate risks and how these decline among the various economic agents that operate and interact with the bank.

4.1 THE RISK INTEGRATION PROCESS: CLIMATE SCENARIOS AND MODELS

As mentioned in the introduction, climate risk management is mainly concerned with the long run and, therefore, requires long-term simulations of both climate and economic variables. Climate scenarios serve as key tools for envisioning potential futures shaped by the intricate interplay of environmental, economic, and societal variables. These scenarios provide essential insights into the spectrum of plausible climate outcomes, offering a framework to assess risks, strategize adaptation measures, and make well-informed decisions to mitigate the far-reaching effects of climate change. These are hypothetical representations of future environmental conditions, typically developed considering several variables such as greenhouse gas emissions, temperature changes, precipitation patterns, and sea-level rise. Each scenario assumes divergent trends in these variables, resulting in different magnitudes of transition and physical risks. The most common are divided into the so-called transition and “business-as-usual” scenarios. The former involves the implementation of policies aimed at reaching zero greenhouse gas emissions and, therefore, is characterized by high transition risk, especially in the short- to medium-term, and low physical risk. The second, on the contrary, does not imply any kind of evolution in current climate policies and, therefore, is marked by lower transition risk but high physical risk.

Many organizations, including governmental ones, have been studying and developing climate scenarios. Among the most well-known are the “IEA World Energy Outlook”,¹ developed based on the World Energy Model and the NGFS (Network for Greening the Financial System), already presented in Chapter 2.

¹ <https://www.iea.org/events/world-energy-outlook-2023>.

Another example of complex model is the Integrated Assessment Models (IAMs), designed to analyze multiple interactions between different aspects of society, the economy, and the environment. These models combine various data sources and modeling techniques to comprehensively assess how different policies and actions can impact a range of interconnected issues, particularly in the context of climate change.

It is important to note that the path of these scenarios—and therefore the effects—are different depending on whether there is a regular and ordinary transition path compared to a sudden and/or late transition strategy. It is also important to highlight that many of these scenarios must be interpreted in consideration of the following factors:

- the political magnitude of the interventions aimed at achieving the level of climate ambition (appetite) as well as the types of interventions themselves (for example, by imposing higher carbon prices, emission limits, subsidies for low-carbon technology, bans on certain products or obsolete technologies);
- the hypothesized technological change;
- the change in consumer preferences toward products and services with low harmful emissions.

The proper identification and interpretation of the scenario is the first, crucial step for correctly estimating risks. The pathways of these scenarios must then be translated into economic and financial impacts on the balance sheet items of both the bank and its counterparties (Fig. 4.1). This second element will be developed in more detail in the following sections dedicated to the impact of climate variables on the bank's lending, mortgage, and investment portfolios.

Linking climate scenarios with the impacts on risk factors is not easy. This is due to several reasons. First, climate scenarios are typically developed for macroprudential purposes, not for assessing the riskiness of counterparties. Even though climate scenarios are often designed at a geographic or economic sector level, they almost certainly do not have the level of granularity to be used at the level of a single counterparty. This, therefore, requires a reasoned and financially interpreted “clustering” process, which needs a “hybrid top-down” approach, defined as the determination of financial impacts at the level of macro-geographical

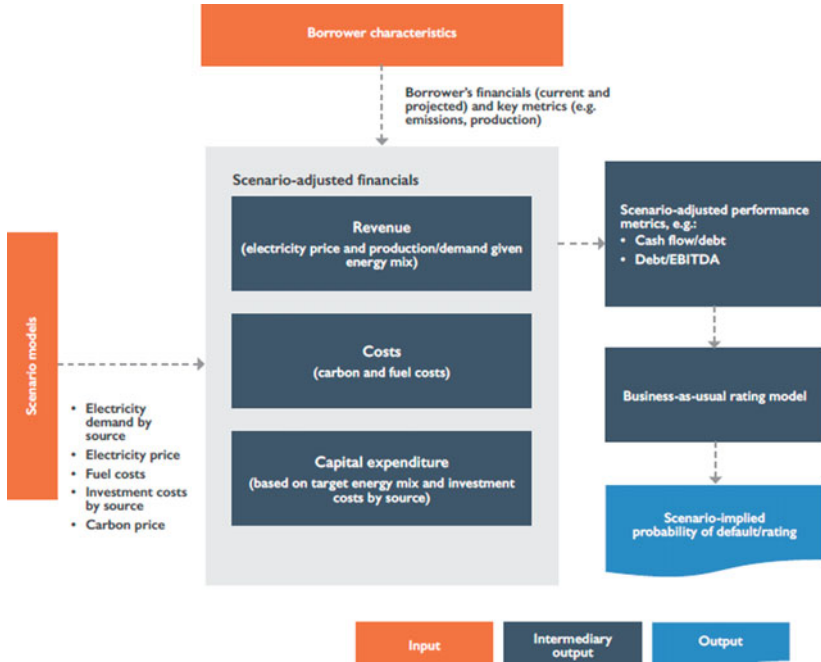


Fig. 4.1 Adjusting rating factors (*Source* UN Environment Programme Finance Initiative [UNEP FI], Oliver Wyman, Mercer [2018, April] “Extending our Horizons. Assessing credit risk and opportunity in a changing climate: Outputs of a working group of 16 banks piloting the TCFD Recommendations. PART 1: Transition-related risks & opportunities”). Figure 2.6: Adjusting rating factors for unregulated power generation utilities using scenario variables [simplified example, illustrative]

zones and macro-sectors, the identification of loans and investments with similar characteristics, and finally, the attribution of average impacts to individual borrowers through a process known as *cascading*.

The implications arising from the management of climate and environmental risks in the bank’s overall risk management framework are discussed in more detail below. To this end, given the peculiarities inherent in the identification, management, and mitigation activities of transition and physical risks, they will be treated separately. Obviously, these concepts represent an initial indication of the management

treatment of climate risk, toward further methodological/operational declination on RAF and ICAAP processes.

In the case of physical risk, changes in temperatures, precipitation, and related variables affect the productivity and output of economic sectors. Typically, public databases containing historical information linking climate events to changes in sales or company costs are used. For extreme events (acute), losses in production and costs incurred are more frequently derived from proprietary databases. In the case of the Power Generation sector, for example, the impacts of extreme events are expressed as typical “downtime” periods during which production ceases (e.g., downtime of a power plant following a tropical cyclone). Where there is empirical evidence of a slowdown in operations rather than a complete shutdown (e.g., thermal power plants that reduce electricity production during periods when cooling water is scarce), the impact is expressed as an equivalent downtime. These relationships are robust depending on the size of the database, the geographic areas covered, and the economic sector involved. Therefore, in the case of physical risk, when the granularity and accuracy of these data are not sufficient, expert-based assessments are applied to supplement the available information.

Concerning the practices for identifying, managing, and mitigating physical risk, it is first necessary to focus on the underlying perimeter concerning the components of corporate and collateral exposures. In this regard, the indispensable discriminator for preparing the preliminary identification phase is based on the availability of information data on the assets of both non-financial corporates and mortgage collaterals to enable the bank to correctly geolocate the overall portfolio. Geolocation of the portfolio at the single asset granularity level constitutes a significant starting point for the evaluation of the exposure of the whole portfolio to physical hazards. Within this regard, all the head offices and local units (production sites) of the non-financial corporations and residential and commercial real estate belonging to collaterals are geolocated, and corresponding coordinates information is gathered.

After the identification of the precise geographic location of the assets, the next step is to indicate which physical hazards these properties are exposed to. The following list of hazards is not exhaustive, but it covers the main physical hazards, both acute and chronic, considered by the ECB in climate stress test and Pillar 3 disclosure practices:

- Wildfire

- Heavy rain
- Landslide
- Cold wave
- Heatwave
- Drought
- Wind Gust
- Flood
- Change in Temperature
- Change in Wind Patterns
- Change in Precipitation Patterns
- Precipitation Variability
- Temperature Variability
- Water Stress
- Heat Stress
- Sea-Level Rise

Combining the historical data observed regarding these hazards with the specific macro climatic models which are calibrated according to different scenarios (e.g., NGFS scenarios), highly granular scenario-based risk maps can be built. These maps contain information on the specific technical features for the hazards in scope, like probability distribution and return period,² and thus, in the end, allow associating each geolocated asset with a hazard indicator. Following further calculations involving comparisons of these indicators with probability thresholds of hazards being materialized, the already geolocated assets can be assigned with degrees of risk, which can be mapped as qualitative identifiers (e.g., High, Medium, and Low-risk labels or colored risk maps).

Further elaborations can occur utilizing the results for the hazard-specific indicators of the risk mapping process stated above. The application of Damage Functions allows the evaluation of the quantitative damages observed both in real estate and non-financial corporations. Damage Functions are the functions differentiated by the hazard type, immovable property type (residential, commercial, or industrial) for the collaterals, and sector information for the non-financial corporations,

² Return Period is a measure typically used in Risk Analysis and it is the probability of at least one event occurring above the designated probability threshold. Conceptually, the Return Period is the average time that passes between two events of a certain intensity.

which translate the intensity of a hazard to damage on the asset and related economic losses.

Regarding the real estate, combining the hazard-specific measures with the immovable property features (floor number, surface area, conservation state, etc.) results in the calculation of the structural damages on the properties. Through the application of a mathematical model that links the extent of the damage itself, the real estate features (purchase prices, average price within the location, etc.), and macroeconomic projections of the house price index, a result for the value loss, depreciation, connected to the event for each immovable property, year, scenario and return period is obtained.

Like real estate, damage functions for non-financial corporations enable the calculation of the impact of physical hazards on the companies' business operations, as expressed as shocks to relevant balance sheet items (e.g., turnover, operating costs, etc.). Employing the hazard-specific measures resulting from the mapping procedure, they also consider sector information of the non-financial corporations and the items from Profit & Loss (P&L) and balance sheet statements. For each combination of hazard/sector, a specific damage function can be applied. For example, for the heatwave, the damage function aims to find the percentage of damage to the firm's revenues that resulted from the reductions in labor and asset productivity. For this example, the number of consecutive days (length heatwave) in which a heatwave (temperature > threshold value) is observed determines the coefficients that are used in the damage functions. The distinction of the behavior of the heatwave damage function within the sectors is also made by considering different multipliers for different sectors inside the function.

When addressing transition risk, which pertains to the potential financial impact of shifts toward a low-carbon economy, evaluating its impact on economic agents deviates from relying on historical data and instead adopts a forward-looking approach. Specially crafted models are employed for this purpose, encompassing an integration of climate variables, typically entities' CO₂ emissions and carbon prices. The first element enters the model in the form of direct and indirect emissions, specifically scopes 1, 2, and 3:

- Scope 1 emissions refer to direct emissions produced by an entity's own operations, such as emissions from on-site combustion processes or vehicle fleets. These emissions are under the direct control of the organization.
- Scope 2 emissions involve indirect emissions associated with generating purchased electricity, heat, or steam the entity consumes. Although these emissions occur off-site, they are considered relevant because they result from the entity's energy consumption decisions.
- Scope 3 emissions are broader in scope and encompass indirect emissions that occur in the value chain of the entity but are not owned or directly controlled by it. These emissions can include those from producing purchased goods and services, business travel, and employee commuting. Scope 3 emissions often represent a significant portion of an organization's total carbon footprint and require collaboration with supply chain partners and stakeholders to address effectively.

Regarding the cost of emissions, estimates of future trends in the two main price drivers, the carbon tax and the Emission Trading System market, are employed. The former is a straightforward fee imposed on the carbon content of fossil fuels or the GHGs produced by entities. The latter is a market mechanism that allows companies or manufacturing plants that emit greenhouse gases into the atmosphere to buy and sell emissions permits (allowances) among themselves.

These climate factors enter the models and are combined with traditional macroeconomic parameters (for example, GDP, interest rates, investment and consumption trends, consumer price index, BRENT prices, or public expenditure), conducting simulations that project the balance sheet statements of individuals and enterprises in which the bank has made investments or extended loans.

These balance sheet projections pass through the so-called risk factor pathways, which express the sensitivity of the debtor's economic and financial variables to changes in the reference scenario. The risk factor pathways indicate how the cash flows will change due to the transition risk implicit in the counterparty's reaction to the different climate scenarios. The main risk factors are developed at a geographic and economic sector level and are usually represented by:

- **Direct incremental costs** due to the imposition of a carbon tax on emitters that may result from new regulations issued by national or international entities;
- **Indirect incremental costs**, essentially due to higher prices of intermediate goods in the supply chain that suppliers apply following non-green production policies;
- **Incremental investment costs** arising from the adaptation of production processes and the severity of the level of service to be provided. These costs, as can be imagined, will depend both on the cost of the company's financial structure as well as the cost of the technology and the payback period of its investment;
- **Revenue changes:** higher costs may be passed on to final prices, but consumers may change their demand by directing it to other suppliers/products, thus creating changes in revenue/turnover, also considering the elasticity of demand to price; or, even, "lost revenue" may emerge if the business model adopted forces the entrepreneur to discontinue some productions that are no longer profitable.

This comprehensive analysis enables a more nuanced understanding of the potential financial consequences of transitioning to a lower-carbon economy and guides the bank's strategic decision-making processes.

4.2 THE LENDING PROCESS

Focusing on the contemporary set of banking and financial services, integrating climate risk considerations into the traditional methodologies of assessing credit risk has emerged as a critical concern. When evaluating the creditworthiness of households and businesses, relying solely on conventional metrics and models is no longer sufficient (Fig. 4.2). Instead, it has become imperative to comprehend and incorporate the profound impacts of climate events on various risk parameters. These events, ranging from extreme weather conditions to long-term shifts in climate patterns, can exert significant negative influences on many factors. Future cash flows, the delicate equilibrium of economic and financial stability, the valuation of assets recorded on balance sheets, the integrity of assets offered as collateral, disposable income levels, and even the worth of real estate holdings—all these features of credit risk are now intertwined with the impending specter of climate risk. As a result, the pressing question arises: How reliable is the counterparty that a bank seeks to finance or already has

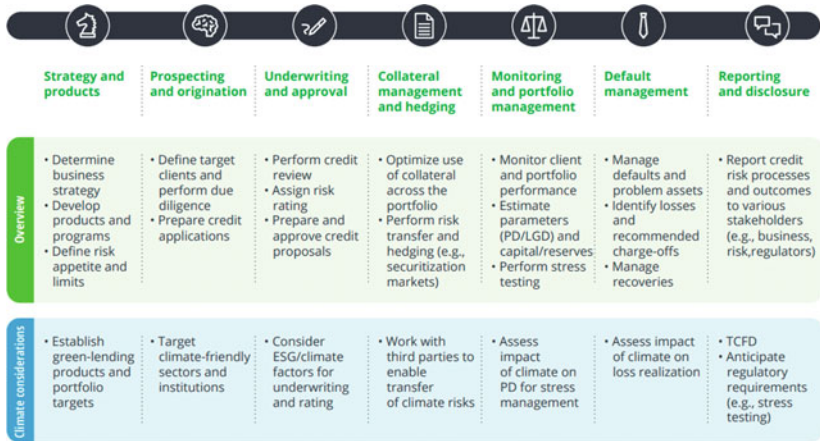


Fig. 4.2 Lending process: incorporating climate-related risks (*Source* Embedding climate risk into banks’ credit risk management: Practical considerations, Deloitte Development LLC (2022). Figure 1: Infusing climate risk considerations throughout the credit risk lifecycle)

in its portfolio when viewed through the new analytical lens of “climate events”?

As mentioned, the effects of transition and physical risk are multiple and differ in outcome depending on the economic sector involved. Even from the perspective of managing these impacts, different approaches are influenced by the agent’s size, geography, and sector. The following sections will discuss the retail sector, small and medium-sized enterprises, and large corporates in detail.

4.2.1 Retail Counterparties

Climate-related disruptions, such as extreme weather events, supply chain disruptions, and shifting consumer preferences, have introduced a level of uncertainty that financial institutions cannot ignore. Talking about the retail sector, physical and transition risks typically impact its real estate assets. As retailers deal with the consequences of climate change, their creditworthiness comes under evaluation, potentially impacting their ability to secure favorable financing terms. Furthermore, the value of real estate assets that serve as collateral for mortgages in the retail sector faces

a growing threat. Rising sea levels, increased flood risks, and the potential for property damage due to extreme weather can erode the value of these assets, making them riskier propositions for lenders. The transition risk event involves the reduction of personal wealth and is generated by the depreciation of owned properties.

Considering only the physical risks of predominantly “climatic and environmental” origin, the risk map of a territory requires the need to have accurate data, as precise as possible in function of the geolocation of the asset: even within the same municipal territory, in fact, the riskiness can be different (think of the hydrogeological risk of properties on the riverbank, or on coasts subject to erosion). Data acquired directly or through data providers can support the bank in gathering accurate information about the type and level of risk to which the asset is exposed and, consequently, the counterparty.

It is also necessary to consider both physical risk and transition risk simultaneously: in fact, the customer may have both energy inefficiencies and be subject to acute climate events that generate an immediate impact on physical assets (of residence, for individuals, but also the headquarters of activities for businesses and micro-enterprises classified as retail).

The current trend of increasing energy costs, mainly those related to heating and cooling costs of homes, and therefore directly related to the energy performance of buildings, determines an erosion of the available income of households, posing a significant issue of evaluation of such expenditure items in the evaluation of creditworthiness.

Therefore, it would be appropriate to take into account, in the prospective assessment of the creditworthiness of individuals for the purposes of granting—as well as monitoring, adopting the same assumptions within the Early Warning (EW) systems—information relating to the energy performance (energy efficiency class, or average consumption) of owned properties, regardless of the type of credit line granted, to assess the customer’s sensitivity to phenomena typically related to the transition.

Of equal importance, albeit extremely more difficult as it is difficult to model, would be to take into account the possible exposure of the subjects analyzed as income earners: exposure to the transition risk of the sector and, more specifically, of the company from which the customer derives their source of income, could determine an impact in terms of employment; at that point, the assessment should, however, take into account the prospects for new employment of the customer—based on variables (level of education, sex, age, propensity to change, recognized

skills in the sector, etc.) not currently available in the bank's information systems and of which integrated assessment has not yet been attempted in even the most advanced banking models.

With specific reference to retail counterparties, the bank's product catalog can offer significant support to policies for reallocating the portfolio toward more sustainable exposures and ensure easier integration into the granting and origination process, as well as subsequent and easier allocation of exposures for the purposes of mandatory non-financial disclosure. The definition of *green products* also facilitates placement through dedicated marketing campaigns and allows for the direct incorporation of any specific capital allocations through favorable pricing policies.

The exposures to individuals that can be considered for the purposes of the valuation of the Green Asset Ratio (GAR; see Chapter 6 for its definition) are:

- Residential Real Estate (lines for the purchase and/or renovation of residential real estate, or guaranteed by a mortgage on residential real estate);
- Loans for the purchase of electric vehicles (or hybrid vehicles, until 31/12/2035).

Within the granting process, aligned products allow to support the assumption that the consumer is not subject, or is subject to a lesser extent, to the transition risk related, as exposed in the previous paragraph, to the increase in non-discretionary costs in terms of energy costs, or to the costs of efficiency of the asset itself. Therefore, the client may benefit, depending on the parameters in use in the bank, for the purposes of assessing creditworthiness, of more favorable metrics (in terms, for example, of Loan-to-Income, LTI, maximum, or in the evaluation of future scenarios).

In addition to aligned products, it is also plausible to associate higher maximum Loan-to-Value (LTV) policies (or, conversely, reduced LTV on properties with higher energy costs) based on the actual concrete hypothesis that the efficiency parameter will become increasingly relevant in the commercial value of the assets themselves and, therefore, it is necessary to hypothesize that over time the value of the inefficient asset could suffer a strong reduction.

However, the issue, while being simple to explain, is far from easy to integrate into the credit-granting process: the EPC (Energy Performance Certificate) is produced at the time of the deed itself and, therefore, at the time when the bank has already concluded the investigation, approved the loan, defined the pricing which, moreover, is the subject of a binding offer to the customer pursuant to the transparency rules and, last but not least, disbursed the sums.

At the very least, it would be necessary to modify LTV, evaluation parameters, and pricing, which means formulating the binding offers on mortgages to individuals in compliance with the transparency rules, taking these factors into account as well, informing the customer that the Certificate will be produced and, where possible, already in the investigation phase, following the market best practice of acquiring the EPC together with the other necessary documents. It should, therefore, be noted that since the EPC is mandatory for the sale, the seller should presumably already have it and be able to make it available to potential buyers even before the deed.

For car loans, it would be necessary to acquire data on gCO₂/km emissions; however, unlike real estate, bank systems are not normally designed to store data on the financed car. It is, therefore, necessary to adjust the processes to be able to acquire and correlate the emission data of the car to the linked loan to be able to identify it as aligned.

In conclusion, it is important to note that, although sometimes considered a “marginal” strategy, the preparation (or exclusion) of specific products can be the winning strategy in pursuing the efficiency of the portfolio in terms of climate and environmental risks, as highlighted in a study by the European Commission.³

³ “Final study on the development of tools and mechanisms for the integration of ESG factors into the EU banking prudential framework and into banks’ business strategies and investment policies”, European Commission, 27 August 2021 (EC 2021). Pag 86, “For instance, banks have stopped providing certain products (e.g. derivatives related to coal-based trading, physical inventory management transactions in coal and crude oil) or prioritized other types of assets (e.g. mortgage and Buy-To-Let transactions to properties with high-energy efficiency ratings) as part of their strategy. This strategic choice has indirectly resulted in a risk mitigation strategy.”

4.2.2 *Corporate Counterparties*

Moving on to the business world, the approach for estimating climate risks varies whether one deals with large corporates or Micro, Small, and Medium-Sized Enterprises (MSMEs). In the case of Corporate and Large Corporate counterparts, the reporting requirements already in place under the EU Taxonomy allow for the safe adoption of the metrics recommended by the TCFD (GHG Emissions) and the alignment of business activities in terms of Turnover, Capex, and Opex with environmental objectives. In addition, from the Non-Financial Disclosure (NFD; see Chapter 6 for details) prepared separately or integrated into the annual or consolidated financial statements, key information is derived with respect to the company's initiatives, objectives, and investments. In some sectors, leverage is expanded relative to traditional multiples for counterparties that are more advanced in the transition: a symptom that the market offers support and confidence in the transition project and an unmistakable sign that traditional financial analysis alone is no longer sufficient for reporting counterparties: a level of debt above the norm, which traditionally would have led to a negative valuation, could instead be a sign that the company is strongly perceived as a winner by the market, even with all the in-depth analyses that will be necessary in this regard.

The traditional analysis by multiples advocated both at origination (following EBA 2020 “Guidelines on loan origination and monitoring”) and when assessing firms as part of the identification of impaired exposures and subsequent provisions (following ECB 2014, Guidance to banks on non-performing exposures, and AQR Manual), is fully affected: observation of market multiples shows a sharp reduction in multiples of “non-recoverable” sectors and widening of these parameters on more “sustainable” sectors.

This poses a considerable challenge to commercial banks in the context of lending and monitoring processes: on the one hand, great caution is needed before above-normal levers can be considered sustainable, especially at the lending stage; on the other hand, any threshold indicators on the level of debt also adopted within rating systems, or Early Warning, could potentially trigger precisely on the best-performing counterparties. The use of override mechanisms or the switching off anomalies detected by EW systems is certainly indispensable at this stage before integrating metrics within traditional financial statements according to European Financial Reporting Advisory Group (EFRAG) technical standards.

In summary, in assessing Corporate and Large Corporate enterprises subject to non-financial reporting requirements, the NFD provides quantitative and qualitative elements to support the granting process and complements traditional economic and financial assessment elements. In the context of Supervisory Expectation 7.5 with reference to “due diligence” against companies, an application threshold should be identified for in-depth assessment to effectively evaluate companies and investment projects to assess their affordability related to the loan and alignment with the Taxonomy. At this early stage, it will be necessary to ensure elastic processes allowing flexible considerations according to specific situations.

An ongoing concern that a bank should not underestimate when discussing risks related to the production system is that of clustering. Sectors potentially most exposed to physical risks according to ECB’s supervisory guidance (ECB 2020a) are the primary sectors (agriculture, forestry, and fisheries), public health, energy and mining, infrastructure and transportation, and tourism, although physical risk, by its nature, exposes all counterparts in affected geographies to risk. Sectors most exposed to the transition to a low-carbon economy include energy, transportation, manufacturing, construction, and agriculture. In particular, assets related directly or indirectly to the extraction, processing, combustion, or use of fossil fuels or characterized by insufficient energy efficiency could lose value suddenly and significantly to the point of even becoming “stranded assets”.

Therefore, it is of great importance and urgency to have the most granular, detailed, and up-to-date counterparty information on assets available to ensure the correct association to the NACE sector they belong to. For counterparties identified as financial holding companies, it is necessary to determine the NACE sector in relation to the predominant activity in which they operate; this also emerged in the Climate Stress Test (CST) exercise recently conducted by the ECB on European banks within the SSM (see Chapter 2 for details), with the requirement to trace exposures to counterparties belonging to a corporate group back to its NACE of membership. In this sense, procedures auxiliary to detecting related customer groups should allow the identification of major subsidiaries. Applying this sectoral association to each exposure allows the bank to have an overall view of the concentration in sectors subject to a higher risk of transition to a sustainable economy and, consequently, allows the bank to

be able to introduce strategic/operational levers for proper risk management. To this end, some institutions are developing and introducing special regulations for the governance of ESG risks that allow:

- The application of negative screening clauses can exclude new credit operations on sectors that are more exposed to transition risks and that have not planned any ecological reconversion investment.
- The application of positive screening clauses that favor lending to companies operating in “green” sectors or that have defined a path of ecological reconversion.
- The definition of an adjusted pricing model that allows for the adequate assessment and pricing of counterparty risk using ESG Ratings internally produced or provided by specialized external info-providers. Regarding the latter point, the topic of ESG ratings, their development, and the problems encountered to date will be discussed in detail at the end of the chapter.

Defining and activating these processes and setting up a framework for monitoring and controlling the level of higher-risk sector exposures will enable the bank to integrate these risks within its risk process. It will, however, prove to be of paramount importance for the banking sector to activate a path of specialized consulting to guide its clients on the path to sustainability, providing support and guidance for the definition of ecological transition plans. Such a path will be essential to avoid that, in the long run, counterparties may find themselves excluded from supply in the financial market, activating a situation of extreme economic and financial vulnerability that will also reverberate on financial intermediaries through the growth of bad loans.

4.2.3 Micro, Small, and Medium-Sized Enterprises (MSMEs)

A different argument applies to assessing Micro, Small, and Medium-Sized Enterprises. These entities play a significant role in the economic system of the European Union, where they represent 99% of all businesses. They provide two-thirds of jobs in the private sector and contribute to more than half of the total added value created by businesses in the Union. The European Union states that “Achieving carbon

neutrality and the digital transition have also been taken into account in the strategies adopted to ensure better framework conditions for SMEs”.⁴

For this purpose, it is crucial that the European banking system takes a pragmatic approach to the assessment of climate and environmental risk for small and medium-sized enterprises (SMEs), and small and micro businesses.

These types of businesses are currently formally excluded from the requirements for non-financial reporting, but they are included in the upstream and downstream value chains of companies required to publish the Non-financial Reporting Directive (NFRD) (see Chapter 6), and therefore, their emissions are included in the Scope 3 emissions data of large companies according to the guidelines of the Green House Gas Protocol Standard GHG. Thanks to this mechanism, the champions of the individual sectors, mainly those most exposed to the transition risk, are already evaluating their suppliers and, where possible, pushing them toward efficiency measures and improvement and the subsequent reporting of the results.

Given that the transition risk is linked to data related to one’s carbon footprint and GHG emissions, SMEs and small economic operators could be penalized as they do not have a transition strategy in terms of carbon footprint yet.

The presence of a strategy, however, is not necessarily a guarantee of its success, and now banks certainly lack specialized figures capable of assessing the reliability and feasibility of plans toward carbon neutrality. The absence of a transition plan, in itself, could be irrelevant or could be a signal of imminent risk. For example, it is clear that in some sectors (e.g., the catering industry), it would be a secondary element if consumption were still sustainable; in others, such as for an electricity producer, it could instead be a factor of high risk for the company’s continuity itself. If the company were part of a supply chain, it would certainly be of great importance to obtain timely assessments regarding the loss of customers subject to reporting obligations: the company could, in fact, already be the subject of exclusion from the market, according to the new sustainability parameters.

It would therefore seem appropriate on the one hand to activate, as a banking system, a process of awareness-raising among SMEs and small

⁴ <https://www.europarl.europa.eu/factsheets/en/sheet/63/small-medium%20enterprises>.

economic operators, and on the other hand, to guarantee them financial support, perhaps through products already designed in line with the taxonomic requirements, and eventually developing ancillary support and consulting services in the implementation of the client's investment projects. Only by accompanying even smaller operators will banks be able to identify exposures that flow into the numerator of the Banking Book Taxonomy Alignment Ratio (BTAR) indicator, but more importantly, only in this way will it continue to provide oxygen to the entrepreneurial world which is largely made up of companies currently not subject to non-financial reporting obligations.

A potential “non-taxonomy” assessment of the transition risk for SMEs could instead look at the efficiency of the production cycle: in fact, SMEs show a very different stage of awareness in terms of energy and raw material consumption efficiency. According to the Survey Eurobarometer 2022, based on the sector of activity, in the last four years, European SMEs have adopted strategies for the efficient use of resources, mainly reducing waste and processing waste (64%), energy saving (61%), efficient use of raw materials (57%), recycling and reuse of materials or waste within the production cycle (47%), and water saving (46%). Over three-quarters of SMEs and Microenterprises (77%) that have taken measures believe it is necessary to further improve the efficiency of their company; on the other hand, about 9% of SMEs and Microenterprises do not take any measures and, among them, 73% do not believe they will take them in the next two years.

In addition to the cost containment and production efficiency factors, however, it is also necessary to assess the proactivity of a company and its ability to effectively follow market trends. From this point of view, given that not all sectors offer potential for developing “green” products, only less than 30% of companies have already implemented their offer.

In summary, the acquisition of information elements that, initially disregarding the numerical data on emissions or turnover alignment with the EU Taxonomy (see Chapter 2), lead to an assessment of the level of awareness of SMEs and micro-enterprises in facing the transition will allow banks to better assess the positioning of the company, both in absolute terms and in comparison, with its sector.

To this end, adopting information questionnaires that collect complementary data to those traditionally used by banks to assess creditworthiness will allow for using the necessary data in the credit-granting and monitoring process, especially for unlisted SMEs and micro-enterprises.

For these companies, NFD will continue to be voluntary, and consistent and proportionate models and standards can be adopted with their characteristics.

4.2.4 The Role of Product Mix in Corporate Risk Management

As stressed earlier in this chapter, managing the climate issue can bring not only risks but also significant opportunities for commercial banks. Within the realm of sustainable finance, commercial banks are diversifying their portfolio with a wide set of environment-related products tailored to the unique requirements of SMEs and corporate clients. The most common offering in this category is the Green Loan, a financial instrument strategically designed to furnish businesses with the necessary capital for executing sustainable initiatives. These projects cover a wide range, from the adoption of renewable energy sources and the implementation of waste reduction programs to the installation of energy-efficient equipment.

Green Loans frequently incorporate precise Key Performance Indicators (KPIs) and Sustainability Performance Targets (SPTs) to ensure transparency and accountability throughout these aims.

For example, a company securing a Green Loan may commit to achieving a specific percentage reduction in its carbon emissions within a predefined timeframe, utilizing the loan proceeds to finance the requisite transformations. Collaboratively, the bank and the borrower establish KPIs to meticulously monitor and measure progress toward this objective. Such KPIs may involve quantifiable metrics such as carbon emissions per unit of production, reductions in energy consumption, or the integration of sustainable practices within the supply chain.

Moreover, sustainability-linked loans have emerged as a forward-looking financial instrument of growing prominence. These loans motivate enterprises to integrate sustainability into their core business strategies by directly tying the loan's interest rate to the company's performance through predetermined SPTs. These targets often encompass a diverse range of sustainability criteria, encompassing reductions in greenhouse gas emissions, enhancements in workplace safety, or the promotion of diversity and inclusion initiatives.

For instance, a corporation could negotiate a reduction in its loan's interest rate if it successfully attains specific milestones, such as reducing

water usage or achieving a defined level of renewable energy consumption within a stipulated timeframe. This framework serves a dual purpose: it aligns financial incentives with sustainable practices and encourages companies to perpetually aspire to elevate their environmental and social performance.

These types of sustainable products not only contribute to supporting the business world toward the transition but also enable the bank itself to reduce its transition risk. To signal to the market and the regulator its commitment in this direction, there are two important indicators, the Green Asset Ratio (GAR) and the Banking Book Taxonomy Alignment Ratio (BTAR), that have gained prominence in the banking sector as part of the industry's commitment to sustainable finance and environmental responsibility.

According to the Disclosure Delegated Act (C (2021) 4987), the GAR covers only exposures toward counterparties subject to disclosure obligations under the NFRD. Following these regulations, the GAR covers only Taxonomy-aligned exposures toward counterparties subject to the disclosure obligations under the NFRD, i.e., exceeding the average number of 500 employees. However, the denominator of the GAR also includes the exposures of counterparties not subject to the NFRD. Consequently, the reported GAR underestimates the “real” GAR by implicitly assuming that these exposures are altogether not Taxonomy-aligned.

The EBA requires the additional disclosure of a “modified GAR”, called the Banking Book Taxonomy Alignment Ratio (BTAR) for large institutions (according to the definition in the CRR (EU) No 575/2013) that are listed on a regulated stock market in the EU. In contrast to the GAR, the BTAR includes Taxonomy-aligned exposures toward non-financial corporates not subject to NFRD disclosure obligations both in the numerator and the denominator.

GAR and BTAR are critical tools for evaluating a bank's environmental performance and commitment to sustainable finance. These ratios enable stakeholders, including investors, regulators, and the public, to assess how much a bank's assets and activities contribute to a more sustainable and environmentally responsible economy (Brühl, 2023).

4.2.5 *Transfer of the Climate Risk on the Creditworthiness Measurement Systems of the Borrower*

So far, the effect of climate risks on the balance sheet items of counterparties securing a loan from banks has been discussed. Of great relevance to a commercial bank is to incorporate these impacts into traditional metrics for measuring credit risk to adjust the borrower's creditworthiness. This issue necessitates adjustments to the rating parameters, specifically the Probability of Default (PD), Loss-Given Default (LGD), and Exposure at Default (EAD).

This is usually performed by introducing correcting factors for PD and LGD estimated with qualitative and quantitative methodologies. On this last aspect, the adoption of expected loss metrics can be helpful, also in connection with the IFRS9 concern for any staging and provisioning treatments. Adopting this metric implies being able to verify what happens to its baseline parameters, that is: how PD, LGD, and EAD change. This means calculating expected loss values conditioned on a specific climate transition scenario in econometric logic. The methodological maturity, at the current stage, is not high. This is due to both the lack of granular information and the difficulty in translating the "climate" scenarios onto the parameters of individual borrowers. In addition, unlike what it has been accustomed to from EU-Stress Test exercises, no mature "satellite" models translate climate risk factors directly into PD-stressed or LGD-Stressed. To date, according to what is available in the literature or from research conducted by various institutions, mainly in the US, some path-generators allow to estimate the impacts on revenues or higher costs only at the level of some economic sectors (typically energy and agriculture) whose parameters can be used as benchmarks (in the absence of historical series) to be applied to counterparties belonging to those sectors. The issue of how to cover the additional NACE that has not been estimated remains.

The methodologies are not mature yet regarding estimating PDs "adjusted" for climate risk. In general, expert scoring systems can be used to remap the assessment result by notching up or down the credit PD or Alternatively through qualitative questionnaires that, when inserted in the override process, produce a final PD adjusted for climate risk. Finally, a quantitative methodology, which is not new as it is already in use in the first rating systems and for sensitivity purposes on the balance sheet variables, provides for using the Merton model (Merton, 1974). This is

based on a shift of the possible values of the asset affected by the climate risk factors and redefines the distance-to-default (Dt), obtaining the PD-Adjusted, corrected for a specific idiosyncratic calibration parameter.

On the LGD parameter side, however, approaches to assessing the effects of the transition risk toward a low-carbon economy are still in development. They are based, now, on the judgments of sector experts who base their conclusions by analyzing the percentages of recovery of stranded assets or assets that can no longer be exploited (typical of oil and gas companies) or on existing correlations between PD and LGD, as in the Frye-Jacobs model (2013). This is a statistical approach that predicts the loss-given default (LGD) as a function of the default probability (PD).

4.3 CLIMATE RISK AND THE FINANCE AREA

Banks' experience with climate risks in the finance and treasury functions is still in its infancy in a situation characterized by low data availability and quality.

Activities to manage the maturity transformation process (Asset & Liability Management-ALM), intra-day and short-to-medium-term liquidity (Treasury), funding policies (issuance of medium-to-long-term debt and/or hybrid instruments, interbank and corporate deposits), financial risk hedges (OTC derivatives) and in general typical Finance and Investment Banking operations, including transactions on portfolios of financial instruments both of the bank and of third parties, are managed through:

- Financial transactions involving counterparties such as financial intermediaries, domestic and international, including those of a public/consortium nature or medium-to-large corporate enterprises;
- Markets, technology platforms, and payment systems, including managing front-middle-back-office activities;
- Info-providers offering information useful for pricing, risk control, accounting, and disclosure.

The physical and transitional risk factors that can impact these three components represent the elements to be analyzed and attended to ensure governance of this operation oriented toward compliance with the principles of sustainability and to make a positive contribution to the transition

to a “green” and inclusive economy, mitigating both direct and indirect exposure to ESG risks and the potential negative reputational fallout that could result.

4.3.1 *Treasury, ALM, and Property Portfolio*

In their Treasury and, especially, Asset & Liability Management activities, banks currently do not have disclosure for all counterparties. Disclosure happens only in the case where the counterparties are represented by large players, required to prepare the Non-Financial Statement, or subject to disclosure requirements of a similar nature and subject to solicited and unsolicited ESG ratings issued by specialized agencies and also available from info-providers (e.g., Bloomberg).

In these situations, with a view to both ex-ante assessment/counterparty selection and periodic assessment of the relevant ESG risk profiles (to be compared with the intermediary’s risk appetite), it is possible to have public and up-to-date information in terms of counterparty exposure to ESG risks (taken together and in the climate-environmental “E” risk component): for example, and with respect to transition risk, the component summarized in the indicators of scope 1 and scope 2 GHG emissions (direct and energy source consumption-related emissions) and scope 3 GHG (supply chain).

The main “E” risk factors that characterize these financial counterparties are exposure to physical risks (e.g., impacts on operational and commercial locations for large banking groups with commercial networks, locations, and functionality of IT systems) and transition risks (e.g., ability to finance “green” sectors/counterparties and to support, relative to “brown” sectors/counterparties, the related conversion and circular economy processes).

Regarding the markets-platforms-systems, their resilience to the occurrence of climate-environmental risk factors (in particular physical risk) relies on their business continuity and disaster recovery systems, the quality and efficiency of which can be ascertained through the analysis of external certifications (including ESG ratings) and IT risk assessments (within which continuity profiles are attentively monitored) that the same operators are required to carry out on an annual and infra-annual basis.

Similar considerations regarding the info-providers component can be made, as highlighted for platform systems. It should be added that,

within the Treasury and Asset & Liability Management activities, info-providers are implementing their offerings to improve the availability and quality of ESG information. At present, info-providers have achieved an adequate level of quality around physical risk. On transition risk, forward-looking approaches are still used due to the lack of historical flows and the incomparability of data among market participants, issuing companies, and counterparty financial institutions today.

With reference to the three components described above (counterparties, markets-platforms-systems, and info-providers), it can be observed that banks operate in a *conditional* market environment, often characterized by elements of *near* monopoly (e.g., markets-side and info-providers) or by the use of a small number of specialized “components” (be it the large banks that manage the interbank market or transactions in derivative contracts, or even the managers of markets and payment systems). On the one hand, this condition reduces or constrains the bank’s ability to choose, making it difficult to use the ESG driver as a differential selection element. On the other hand, in view of factors such as their size and sector, their visibility, regulatory constraints and expectations, and the expectations of different stakeholders (which may include large asset managers), it is difficult to imagine that these operators do not already have internal programs in place to adjust their strategy, processes, infrastructure, operating rules, and products/services to seek greater sustainability and to improve positive assessments of the relevant ESG profiles.

An issue that is always “cross” with respect to the illustrated dimensions of analysis is represented by the negative contribution that all players in the financial and technology sectors can determine in terms of increased CO₂ emissions due to the foreseeable increase in energy consumption related to the spread and intensification of the processes of digitization, fast lending, and the development of “blockchains” technologies (with reference to which financial services related to cryptocurrency trading and use are only one of the components). In this area, it is worth noting how *cloud solutions* increasingly used to manage financial services IT platforms ensure energy consumption management that seeks significant synergies and economies of scale.

Finally, considering the management of portfolios of financial instruments, capital allocation and origination choices are required to factor in the assessments of the ESG profiles of the issuers of said financial

instruments. As for issuers of corporate securities, the physical and transitional risks that characterize them take on a different and somewhat more significant relevance in terms of potential magnitude. This occurs, for example, in relation to the lower digitalization of their business models, as these operators (e.g., industrial companies) are highly dependent on physical production and logistics chains (thus exposed to various physical risks, both acute and chronic). They may also use non-green technologies, making them susceptible to technical obsolescence or the impact of new stringent environmental regulations. Furthermore, they may offer products that customers may no longer appreciate or demand due to sustainability considerations (e.g., plastic product manufacturers). This requires using ESG-related information to assess these issuers and evaluate their positioning, always comparing it to the bank's ESG risk-appetite concerning the operations under analysis.

In terms of pricing, the emerging evidence indicates impacts on the prices of financial instruments stemming from the incorporation of ESG assessments, which are mostly connected to supply and demand dynamics (appetite for green bonds and portfolios with green issuers) and less to actual, measured, or even perceived differences in risk (which is reflected in improved creditworthiness) of the issuer itself due to different ESG exposures (Molino et al., 2023). This factor will increasingly influence the management decisions of such assets, although the current context still prioritizes ESG considerations in financial portfolio management for reputational reasons.

Similarly, investors' growing interest in sustainable investment strategies could lead to an opposite price variation based on the level of compliance of issuers with the ESG framework.

4.3.2 Derivatives Desk, Investment Banking, Corporate Solutions, and Trading Portfolio

Activities related to derivative instrument management result in exposure to ESG risks similar to what has already been explained in relation to Treasury-ALM operations and property portfolio.

The growth of green financial instruments has naturally led to the parallel development of derivative contracts, such as sustainability-linked derivatives tied to specific key performance indicators or derivatives traded on multilateral systems connected to sustainability objectives. The

International Swaps and Derivatives Association (ISDA) has already identified derivative instruments of this type. As green finance continues to expand, there will be an increasing liquidity inflow into sustainability-linked derivative products, with consequent impacts on business models as these instruments facilitate the calibration of ESG factors in credit and investment strategies for financial instruments.

In more general terms, considering the various aspects of the investment banking business, climate, and environmental risks can also become elements to be leveraged in terms of innovative products and services to offer to clients (possibly through partnerships) or to use for the bank's financial risk management.

This pertains, for instance, to corporate solutions services, especially in providing advisory services to corporate clients regarding debt and equity issuance, mergers and acquisitions, public offerings, and so on. This also includes activities related to structuring and placement in the primary market for IPOs, debt offerings, convertibles, and equity stakes.

In this context, the ethical and sustainability dimension can become a distinguishing factor in the services offered and a factor in enhancing the bank's reputation and its ESG ratings issued by specialized ESG rating agencies.

Physical and transition risks could have different impacts on the trading portfolio through increased energy and commodity prices and new strategic and tactical asset allocation trends in portfolios related to European energy transition policies. Specifically, these impacts could have implications in terms of:

- devaluation of financial instruments (MTM, mark to market, or mark to model);
- increased volatility of the MTM of instruments;
- changes in the sensitivities of financial instruments;
- changes in the Value-at-Risk (VaR) of individual positions and the entire portfolio;
- increased frequency of rebalancing and reduced effectiveness of hedging activity;
- changes in the Expected Shortfall (ES) of individual positions and the entire portfolio;
- impact on liquidity horizons (and thus the marketability of assets in the trading portfolio);

In this perspective, it is useful for banking intermediaries, also in line with the guidance of the ECB Guide on climate-related and environmental risks (ECB 2020a, 2020b), to:

- assess the compliance of their investment products with the Paris Agreement and international best practices at the EU level, including, for example, the EU Green Bond Standard, and the guidance from authorities on sustainable financial instruments. In this regard, a market best practice for assessing the alignment of their securities portfolio (both in banking and trading) with ESG themes is represented by the PATCA application (Paris Agreement Capital Transition Assessment),⁵ which allows for understanding the portion of the portfolio exposed to sectors sensitive to environmental and climate risks, its projection over a 5-year horizon, and conducting an appropriate peer analysis;
- Modify the market risk policy and the investment policy/portfolio tree with sustainable finance objectives, identifying the portion of the trading portfolio to allocate to ESG-oriented investments and the related risk metrics, KPIs (ESG ratings, etc.);
- Develop a catalog of ESG investment products/ESG management lines (funds, policies, management lines, advisory lines) or trading platforms with ESG ratings, including ESG regulatory adjustments (MIFIDII/IDD), and projects to incorporate ESG factors into financial instrument pricing models;
- Develop a catalog of derivative products to hedge climate and energy events (weather and energy derivatives). The strong attention of European authorities and financial markets to the climate change and environmental disaster theme, as well as the entire ESG framework, necessitates structuring tailor-made weather derivatives or extreme environmental event coverage tailored to the specific needs of corporate clients or the bank itself. In many cases, this is a new area of

⁵ PACTA (Paris Agreement Capital Transition Assessment), developed by the 2 Degrees Investing Initiative, which assesses alignment with climate objectives. This tool combines information on exposures to companies held in the portfolio, at the individual exposure level, within a database containing production plans and technologies used by these companies, comparing them with scenarios developed by the International Energy Agency to evaluate alignment with the goals of the Paris Agreement by each intermediary.

activity for which the intermediary often needs to acquire specialized skills and expertise.

In the near future, introducing the Fundamental Review of Trading Book (FRTB)⁶ may potentially increase capital requirements for the trading portfolio in relation to what has been discussed above. Under the new FRTB approach, banks will need to calculate an expected shortfall calibrated at a 97.5% confidence level for all risk factors, pass the Risk Factor Eligibility Test, and scenario stress tests for each Non-Modelable Risk Factor (EBA, 2020; The Role of environmental risks in the prudential framework, 2022).

Banks are required to calibrate shocks to risk factors based on historical data, ensuring that the measurements reflect stress periods.

In this approach, measuring environmental risks may require banks to adjust their historical data series to include potential future dynamics of market factor shifts (to which portfolio assets are sensitive) related to climate and environmental risks.

However, data adjustments could affect the accuracy of measuring the capital requirement for market risk for the portion not correlated with C&E risk, as it may also lead to double-counting effects if the hypothetical effects of environmental risks are already covered by volatility.

Currently, the supervisory framework requires banks to consider all “material” risks. Therefore, banks must capture all environmental risks when they have a material impact on the trading portfolio.

Article 370 of the CRR (Capital Requirements Regulation) also specifies that event risk should be measured using an internal model. In this regard, it could be useful to utilize risk measurement models (including extreme climate events and environmental disasters) through external tools separate from VaR (Value at Risk) or ES (Expected Shortfall) measurement. These models would prevent the need to update the input historical data series of the aforementioned models. They would also provide explicit recognition of environmental risks through a dedicated add-on, determined by considering a specific scenario of events. This

⁶ The new regulations in force since mid-2023 within the framework of the Fundamental Review of the Trading Book (FRTB) include a stricter separation of positions between the trading and banking book, the introduction of a new standardized approach for market price risks as well as revised regulations on the use of internal models.

approach would facilitate the monitoring phase of the add-on's appropriateness, offer a certain level of transparency, and would not require modifications to VaR or ES frameworks.

Multiple studies have shown that the intensity of CO₂ emissions is reflected in stock returns, particularly in the case of companies with higher carbon impact (Bolton & Kacperczyk, 2020). Another study conducted by Ilhan et al. (2021) found that the prices of derivative contracts used for tail risk hedging are higher for high-carbon intensity firms and significantly increase during periods of heightened public attention to climate risk. All studies conducted to date have been focused on specific sectors, especially those most exposed to climate risks, tending to underestimate these risks in sectors with lower exposure or indirect exposure.

It is not certain whether, at the current state, markets fully price climate risk across all economic sectors. Therefore, it is highly likely that price fluctuations and other risk factors may continue to manifest in the future with uncertain impacts. To assess the extent to which market risk models account for environmental risks, it is important to highlight the divergence between the actual volatility related to asset price fluctuations in the markets caused by environmental events and the prospective volatility captured by the models.

Regarding correlation models, in the current capital framework, banks are already required to test correlation scenarios different from those observed during stress periods. For example, the EBA, with reference to market risk assessment methodology, requires the competent authority to ensure that the institution assesses the potential effect that historically unobserved alternatives, both high and low correlation, could have on VaR (Value at Risk) calculations. Therefore, the framework for correlations among assets in the trading portfolio should incorporate the effects of joint variability due to ESG factors. However, this does not necessarily imply that banks adopting internal models for capital requirements already include climate and environmental risk considerations, even though correlation algorithms.

4.3.3 *Climate Risk and Asset Management*

The Asset Management industry plays a prominent role in ESG issues because finance is transformative. It is, indeed, the flows of risk capital (equity) and third-party capital (debt) that shape the real economy and thus determine its trajectory. Just as credit intermediaries, in introducing

climate risk, update their assessments regarding loans to companies, the asset management industry makes its investment decisions by allocating the financial flows collected through managed savings. This is why asset management is responsible for adjusting its transmission mechanisms to ensure the proper implementation of sustainable and responsible investment principles in general and the introduction of climate risk in particular.

It is, therefore, important the process for the integration of ESG criteria in the definition, management, and monitoring of a sustainable investment portfolio. The starting point is the regulation on sustainability investments: EU Sustainable Finance Disclosure Regulation, SFDR, EU regulation 2019/2088, already introduced in Chapter 2, as well as EU Regulation 2020/852, the so-called Taxonomy Regulation that allows financial and non-financial companies to share a common definition of economic activities that can be considered environmentally sustainable. These regulations support asset managers in the definition of strategic guidelines for the integration of sustainability risk in investment decisions.

According to the SFDR's classification system, a portfolio/investment fund will either be classified as an article 6, 8, or 9, depending on its characteristics and level of sustainability:

- Article 6: portfolio without a sustainability scope: it does not promote ESG characteristics ESG.
- Article 8: a portfolio that promotes investments with environmental or social characteristics (light green), with other characteristics, and the preventive assurance that invested companies follow good governance practices.
- Article 9: a portfolio with sustainable investment as its objective (dark green) and presents a benchmark reference index.

In the field of collective asset management products, it is necessary to distinguish between products that invest in listed markets (typically UCITS products) and those that invest in unlisted assets (typically AIFMD products). This distinction is useful concerning the investment approach and the tools used by the products.

Indeed, climate risk management will be particularly characterized by the type of risk transmission mechanism specific to the investment target. Regarding listed ESG markets, investments made in stocks typically involve

minority stakes without access to the decision-making levels of the target company. In this case, a pre-screening analysis takes on greater emphasis, the outcome of which determines whether the final decision to invest is made. A similar discussion applies to investments in listed debt instruments that may have climate risk mitigation characteristics (consider, for example, Green Bonds) that make them desirable from a pre-screening analysis perspective. However, regardless of the channel used (Private Banking, Advisory, Wealth Management, etc.), this type of investment does not allow for a significant impact approach by the investor. This is why the investment decisions made by the asset manager may be influenced by the quality of issuer disclosures.

Within the asset management domain, investments made in private markets, typically represented by the “Private Equity” asset class (belonging to AIFMD products), take on particular significance regarding their impact on climate risks and, more generally, on the ESG risk profile. Private Equity funds, for example, invest in acquiring majority stakes in industrial companies in the goods and services sector, with the ability to intervene at all levels of the target company’s governance. This privileged role allows them to influence or even determine the strategies and industrial plans of the invested company. This process highlights a direct transmission mechanism from asset management to companies, as it makes it possible to impact organizational production choices.

It becomes evident that the asset management industry’s role in sustainability is twofold. On the one hand, it directs and influences the choices and actions of companies, and on the other hand, it contributes to disseminating a risk culture related to ESG issues in general and climate risk in particular.

In a widely used definition (Eurosif, European SRI Studies 2018), “*Sustainable and responsible investment (SRI) is a long-term oriented investment approach that integrates ESG factors in the research, analysis and selection process of securities within an investment portfolio. It combines fundamental analysis and engagement with an evaluation of ESG factors in order to better capture long-term returns for investors and to benefit society by influencing the behavior of companies*”.

Different SRI strategies have been developed and may be summarized as follows (Eurosif, European SRI Studies 2012, 2016, and 2018):

1. Sustainability-themed investments: involving investments in assets linked to the development of sustainability issues such as climate

change, food scarcity, water security, renewable energy, and agriculture.

2. Best-in-class investment selection: involves investments in sectors or companies belonging to a specific investment cluster with positive ESG performance relative to peers.
3. Exclusion of holdings from the investment universe: eliminates from the universe of securities available in the market those that do not meet certain ESG criteria, such as securities belonging to controversial sectors such as arms, tobacco, etc.
4. Norms-based screening: based on excluding investments that do not meet international norms and standards, such as those promoted by the OECD, ILO, United Nations, and UNICEF.
5. Integration of ESG factors in financial analysis: involves the explicit and systematic consideration of ESG factors in traditional financial analysis and securities investment decisions.
6. Engagement and voting on sustainability matters: provides for engagement activities and active ownership through voting of shares and engagement with companies on ESG matters.
7. Impact investing: a strategy of investments into companies, organizations, and funds with the intention to generate social and environmental impact alongside a financial return.

4.4 CONCLUSIONS

From the above, it is clear that banks are under increasing pressure to gain a deeper understanding of transition and physical risks within their loan and investment portfolios. As the impacts of climate change intensify, addressing climate-related risks has become a global priority for banks, which should be considered influential factors in categories such as credit risk, market risk, liquidity risk, reputational risk and operational risk.

Regarding the lending process, there is a clear need for banks to incorporate climate-related risks at various stages of the lending process to integrate climate risks into credit risk modeling, such as loan approval and pricing, collateral valuation, quantification of credit risk metrics, monitoring of exposures and limits, and the definition of credit risk policies and procedures. Methodologies to quantify the impacts of climate on a borrower's creditworthiness are still under development. Improvements are expected in the coming years to address challenges such as

extending the horizon of models, designing climate scenarios for financial risk analysis, solving problems with limited granular data, identifying relevant metrics for climate risk exposure, and adapting existing risk tools to climate risk modeling. Adapting traditional credit risk models will require expert judgment, due to the complexity of the topics and the diversity of climate change pathways.

On the financial side, the banking and asset management sector is facing increasing pressure to strengthen disclosure of climate-related risks and opportunities and to support “sustainability” initiatives while continuing to maximize financial returns for their investors. As finance/treasury functions and asset managers try to balance these potentially conflicting tasks—pursuing “sustainability” and making money—in an evolving regulatory landscape, they should continue to monitor and rely on guidance from regulators.

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Insurance Companies

5.1 IMPACTS OF CLIMATE CHANGE RISK ON THE INSURANCE BUSINESS

In 2015, the Prudential Regulation Authority (PRA) of the Bank of England, in a report on the impact of climate change on the UK insurance sector (BoE-PRA, 2015), identified (emphasizing their significance) three main channels (risk factors) through which impacts are foreseeable. These are physical risks, transition risks, and liability risks. It also underscored that especially “liability risks” require particular attention in terms of monitoring and governance.

In recent years, environmental risks, particularly those associated with climate change, have undergone a “standardization” in defining their components (AIFIRM, 2021, p. 19). “Climate change risk” is based on widely shared definitions found in TCFD (2017) and also in EIOPA (2021, p. 6). According to these definitions, climate change risk can be classified into two categories (two drivers) of risk: transition risks and physical risks. According to TCFD (2017), transition risk includes the following different but interconnected types of risks: policy risks, legal risks, technology risks, market sentiment risks, and reputational risks.

Each of these is associated with different drivers and impacts that require specific analysis. For example, legal risk is related to “litigation” arising from potential claims and/or legal actions by entities (property owners, municipalities, states, insurers, shareholders, organizations,

etc.) for reasons related to situations such as inadequate mitigation of the impacts of climate change, failure to adapt to climate change or inadequate disclosure related to perceived significant financial risks.

Depending on the nature, speed, and focus of these changes, transition risks can pose various levels of financial risk for insurance companies. Physical risk can be attributed to potential negative financial impacts resulting from physical effects due to climate change.

In turn, physical risk is identified as either “acute” or “chronic” risk. In summary, it is evident that in the case of the insurance sector, there are at least three fundamental dimensions of climate change impacts: physical risks, transition risks, and liability risks. Insurance companies, called upon to provide coverage for damages caused by weather events or gradual changes, directly (and indirectly) experience the effects of climate change in the short term as well as the medium and long term. The challenges for insurance companies are, therefore, manifold and primarily relate to risk management within the broader risk management framework.

However, one must not overlook the challenges arising from the ability to seize the opportunities associated with climate change, including possible innovation in business models. As highlighted in the report “Climate Change Risk Assessment for the Insurance Industry” (The Geneva Association, 2021), climate change brings various levels of physical and transition risks to the attention of insurance companies, impacting their balance sheet structure. TCFD (2018) emphasizes, in terms of risk management, disclosure regarding the organization and processes of identifying, measuring, and managing climate risk, as well as their integration into the broader corporate risk system.

It has been observed that, at present, the development of “climate change risk” management models has made more progress in assessing physical risks while still being in its early stages concerning transition and liability risks. The main impacts that these risks produce can manifest as loss of profitability and asset devaluation. The drivers of losses can be diverse and related to various aspects of different nature (and predictability), including legal, technological, and, among others, reputational damages.

Of relevance to the issues discussed here is the analysis conducted by The Geneva Association (2021) concerning methods and tools for assessing climate risk in the insurance sector. The work provides a detailed integrated decision framework for assessing climate change risk, considering various dimensions, including:

1. Business line (property and casualty, life insurance)
2. Balance sheet section (assets and liabilities)
3. Time horizon (short-medium vs. long-term)
4. Type of risk (physical and transition)

The exercise of mapping climate change-related risks, including their relationship with the various types of risks traditionally monitored within insurance and reinsurance intermediaries, proves to be highly valuable.

Tables 5.1 and 5.2 present a summary of climate change-related risks, linking them to the main categories of risks traditionally monitored by insurance (or reinsurance) companies: underwriting risks, market risks, counterparty/credit risks, strategic/operational/reputational risks, and also identifying the main propagation mechanisms.

5.2 THE INTEGRATION OF CLIMATE CHANGE RISK INTO THE ORSA

After outlining the impact that climate risks can have on insurance companies, it is important to incorporate these types of risks into the Own Risk and Solvency Assessment (ORSA) process. This process, introduced with Solvency II, falls under the so-called “second pillar”, which encompasses measures aimed at verifying the practical operability of the solvency system outlined in the first pillar. The control is carried out both by the company itself, through governance rules, risk management, and internal controls, and by the Supervisory Authority, which jointly assesses the company’s risk profile, adequacy of financial resources, and prudential behavior. The ORSA process consists of a comprehensive risk management process embedded in the management of the enterprise and serves the purpose of better understanding corporate risks from a strategic and business perspective.

The assessment takes the form of an economic analysis of balance sheet items, conducted according to the principles and guidelines provided by the Supervisory Authority.

On 19 April 2021, EIOPA issued an opinion in which it calls on National Competent Authorities (NCAs) to oversee the integration of “climate risk scenarios” into the Own Risk and Solvency Assessment

Table 5.1 Climate change risk channel: transition risk

<i>Sub type</i>	<i>Underwriting risk</i>	<i>Market risk</i>	<i>Counterparty/(credit) risk</i>	<i>Operational/reputational/ strategic risk</i>
Policy	<ul style="list-style-type: none"> The economic impact of a policy-triggered transition to a low-carbon economy leads to higher claims for some lines of business, e.g., credit insurance 	<ul style="list-style-type: none"> Energy efficiency regulation of commercial and residential property reduces the value of undertakings' investments in real estate that do not comply with the requirements and/or reduction in emission rights negatively affects investments in carbon-intensive sectors, like mining, energy, transport, and manufacturing Late government intervention to achieve transition to low-carbon economy disrupts the stability of the real economy and the financial sector, depressing asset values, and interest rates Transition to a low-carbon economy results in higher spreads on government bonds of countries that are economically dependent on oil and gas exploration, coal mining, and/or carbon-intensive industries 	<ul style="list-style-type: none"> Collateral backing of commercial and residential mortgage portfolios decline in value, e.g., due to government policy with regards to the energy efficiency of real estate 	<ul style="list-style-type: none"> Maritime insurance undertakings experience market contraction as policy-induced transition to a low-carbon economy leads to a fall in global shipping of oil and gas Transition to a low-carbon economy reduces demand for insurance products and services where undertakings' customer base is heavily exposed to conventional carbon-intensive industries

<i>Sub type</i>	<i>Underwriting risk</i>	<i>Market risk</i>	<i>Counterparty/(credit) risk</i>	<i>Operational/reputational/ strategic risk</i>
Legal	<ul style="list-style-type: none"> Higher climate change-related claims under liability policies, like directors and officers, professional indemnity, and third-party environmental policies 	<ul style="list-style-type: none"> Price declines of investments in carbon-intensive sectors due to companies facing litigation for failing to avoid or minimize adverse impacts on the climate or failing to adapt to climate change 	<ul style="list-style-type: none"> Reinsurance undertaking faces claims for not considering the impact of its underwriting decisions on climate change, resulting in a lower credit standing and higher exposure of undertakings to reinsurance losses 	<ul style="list-style-type: none"> Undertakings that do not take into account the impact of their underwriting and investment decisions on climate change experience direct claims for damages and litigation costs
Technology	<ul style="list-style-type: none"> High claims on new insurance products covering green technologies because of under-pricing due to lack of data 	<ul style="list-style-type: none"> Advances in clean energy technology result in stranded assets of companies involved in oil and gas exploration and carbon-based power generation Companies or sectors invest in new low-carbon technologies but some of those prove not to be successful, depressing their asset values 	<ul style="list-style-type: none"> Advances in clean energy technology result in losses on private loans to companies dependent on carbon-based power generation as well as companies developing unsuccessful clean energy technologies 	<ul style="list-style-type: none"> Undertaking's strategy fails to take into account the disruption of conventional industrial organization induced by the technology-driven transition to a low-carbon economy with firms demanding new insurance products and services, leading to a drop in demand for its products

(continued)

Table 5.1 (continued)

<i>Sub type</i>	<i>Underwriting risk</i>	<i>Market risk</i>	<i>Counterparty/(credit) risk</i>	<i>Operational/reputational/ strategic risk</i>
Market sentiment	<ul style="list-style-type: none"> Shift in customer preferences for climate-friendly goods and services, e.g., electrical cars and transport vehicles, puts investments in producers of conventional, carbon-based goods and services under pressure 	<ul style="list-style-type: none"> Shift in customer preferences for climate-friendly goods and services, e.g., electrical cars and transport vehicles, puts investments in producers of conventional, carbon-based goods and services under pressure 	<ul style="list-style-type: none"> Shift in business preferences to occupy sustainable office and retail space lowers the value of mortgage loans on climate-unfriendly commercial property 	<ul style="list-style-type: none"> Shift in customer preferences for sustainable companies diminishes demand for the undertaker's insurance products and services, as its business strategy does not sufficiently take into account the long-term impact on sustainability factors
Reputation	<ul style="list-style-type: none"> Investments in certain companies perform poorly because of their reputation of contributing to climate change 	<ul style="list-style-type: none"> Higher spreads on loans to certain companies and real estate funds that have a climate-unfriendly reputation, resulting in lower revenue for these companies and lower occupancy rates of the real estate 	<ul style="list-style-type: none"> Higher spreads on loans to certain companies and real estate funds that have a climate-unfriendly reputation, resulting in lower revenue for these companies and lower occupancy rates of the real estate 	<ul style="list-style-type: none"> Non-life underwriting in economic sectors contributing to climate change, e.g., coal-fired power infrastructure, damages the reputation of undertakings, making it difficult to attract and retain customers and staff

Table 5.2 Climate change risk channel: physical risk

<i>Sub type</i>	<i>Underwriting risk</i>	<i>Market risk</i>	<i>Counterparty/(credit) risk</i>	<i>Operational/reputational/strategic risk</i>
Acute	<ul style="list-style-type: none"> Climate change increases the frequency and concentration of extreme weather events and natural catastrophes, e.g., heat waves, landslides, floods, wildfires, and storms, resulting in higher insurance claims Climate change increases the frequency and concentration of extreme weather events and natural catastrophes, damaging property and resulting in higher insurance claims Motor and auto underwriting losses increase over time due to increased severe hailstorm events Aviation hull claims increase over time due to increased hailstorm and lightning strike losses Higher frequency/intensity of hail or floods result in higher claims on crop insurance Climate change increases the losses related to Non-Damage Business Interruption (NDBI) insurance by preventing firms' operations following a natural disaster, even if they have not been physically impacted (for example aviation companies) AN increase in extreme events will impact the creditworthiness of firms and individuals, resulting in higher credit insurance claims 	<ul style="list-style-type: none"> Higher credit spreads on government bonds issued by countries that are highly susceptible to acute physical risks Downgrade of municipal bonds issued by municipalities whose infrastructure, economy, and/or revenues are impacted by extreme weather events Values of real estate portfolios decline due to properties being located in areas highly sensitive to the increase in extreme weather events Climate change-related shocks, e.g., a pandemic, negatively affect the economy and the financial system and depressing interest rates and asset values Increased currency volatility of countries that are vulnerable to the rise of extreme weather events and natural disasters, increasing undertakings' foreign exchange risk 	<ul style="list-style-type: none"> Higher frequency and concentration of extreme weather events and natural disasters reduce the credit standing and/or lead to defaults of reinsurance undertakings, exposing undertakings to reinsurance losses The availability and cost of reinsurance cover become prohibitive for smaller insurers in certain markets due to the increase in frequency, correlation, and severity of natural disasters Higher frequency and severity of extreme weather events reduce the credit standing of non-life undertakings, raising their cost of capital Uninsured losses on commercial and residential property arising from climate change-induced physical perils negatively affect the performance of mortgage loans 	<ul style="list-style-type: none"> Climate change-related increase in extreme weather events and natural disasters affecting undertakings' own assets (property, equipment, IT systems, and human resources), increasing costs and potentially compromising operations Undertaking's risk management and pricing fail to take into account the potential non-linear character of acute physical risks, e.g., the coincidence of previously un-correlated events, resulting in unexpected claim burdens, resulting in unexpected losses Increasing acute physical risks, like wildfires, floods, and storms, constrains insurers to underwrite property and assets Inappropriate strategy relating to acute physical climate risk mitigation reduces the insurer's competitiveness Melting arctic ice due to climate change is likely to lead to an opening up of the Northwest Passage leading to new opportunities for marine insurance

(continued)

Table 5.2 (continued)

<i>Sub type</i>	<i>Underwriting risk</i>	<i>Market risk</i>	<i>Counterparty/(credit) risk</i>	<i>Operational/reputational/strategic risk</i>
<ul style="list-style-type: none"> Higher frequency and severity of epidemics and pandemics due to climate change lead to higher non-life insurance claims, e.g., business interruption and credit insurance An increase in temperatures will negatively affect the productivity of crop farming, thereby increasing crop insurance claims that cover revenue losses Decreasing river water levels prevent firms from operating, resulting in higher losses related to Non-Damage Business Interruption (NDBI) insurance 	<ul style="list-style-type: none"> Higher credit spreads on government bonds issued by countries that are highly susceptible to chronic physical risks Fall in value of real estate portfolios due to properties being located in areas highly impacted by the increase in chronic physical risks, e.g., coastal urban areas vulnerable to sea-level rise Government prioritizes water supply to households and resulting water scarcity will put pressure on non-essential business activities 	<ul style="list-style-type: none"> A higher incidence of pandemics results in losses on commercial mortgages, as consumers avoid shopping malls and working from home reduces demand for office space 	<ul style="list-style-type: none"> Climate change-induced sea-level rise renders residential and commercial property in vulnerable areas uninsurable Agricultural insurance undertakings experience a market contraction as crop farming is no longer possible due to temperature increases and lower water availability and as rising ocean temperatures reduce the productivity of fish farming Travel insurance undertakings face a severe market contraction following a climate change-induced pandemic Sea-level rise constrains the insurability of houses located next to the coast, resulting in lower revenues for non-life insurers 	

Source: European Insurance and Occupational Pensions Authority (EIOPA), 2021, Opinion on the supervision of the use of climate change risk scenarios in ORSA, BoS 21-127, 19 April, pp. 18-25 (Annex 3 e 4)

(ORSA) of European insurers and reinsurers within the Solvency II framework. By integrating climate change risk into the ORSA process, insurance companies include sustainability and environmental risk management among their corporate objectives, contributing to the promotion and development of new mitigation technologies.

The increased attention paid by the decision-making boards of companies to the impacts of climate change should lead to a reduction in climate-related litigation and associated liability risks. On this point, an analysis conducted by UN Environment reports that in 2020, the number of climate change-related litigations had doubled compared to the data from 2017 (UNEP, 2020). Among the issues related to climate change for the insurance sector are exposures such as D&O (Directors & Officers Liability), PI (Professional Indemnity), and third-party environmental liability policies.

The hope is that insurance companies increasingly implement sensitivity analyses within the risk measurement process conducted over longer time horizons than those currently employed, ensuring the long-term solvency and profitability of the sector.

In the ORSA report, required to be prepared and provided to the Supervisor, insurers should describe the analysis of short and long-term climate change risks. This should include an overview of all relevant exposures to climate change risks, an explanation of how the company has assessed the relevance, and, if applicable, an explanation of how the company has concluded that the climate change risk is not relevant. Additionally, the methods and key assumptions used by the company in assessing the risk of relevant exposures, including long-term scenario analysis, should be indicated, along with the quantitative and qualitative results of scenario analysis and the conclusions drawn from the results.

Beforehand, it will be necessary to conduct an assessment to identify material exposures to climate change risk and subject these material exposures to adequate evaluation. All of this will inevitably require significant effort on the part of companies, along with increased costs, which may be manageable for larger companies but may pose challenges for smaller ones.

5.3 THE IMPACTS OF CLIMATE RISK ON THE BUSINESS MODEL OF INSURANCE COMPANIES

The increasing relevance of climate and environmental risks is having significant impacts on the business models of insurance companies, which are called upon to develop new insurance solutions to cover damages resulting from the manifestation of these risks.

One of the first environmentally oriented products dates to the mid-1990s when some American insurance companies devised and issued what is known as “catastrophe bonds” or “Cat-bonds”. These are high-yield, high-risk debt securities through which insurance and/or reinsurance companies (the issuing companies) aim to transfer the risk of an exceptional catastrophic event (such as a hurricane, earthquake, or pandemic) to subscriber-investors, in exchange for adequate compensation. By issuing Cat-bonds, insurance companies protect themselves against the risk of catastrophic events because the funds raised through the issuance of these bonds can be used to cover the significant compensatory expenses that events of this magnitude inevitably entail.

While such financial instruments primarily target institutional investors, other products aim to involve the private client base. In fact, the retail insurance offerings of major insurance companies have recently expanded with new solutions and products designed to achieve two objectives: promote and encourage more eco-friendly behaviors among the population and meet the growing demand from customers to insure against risks arising from climate change.

The first category includes all insurance solutions to promote sustainable, environmentally friendly mobility, including coverage for electric and hybrid vehicles and policies that reward low annual mileage. It also includes products that support energy efficiency in buildings and homes to optimize energy consumption.

The second category includes products designed to address catastrophic risks or specific environmental damages, anti-pollution products (such as pollution liability policies), and policies covering risks related to renewable energy production. In the latter case, these products aim to compensate for damages caused by weather events to solar panels, photovoltaic systems, or similar installations, potentially including guarantees to protect against profit losses resulting from interruptions or reductions in electricity production.

In addition to compensatory solutions for direct damages caused by natural disasters, some insurance companies have also developed products for post-event management. The environmental insurance market is now in an irreversible phase of development. However, the exponential growth of these products poses further questions and challenges for the insurance business, especially in terms of the optimal management of the assumed risks due to the increasing frequency of adverse climate events. This could lead to a substantial increase in premiums demanded or even the refusal to provide coverage in certain geographical areas particularly exposed to the negative impacts of climate change, especially for smaller insurance companies.

Apart from product offerings and resulting business decisions, aspects that should be considered for proper risk assessment include:

1. Improved accuracy in determining premiums (pricing) for certain policies;
2. Application of impact underwriting by integrating climate risks into underwriting policies.

Insurance companies are particularly exposed to climate risk through their underwriting activities, which cover economic losses due to natural events and disasters.

In managing climate risk, insurance companies typically base their models on the past, i.e., what has happened in a specific geographical area or with regard to a particular phenomenon affecting human life over the past few decades. Managing natural disasters with impacts on individuals and businesses requires an improvement in predictive models. With climate risk, models based on the past need to be adjusted because they must consider factors such as geographical location to more accurately determine premiums that would otherwise tend to increase for all insured parties exposed to the same type of risk. An adjustment of current data is necessary because historical data on the frequency and impacts of meteorological events is not long-term and, therefore, not entirely indicative of possible future developments. This means that integration with medium and long-term predictive climate scenarios is essential to align with the timeframes required by regulators for climate risk measurement (from 30 to 40 years).

Once scenarios and data sets, especially with a higher level of granularity and geographical placement, are defined/integrated, it will be possible to measure the resilience of the insurance company to climate risk. Territorial considerations are important because, for premium determination purposes, insuring assets/properties in highly exposed areas could be very costly for companies and simultaneously too risky and unprofitable for insurers.

As for life insurance and, in particular, Insurance-Based Investment Products (IBIP), the focus is not so much on identifying specific coverage but rather on considering the sustainability preferences expressed by the customer in the distribution of these products.

5.4 CONCLUSIONS

The insurance industry is indeed facing growing risks, but could also find opportunities, due to its crucial role in tackling climate change. Like most financial firms, insurance companies bear transition and physical risks, along with a unique exposure to liability risk, resulting from increasingly common litigation over climate mitigation and adaptation efforts. It is therefore necessary to conduct an assessment to identify material exposures to climate change risk and subject these material exposures to adequate evaluation since these risks can potentially manifest on both sides of their balance sheets through a reduction in the value of their investments and increased liability for claims. The adaptation to the new scenario with increasing climate risks and challenges requires relevant efforts on the part of companies: the increase in costs might be difficult to manage by small companies.

Success in the insurance business relies on accurate risk prediction and the future in managing climate risk also involves the use of new technologies such as Machine Learning and artificial intelligence, which allow for the handling of large amounts of data to derive usable elements and information for strategy definition and the implementation of advanced predictive models. In addition, partnerships with specialized start-ups in climate risk measurement should be considered, especially because the demand for insurance products related to natural phenomena is expected to increase, especially for property and casualty insurance.

When considering climate change as an opportunity, a key point for insurance companies is to keep up with customer needs, developing innovative insurance products on the one hand, and investing in innovation

to measure the effects of these new risks more accurately on the other. It is also necessary to establish a governance model capable of analyzing evolving data and managing these new risks properly to address the challenges and transformations resulting from climate change, which is crucial in ensuring a transition toward a sustainable dimension for the entire economic and financial system.

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Governance Implications: The Challenge of Disclosure

Regulators and supervisors are demanding increased transparency from financial institutions when it comes to their climate and environmental disclosures on points such as their material exposure to climate-related risks and the methodologies they use to assess their vulnerability.

For financial institutions, disclosure plays a significant role as a communication tool and a catalyst for spreading awareness about climate:

- intermediaries face the challenge of communicating to non-financial companies what impact might result from the evidence emerging from the disclosure;
- in turn, non-financial companies may become increasingly aware of the reach of the messages and their communicative power in end markets, leading them to reconsider production processes affected by carbon emissions.

In this context of mutual interdependencies, intermediaries inevitably play an increasingly social role as engines of growth and development.

The following sections will examine the standards to which intermediaries, particularly banks, refer in their information and disclosure activities internally to decision-making bodies and the market.

6.1 ECB EXPECTATIONS ON INFORMATION AND DISCLOSURE

The ECB’s “*Guide on climate-related and environmental risks*”, mentioned in Chapter 1, introduced in November 2020 13 expectations regarding climate and environmental risks. The expectations covered four areas: business models and corporate strategy, governance and risk appetite, risk management, and reporting and disclosure.

In the same month, the “*ECB Report on institutions’ climate-related and environmental risk disclosures*” was published, assessing the completeness of climate and environmental risk disclosure of 107 significant and 18 less significant banks with respect to the 2019 reporting year. The ECB noted a lag in banks’ disclosure of climate and environmental risks. The level of disclosure varied considerably among institutions, depending on their size and scope. No bank among those assessed was in line with the minimum level of disclosure required by the recommendations published by the ECB in the Guide, the European Commission’s Guidelines on the Disclosure of Non-Financial Information, and the Recommendations of the Task Force on Climate-Related Financial Disclosures—TCFD (both referred to in the ECB Guide). The report also noted that climate-related topics were characterized by a general lack of articulation and a lack of quantitative information.

In March 2022, the ECB published a second snapshot of the level of disclosure of climate-related and environmental risks among significant institutions: “*Supervisory assessment of institutions’ climate-related and environmental risks disclosures—ECB report on banks’ progress towards transparent disclosure of their climate-related and environmental risk profiles*”.

In April 2023, the ECB published its third review of the disclosure of climate-related and environmental risks among significant institutions (SIs) and a selected number of less significant institutions (LSIs): “*The importance of being transparent. A review of climate-related and environmental risks disclosures practices and trends*”.

The focus of this paragraph is the analysis of expectation 13 to provide a summary of the alignment of European banks with the expectations outlined in the ECB’s documents.

Expectation 13—Regulatory Disclosure—“*For the purposes of their regulatory disclosures, institutions are expected to publish meaningful information and key metrics on climate-related and environmental risks that*

they deem to be material, with due regard to the European Commission's Guidelines on non-financial reporting: Supplement on reporting climate-related information".

Therefore, the materiality of climate-related and environmental risks is expected to be assessed using qualitative and quantitative information and by duly considering reputational and liability risks associated with the institution's impact on the climate and environment arising from controversy concerning its products and operations. As there is no standard threshold for materiality, institutions must conduct an assessment customized to their business model and risk profile over short and longer time horizons. Materiality assessment should be based on solid quantitative and qualitative thresholds.

According to the first assessment by the ECB (see Fig. 6.1), only 36% of the assessed institutions disclosed whether climate-related and environmental risks had a material impact on their risk profile; however, banks made clear progress compared with 2021, improving their public disclosures to address C&E risks: the percentage of banks making such a disclosure—at least for some risks or in general terms—is now 86%.

Expectation 13, in turn, consists of 7 “sub-expectations” related to two main areas: disclosure policies and procedures and content of climate-related and environmental risk disclosures.

Disclosure policies and procedures

Expectation 13.1—*“Institutions are expected to specify in their disclosure policies key considerations that inform their assessment of the materiality of climate-related and environmental risks, as well as the frequency and means of disclosures”*.

Expectation 13.2—*“In case an institution deems climate-related risks to be immaterial, the institution is expected to document this judgment with the available qualitative and quantitative information underpinning its assessment”*.

Expectation 13.3—*“When institutions disclose figures, metrics, and targets as material, they are expected to disclose or reference the methodologies, definitions, and criteria associated with them”*.

The ECB report (2022) observed that only 20% of the assessed institutions disclosed the methodologies, definitions, and criteria for all the figures, metrics, and targets reported as material. The remainder did not disclose these aspects at all (37%) or partially revealed the methodologies, definitions, and criteria (around 43%).

Expectation	Disclosure practices	2021	2022	
		Existence of disclosures	Existence of disclosures	Adequate and broadly adequate disclosures ^a
13	Does the institution disclose that its exposure to climate-related and environmental risks is material?	38%	88%	24%
13.4	Does the institution describe the potential strategic impact of transition risks in the short or long term?	41%	80%	37%
	Does the institution describe the board's oversight of climate-related and environmental risks?	71%	97%	50%
	Does the institution describe the organisation's processes for identifying, assessing and managing climate-related and environmental risks?	71%	92%	41%
	Percentage of institutions that disclose all of the information set out in Expectation 13.4	39%	58%	21%
13.5	Does the institution disclose its Scope 3 financed emissions?	15%	50%	16%
13.6	Does the institution disclose its key performance indicators or key risk indicators associated with its strategy-setting?	49%	75%	46%
Percentage of institutions that disclose all of the information set out in Expectations 13.4 to 13.6		8%	34%	6%
13.7	Does the institution disclose key information on environmental risks other than climate-related risks?	25%	35%	17%

Fig. 6.1 Overview of the institutions that disclose climate-related and environmental risk in line with expectation 13 (*Source* The importance of being transparent—ECB [2023], Table 4)

This type of approach is relevant when it comes to financial institutions that are committed to aligning exposures with the goals of the Paris Agreement; however, among the institutions having made such commitments, less than half provided qualitative and quantitative information supporting them, and almost 30% of the institutions did not give any information supporting these commitments, while about a quarter provided only qualitative information. This means that most institutions disclosing these types of commitments should have comprehensively substantiated them in their disclosures, potentially exposing them to reputational and liability risks.

Content of climate-related and environmental risk disclosures

Expectation 13.4—“Institutions are expected to disclose climate-related risks that are material with due regard to the European Commission’s Guidelines on non-financial reporting: Supplement on reporting climate-related information”.

The Supplement states that stakeholders must “*understand the company’s view of how climate change impacts its business model and strategy, and how its activities can affect the climate, over the short, medium and long term*”. This entails not only the description of climate-related risks to the company’s business model, strategy, and financial planning but also how the company’s business model can affect the climate. Concerning the 2022 assessment (2021 figures), 57% of the institutions in the sample did not describe the potential strategic impact of either transition or physical risk; many gave a general description of climate change or climate-related risks affecting either the economy or the financial sector without a clear link to the bank’s business model; 31% of the banks disclosed a strategic impact of both physical and transition risk, 10% of transition risk only and 2% of physical risk only. For transition risk, 31% of the banks disclosed an impact in both the short and long term, 7% only in the short time, and 3% only in the long term. For physical risk, 23% of the banks disclosed an impact in both the short and long term, 7% only in the short time, and 3% only in the long term.

The 2023 assessment (2022 data) shows a slight improvement, with disclosure in force for 60% of the sample; however, only one-third of assessed institutions present adequate or broadly adequate disclosures.

The European Commission’s Supplement on reporting climate-related information in the ECB Guide expectation 13.4 sets guidelines for describing governance and the best risk management practices. On the one side, it defines the board’s oversight of climate-related risks and management’s role in assessing and managing climate-related risks and for explaining the rationale for the approach taken. Conversely, the processes for identifying, evaluating, and managing climate-related risks (including how decisions are taken on mitigating, transferring, accepting, or controlling those risks) are integrated into the company’s overall risk management.

Concerning the governance issues, in 2021, 71% of the institutions in the sample described board oversight of climate-related and environmental risks, a noticeable improvement from the 2020 disclosure assessment, when only 53% of the institutions provided disclosures on the board’s oversight of climate-related risks or opportunities. The improvement path continues in 2022, where disclosures regarding board oversight are particularly well-advanced both in terms of existence and adequacy (97% and 50%, respectively).

Concerning risk management issues, the 2022 ECB's disclosures assessment showed that 71% of the institutions described their processes for identifying, assessing, and managing climate-related and environmental risks. However, only 17% did this comprehensively to let stakeholders clearly understand how the elements of climate-related and environmental risks were integrated into the risk management processes in terms of interconnections, temporal horizon, proportionality, and consistency. However, significant advances have been identified in this area in the 2023 Assessment, with 92% of institutions now disclosing meaningful C&E risk information pertaining to risk management and almost half of the sample being broadly adequate or adequate in this category. However, the ECB states that banks' disclosures in the business model, metrics, and target categories remain insufficient, with almost half of banks achieving an inadequate score.

Expectation 13.5—*“Institutions are expected to disclose the institution’s financed Scope 3 GHG emissions¹³⁷ for the whole group”*.

Institutions are expected to disclose (pag. 49 ECB Guide, 2020):

- the amounts or percentage of carbon-related assets in each portfolio in €millions or as a percentage of the current portfolio value and, to the extent possible, a forward-looking best estimate of this amount or percentage over the course of their planning horizon;
- the weighted average carbon intensity of each portfolio, where data are available or can be reasonably estimated and, to the extent possible, a forward-looking best estimate of this weighted average carbon intensity over the course of their planning horizon;
- the volume of exposures by sector of counterparty and, to the extent possible, a forward-looking best estimate of this volume over the course of their planning horizon;
- credit risk exposures and volumes of collateral by geography/country of location of the activity or collateral, with an indication of those countries/geographies highly exposed to physical risk.

Institutions are expected to disclose the methodologies used and assumptions made. This would include the definitions and formulae for the computation of the abovementioned metrics.

Although the ECB does not prescribe a specific measurement and attribution methodology, institutions are encouraged to adopt a granular approach to measuring carbon emissions while adhering to the GHG Protocol guidelines outlined in the European Commission’s Supplement.

Scopes 1, 2, and 3 are categories that organizations can use as a conceptual tool to formalize their GHG emission accounting while avoiding double counting. The Greenhouse Gas Protocol is a standard reference in that regard. Scope 3 covers all indirect GHG emissions that occur in the value chain of the reporting company, including both upstream and downstream emissions. In the case of a credit institution, this includes the emissions of counterparties linked to lending portfolios, or in other terms, “financed emissions”, which are expected to represent most emissions.

In 2021, 74% of banks in the sample disclosed Scope 1, 2, and 3 emissions, but only 15% declared Scope 3 financed emissions (or some of them). In 2022, such percentage has increased to 50%, though in 85% of cases, Scope 3 emissions are not (broadly) adequately disclosed.

Expectation 13.6—*“Institutions are expected to disclose the KPIs and KRIs used for their strategy-setting and risk management, as well as their current performance against these metrics”.*

Using the metrics above, financial institutions are expected to describe their strategy’s short-, medium-, and long-term resilience in the light of different climate-related scenarios.

In 2021, only half of the banks in the sample published the required information, and within this group, the published indicators were more related to green financing than to actual risks. Furthermore, only 32% of banks evaluated their performance against the published KPIs or KRIs. Fifty percent of banks also disclosed targets, often related to non-core activities (electricity consumption, business travel, etc.). Several banks developed targets for Scope 1, 2, and 3 emissions, but not all indicate financed Scope 3 emissions.

In 2022, progress has been made in relation to processes, KPIs, and KRIs.

Expectation 13.7—*“Institutions are expected to evaluate any further environmental risk-related information needed to comprehensively convey their risk profile”.*

Banks’ risk management and public disclosures are expected to take a holistic approach to identifying, monitoring, and managing all material climate-related and wider environmental risk drivers. In 2021, 25% of

the banks in the sample made a generic reference to other environmental risks, such as pollution or water consumption. Only 6% of the banks in the sample conducted environmental impact analyses on their portfolios (e.g., water footprint or biodiversity); even in these cases, the impact is rarely quantified. Approximately 80% of the institutions did not disclose information about the processes for identifying and quantifying the environmental impact on their lending activities. In 2022, few improvements are recorded, with only 35% of banks disclosing environmental risk-related information and less than 1 over 5 banks being adequate or broadly in this regard.

In sum, although much progress can be witnessed, in its latest report, the ECB still concludes that *“at this point in time, external stakeholders are not given sufficient information on how banks could be affected by C&E risks, how they monitor these risks, which scenarios have been used, and how their business strategies have been amended following their findings”*.

6.2 STANDARDS OF DISCLOSURE

The significant proliferation of regulatory activities related to ESG disclosure has compelled companies to increase their commitment to these issues and has subjected them to new reporting methods. Over the past decade, there have been standards that companies (both financial and non-financial) have not been able to embrace due to a lack of data or the excessive cost of research. However, these standards and regulations have not only created obligations but also opportunities. Companies find support to provide the market with increasingly detailed non-financial information about their activities, attracting more conscious investors who understand how their resources can contribute to a better future. Therefore, all companies must equip themselves with the tools and resources necessary to measure their emissions. They are responsible for setting greenhouse gas reduction targets, reporting on their progress, and reducing their emissions.

The following paragraph summarizes the main climate disclosure standards the European Union and other important stakeholders are shaping. A multi-stakeholder perspective guides these standards and is consistent with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD).

6.2.1 *International Initiatives*

Taskforce on Climate-Related Financial Disclosures (TCFD)

The increasing demand for information has led to various climate reporting standards, primarily focusing on GHG emissions and other metrics. The lack of data on the financial implications for an organization's business is the main obstacle to integrating climate-related risks and opportunities. In response, the Financial Stability Board established the TCFD (Task Force on Climate-related Financial Disclosures) in 2015 to provide a unified framework that makes all the necessary information accessible to investors, financiers, and insurers. The goal is to facilitate informed decision-making and enhance understanding of the risks and opportunities associated with climate issues.

The principles underlying the standard produced by the TCFD can be summarized as follows:

- specific information on risks/opportunities in the relevant market;
- specificity and completeness of exposures/impacts, including their nature and magnitude, and strategies to address them;
- clarity, balance, and comprehensibility;
- consistency over time, consistent language, and metrics across periods enable comparability;
- comparability of strategies, risks, and performance across sectors, industries, or portfolios;
- credibility, verifiability, and objectivity, providing high-quality and unbiased information;
- timeliness, with at least annual reporting and updates in the event of disruptive events.

Better information makes the economic system more resilient, facilitating more effective risk assessment, improved capital allocation, and strategic planning in the short, medium, and long term. The Task Force ensures that its recommendations and related developments can promote alignment among existing disclosure regimes. It also strives for efficient implementation of the work in the financial reports of organizations. The characteristics of the recommendations include widespread adoptability, providing decision-useful information on financial impacts, and a significant focus on risks and opportunities.

The Task Force structures its recommendations around four thematic areas that represent the key elements of an organization: governance, strategy, risk management, and metrics and targets. Guidelines are available to support all organizations in developing climate-related financial disclosures consistently with the recommendations, providing context and suggestions. Additional guidance has been developed for the financial sector and specific non-financial sectors to offer a more comprehensive framework for potential climate-related financial impacts in those sectors. It also provides examples of good practices.

The required information consists of 7 cross-industry metrics for climate-related risks:

1. GHG Emissions (Scope 1, Scope 2, Scope 3, emission intensity)
2. Transition risks (% of vulnerable assets to transition risks)
3. Physical risks (% of vulnerable assets to physical risks)
4. Climate-related opportunities (% of revenues, asset aligned)
5. Capital deployment (amount of expenditures to mitigate risk)
6. Internal carbon prices (price per ton of GHG used internally)
7. Remuneration (% of executive management remuneration linked to climate considerations)

One of the critical pieces of information recommended by the Task Force focuses on measuring the resilience of an organization's strategy, considering different climate-related scenarios (such as the 2 °C scenario or lower), commonly referred to as "stress tests". Understanding how an organization's strategies might change when addressing potential climate-related risks and opportunities is a fundamental step in considering the implications of climate change. Although the use of scenarios in assessing climate-related issues and their potential financial impact is relatively recent and still evolving, it is crucial for improving the awareness of financial decisions related to climate change.

CDP—Carbon Disclosure Project

The Carbon Disclosure Project (CDP) is an international nonprofit organization that provides a global system for companies and cities to measure, disclose, manage, and share environmental information. CDP is committed to gathering information from companies, including small businesses, about their greenhouse gas emissions and their assessment of

climate change, water risks, and opportunities. At the heart of CDP's goals is the aim to halve global greenhouse gas emissions by 2030 and reach net-zero emissions by 2050 to reduce the risk of irreversible environmental consequences. Therefore, every company needs to commit to reducing its environmental impact.

Data providers are the companies that will disclose data about their climate impact. Data users are organizations that utilize the information disclosed in their decision-making processes from data providers.

The requested information pertains to the environmental impact generated by the activities carried out by the company (e.g., Scope 1–2–3 emissions).

CDP produces a scoring system to encourage and guide companies toward greater disclosure to achieve higher leadership in environmental transparency. By assigning scores ranging from D- to A, CDP incentivizes companies and cities to increase their disclosure, identifying best practices in environmental leadership, such as setting meaningful and ambitious goals.

The CDP questionnaire is aligned with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). In 2021, more than 13,000 companies, representing over 64% of global market capitalization, disclosed their information through CDP. This marked a more than 35% increase compared to the previous year and an impressive 141% increase since 2015, the year of the signing of the Paris Agreement. This substantial disclosure growth reflects companies' growing commitment to provide transparency on their climate-related financial information and align with international climate goals.

SASB Standards

The standards by SASB (Sustainability Accounting Standards Board) were created to help companies and investors develop a shared understanding of corporate value, specifically how it is made, preserved, or eroded over time. A company's management of ESG factors can substantially impact its accounting and market performance. Asset management and custody companies that do not consider these risks and opportunities in their investment management activities may see a decrease in investment returns, which could reduce performance fees.

The SASB standards also include sector-specific standards with disclosure topics, associated accounting metrics, techniques, protocols, and activity metrics for each industry. These sector-specific standards provide

a framework for companies within each industry to report relevant ESG information consistently and comparably, allowing investors to better assess and compare companies’ ESG performance within their respective sectors.

The standards were designed to identify a minimal set of sustainability topics typical of the company’s industry, which are more likely to impact the company’s operations, performance, or financial conditions. Using these standards benefits both companies, enhancing their transparency and investors by encouraging comparable, consistent, and financially relevant reporting, thus enabling them to make more informed investment choices. The use of SASB Standards is voluntary, and each company determines which standards are relevant to its operations, which disclosure topics are financially pertinent to its business, and which associated metrics to use, considering relevant legal requirements. In particular, the standards include certain areas and metrics to be integrated into the disclosure, as exemplified in Fig. 6.2.

This version for asset management and custody activities is applicable for all entities starting from 1 January 2022, but early adoption was also allowed. Suppose an entity chooses not to adopt the version related to a standard. In that case, it must specify the omissions and the reasons for those omissions, which must be consistent with the guidelines provided in the SASB standards.

TOPIC	ACCOUNTING METRIC	CATEGORY	UNIT OF MEASURE	CODE
Incorporation of Environmental, Social, and Governance Factors in Investment Management & Advisory	Amount of assets under management, by asset class, that employ (1) integration of environmental, social, and governance (ESG) issues, (2) sustainability themed investing, and (3) screening	Quantitative	Reporting currency	FN-AC-410a.1
	Description of approach to incorporation of environmental, social, and governance (ESG) factors in investment and/or wealth management processes and strategies	Discussion and Analysis	n/a	FN-AC-410a.2
	Description of proxy voting and investee engagement policies and procedures	Discussion and Analysis	n/a	FN-AC-410a.3

Fig. 6.2 SASB—Sustainability Disclosure Topics and Accounting Metrics: some examples (*Source* SASB—Sustainability Disclosure Topics and Accounting Metrics)

As of August 2022, the International Sustainability Standards Board (ISSB) of the IFRS Foundation assumed responsibility for the SASB Standards. The ISSB has committed to maintaining, enhancing, and evolving the SASB Standards and encourages preparers and investors to continue to use the SASB Standards. The ISSB has confirmed that industry-specific disclosures are required and, in the absence of specific IFRS Sustainability Disclosure Standards, companies must consider the SASB Standards to identify sustainability-related risks, opportunities, and related information to disclose.

SBTi—Science-Based Target Initiative

Most global greenhouse gas emissions are generated directly or indirectly by the private sector, so companies play a significant role in decarbonization. In this regard, the Science-Based Targets Initiative (SBTi) has created Science-Based Targets, which are emission reduction targets consistent with the guidelines provided by the Intergovernmental Panel on Climate Change (IPCC), the United Nations' intergovernmental group on climate change. The SBTi initiative involves five key steps:

1. Commit: Produce a corporate letter of intent to establish a science-based target.
2. Develop: Work on the emission reduction target in line with SBTi criteria (Scope 1, 2, and 3).
3. Submit: Submit the target to SBTi for validation.
4. Communicate: Announce the target to inform stakeholders.
5. Disclose: Produce an annual emissions report and track progress.

This initiative represents a best practice for the company, increasing investor confidence and demonstrating a tangible commitment to sustainability in the eyes of increasingly aware stakeholders.

The goal is the progressive reduction of climate-altering emissions. Reduction targets must cover emissions associated with the company's activities (Scope 1 and Scope 2) and those in the value chain (Scope 3). In October 2021, during COP26 in Glasgow, the initiative revised its previous criteria, introducing the so-called "Net-Zero Standard": long-term targets consistent and in line with global net-zero emissions to be integrated with short-term targets. These long-term targets must be set

no later than 2050 (2040 for the energy sector), in line with the 1.5 °C target.

The initiative is aimed at companies of all sizes from all sectors, recognizing sector-specific characteristics. For this reason, specific pathways have been developed for each sector. Special attention is given to the financial sector and high-emission sectors.

Starting in July 2022, SBTi requires a company's emission reduction targets to align with the climate agreement reached at COP 21, which is the goal of limiting the global average temperature increase to + 1.5 °C by the end of the twenty-first century. These targets must span a minimum of 5 to a maximum of 10 years from the submission date to SBTi, and the reductions must be consistent with the guidelines provided by the IPCC and other relevant authorities for different sectors.

NZBA – Net-Zero Banking Association

Within the projects involving banks in ESG initiatives, the NZBA (Net-Zero Banking Alliance) is the initiative promoted by the United Nations and accredited by the Race to Zero to accelerate the sustainable transition of the international banking sector. The alliance aims to:

- direct portfolio GHG emissions toward a Net-Zero pathway by 2050
- strengthen, accelerate, and support the implementation of decarbonization strategies, outlining a framework of international operational guidelines
- focus on sectors with the highest impact (most GHG-intensive).

The NZBA's vision for change is structured into two main components:

1. a leadership platform for defining a common standard for interpreting “alignment with a 1.5 °C trajectory” and action to engage new institutions in the Alliance
2. a structured forum to support the transition with concrete examples of “how to” for implementation, the creation of methodologies, and leading practices in areas such as data, identification of gaps, and strategies to overcome them.

The ultimate goal is compliance with the Paris Climate Agreement. Therefore, participants in the Alliance commit to investment and financing activities with a path toward Net-Zero by 2050 and annual reporting on absolute emissions and emission intensity. The sectoral focus of banks' investment and financing includes the agriculture, aluminum, cement, coal, real estate, iron and steel, oil and gas, electric power, and transportation sectors. The reduction of environmental impact is set within 18 months of joining the Alliance, with intermediate steps (subject to a five-year review) starting in 2030. This is achieved by combining short-term strategies with robust science-based guidelines. Banks are required to set Net-Zero targets for 2030 and 2050, aligned with the no/low-overshoot 1.5 °C transition pathway, based on credible science-based scenarios. The targets must be defined considering absolute emissions and/or specific emission intensity by sector. The targets should include Scope 1, Scope 2, and significant Scope 3 emissions from clients where data allows, with increasing coverage in each revision.

The initiative is open to all banks domiciled in jurisdictions recognized by the United Nations, and participation in UNEP FI is not strictly necessary. It involves banks that adhere to the UN Principles for Responsible Banking and the Collective Commitment to Climate Action. A prerequisite for joining is the Commitment Statement signed by the CEO.

6.2.2 *EU Initiatives*

NFRD—Non-Financial Reporting

Directive—And CSRD—Corporate Sustainability Reporting Directive

Directive 2014/95/EU, known as the NFRD (Non-Financial Reporting Directive), is the first regulatory provision that, in accordance with OECD guidelines, introduces the obligation of non-financial reporting within the annual report. It is based on the assessment of the risk of future adverse impacts on the company and its stakeholders.

The companies falling within the scope of the NFRD are large enterprises that are public interest entities, banks, and insurance companies. Starting from 2018, they must consider ESG issues in their non-financial statements. The four main thematic areas concern environmental impacts, social issues, respect for human rights, corruption, and money laundering.

The disclosure required from companies in these four areas includes the business model adopted, the policies in place, the results of these policies, risk management profiles, and relevant KPIs for the type of business. The aim is to provide better information to investors, prevent accountability deficits, and inform citizens about the corporate impact on society and the environment, thus encouraging a more responsible approach to business. The NFRD does not impose an obligation to conform to a particular reporting standard or provide a detailed list of disclosure requirements in the form. Instead, it requires information that allows an understanding of the company's performance, results, financial position, and the impact of its activities.

On 5 January 2023, the Corporate Sustainability Reporting Directive (CSRD) entered into force. The CSRD Directive (EU 2022/2464) significantly extends the application of sustainability reporting to all large European companies, both listed and unlisted, including banks and insurance companies, with the only exception being micro-listed companies. Moreover, groups will be required to produce a consolidated sustainability report, and the possible extension of sustainability reporting along the supply chains will also be evaluated. The new sustainability reporting rules will apply voluntarily to unlisted SMEs. In contrast, differentiated and simplified European reporting standards for listed SMEs will be issued, which will, however, be applicable three years later than for other companies. Sustainability information will be both quantitative and qualitative, and it must be retrospective and forward-looking, focusing on assessing the level of exposure to future adverse impacts, and it must be included in the Management Report.

EFRAG (European Financial Reporting Advisory Group), an advisory body of the European Commission, is tasked with issuing differentiated sustainability reporting standards for large enterprises and SMEs.

The CSRD Directive also extends the obligation of "limited assurance" to all sustainability reports prepared according to its rules, with the perspective of achieving "reasonable assurance" within a short time frame.¹ In the CSRD Directive, the principle of "double materiality" is reaffirmed, which means that for ESG risk information to be material (i.e.,

¹ The Limited Assurance Certification is a process that leads to a negative conclusion: the professional conducting it performs more limited checks and states that they have not identified significant inaccuracies in the documents under review. The Reasonable Assurance Certification, on the other hand, is a process that leads to a positive conclusion.

significant) and therefore included in the sustainability report, it must be relevant to the company or the socio-environmental context of reference.

The CSRD introduces a modification of Article 26bis in EU Directive 2006/43, “Principles of Information on Sustainability Compliance”, stating that “Member States shall apply principles, procedures or national requirements regarding certification until the Commission has adopted a certification principle concerning the same matter”. Furthermore, “Member States shall communicate the certification procedures or obligations to the Commission at least three months before they enter into force”. Therefore, auditors, audit firms, and accredited bodies must certify the sustainability report based on a standard adopted by the Member State.

EU Taxonomy—EU Regulation 2020/852

Organizations subject to the NFRD and, subsequently, to the CSRD are required to disclose information regarding the alignment with the taxonomy of eco-compatible economic activities introduced by EU Regulation 2020/852.

The Taxonomy represents a classification of activities that can be considered sustainable according to alignment with the environmental objectives of the European Union. The achievement of the Sustainable Development Goals in the Union requires the channeling of capital flows toward sustainable investments, and for this reason, it has become necessary to create a harmonized definition of sustainable investment to limit gaps or information gaps for investors.

The legislation on the Taxonomy for Sustainable Finance has been in force since 13 July 2020, following its publication in the European Official Journal on June 22. The expected timeline involves the application of these standards for the first time to reports to be published in 2024, referring to the financial year 2023. The requirements for listed SMEs will apply to financial years starting on 1 January 2026. Starting from 1 January 2023, companies obliged to disclose non-financial information under the CSRD must report their alignment status.

The Taxonomy aims to achieve 6 objectives:

In this case, the professional conducting it expresses a judgment based on the evaluation of the subject of the review against predefined criteria.

1. Climate change mitigation;
2. Adaptation to climate change;
3. Sustainable use and protection of water and marine resources;
4. Transition to a circular economy;
5. Prevention and reduction of pollution;
6. Protection and restoration of biodiversity and ecosystems.

Article 3 states that to establish the degree of eco-sustainability of an investment, it is necessary to assess the sustainability of economic activity by considering its contribution to the objectives listed above or the possible damage to them following certain technical screening criteria. The criteria are:

1. contribute substantially positively to at least one of the six environmental objectives;
2. do not produce negative impacts on any other objective (Do Not Significant Harm);
3. be carried out in compliance with minimum social guarantees (e.g., those provided for in OECD and UN guidelines).

The taxonomy aims to establish an internal market that works for sustainable European development based on balanced economic growth and a high level of environmental protection. In the long term, the aim is to operate sustainably, transitioning to a safe, climate neutral, climate-resilient, and more resource-efficient economy to ensure competitiveness.

What information obligations does the Taxonomy introduce? Non-financial corporations must disclose information about:

- the percentage of revenue generated from products or services associated with economic activities aligned with the taxonomy;
- the percentage of capital expenditure (Capex) and *iii*) operating expenses (Opex) related to assets or processes associated with economic activities aligned with the taxonomy.

Financial companies are required to disclose Key Performance Indicators (KPIs) that express the percentage alignment with the taxonomy of assets under management. In this case, the Key Performance Indicator (KPI) is represented as a ratio between investments and financial activities

aligned with the taxonomy (in the numerator) and the total investments and financial activities (in the denominator). The application of these requirements will be phased in between 2022 and 2024. The Regulation also requires (Articles 5 and 6 of the Taxonomy Regulation) to disclose the percentage of alignment with the taxonomy of financial products that aim to be environmentally sustainable investments (so-called Products under Article 8 and Article 9 of the SFDR).

6.3 REPORTING TO MANAGEMENT BODIES

Strategic supervisory and control bodies must have sound information to manage climate and environmental risks in the broader context of the ESG strategy.

As seen in the previous paragraph, expectation no. 13 of the 2020 ECB's "*Guide on climate-related and environmental risks*" is explicitly dedicated to information and disclosure, focusing on two macro-areas:

- policies and procedures adopted for internal and external disclosure regarding the relevance and management of climate and environmental risks, as well as the frequency (greater for reporting to top management bodies compared to public disclosure) and methods of communication. Special attention should be given to data reliability, the assessment of metrics used, and the definition of pursued objectives, especially in relation to aspects that are chosen to be made public.
- content of the information on climate and environmental risks. This area is more technical and concerns the measurement of assets owned and financed that pose a transition risk (e.g., financed greenhouse gas emissions) and/or physical risk. The governing bodies must assess the degree of detail, which is expected to increase over time, and the methods of presentation of the disclosure, current and prospective: aggregate disclosure or by portfolios of loans, securities, and possibly other activities. On the proposal of the structures involved, the same governing bodies must approve the KPIs and KRIs for which the authorities expect there to be external disclosure, with particular attention to the publicity of the metrics used.

Most significant banks (and even less significant banks) are embarking on a process of adaptation to the governance of climate and environmental risks. The flow of information to the management bodies must inevitably be enriched by updating and integrating internal reporting through the definition of a dedicated climate and environmental-related information structure that, on the one hand, allows for informed decision-making and, on the other hand, highlights the bank's progress and level of maturity in this field.

Since the articulation of the information-sharing methods is closely related to the specific governance structure of climate and environmental risks that each intermediary is adopting, the information flows vary from bank to bank. The board of directors is responsible for sharing and approving the most suitable reporting system with the dedicated structure and advisory committees responsible for these issues.

Banks are organizing themselves to create transversal management committees that involve, in addition to the CEO, business structures (Credit, Finance, Commercial, etc.) and Control (primarily the Risk Function) to integrate ESG drivers into credit, investment, liquidity/funding strategies, etc. Different names are used (attributable to the Sustainability Management Committee, ESG Committee, or the Sustainability Steering Committee or similar). Similarly, within the Board Committees, the choices made, which are not definitive given the continuous evolutions, mainly involve the presence of the Risk and Sustainability Committee or, alternatively, the presence of two Committees: the Risk Committee and the Sustainability Committee.

The definition of information flows for top management bodies and Board Committees is the result, especially in this initial phase, of an intense and constructive dialectic, mediated by the contribution of the Board Committees, between the CEO and the managerial structure on the one hand and top management bodies on the other. Importance must be given, as also required by supervision, to the minimum content (with a gradual implementation plan) and frequency of information, seeking solutions that are most consistent with the actual degree and intensity of exposure to these risks, depending on the specific characteristics of the bank.

Although there is no consolidated model—given the breadth and variety of potential climate and environmental risks, the evolving experiences in the methodological field, and the relevant problems related to the availability and quality of information—reporting is moving toward

the inclusion of KPI and KRI indicators through which to monitor, based on “entity-specific” climate risk-related metrics, the achievement of objectives and compliance with exposure limits to specific risks, and to implement escalation mechanisms if necessary. The frequency of collection and granularity of data (e.g., sector, portfolio, or counterparty, as well as geographical area) may vary depending on each indicator. The “bank-specific” dimension of this information is well underlined by a recent paper by GARP and UNEP-FI (2022), which also provides a synoptic climate dashboard of the most relevant KPIs/KRIs (see Table 6.1):

In presentations to the Board of Directors, it is important to include information showing trends over time and progress against set objectives, including contextualizing and testing its robustness and benchmarking data. Furthermore, given the limits for the assessment of these risks of analyses based on historical data, reporting directed to the Board includes, or must include, prospective assessments (sensitivity analysis, scenario analysis, and stress test) potentially able to more adequately intercept the elements of dynamism of the external environment and modification of the perimeters and sources of climatic and environmental risk. The scenario analysis allows a range of time horizons to be used: shorter times, such as those typically used so far for the bank’s business planning, although characterized by a lower level of uncertainty, are insufficient to fully grasp the manifestation of the impacts of climate-related risks. For this reason, longer timeframes, leading to higher levels of uncertainty, need to be introduced to assess the resilience of existing strategies and business models to structural changes in the economy, financial system, or risk distribution.

Alongside the revision of analytical tools, especially in cases where adequate quantitative metrics are unavailable, the reporting incorporates qualitative information from internal sources, acquired through active engagement with counterparties via questionnaires, along with external data sources such as market data at the geographical, sectoral, or portfolio level, and ESG ratings/scorings provided by information providers. Indeed, there is a growing demand from regulatory authorities, governance bodies, and even the management structure for information capable of providing forward-looking and aggregable data by sector, geographical location, asset class, and counterparties’ cluster.

Particular attention must also be paid by the board of directors to the frequency of information flows since timeliness is an important factor concerning climate and environmental risks, both under normal operating

Table 6.1 Dashboard of indicators for the Board on climate risk

	<i>Measure category</i>	<i>Examples of subjects to be covered</i>
Balance sheet management	Climate risk management	<ul style="list-style-type: none"> • Exposures to high carbon-emitting sectors • Sensitivity of sectors to physical and transition risk • Impact of physical and transition risk on portfolio • Portfolio concentration to transition and physical risks
	Portfolio alignment	<ul style="list-style-type: none"> • Degree of portfolio alignment or implied temperature rise of portfolio • Financed emissions • Amount of transition finance provided • Extent of engagement with counterparties
	Regulatory	<ul style="list-style-type: none"> • Progress on meeting regulatory expectations
	Disclosures	<ul style="list-style-type: none"> • Alignment with jurisdictional disclosure requirements or TCFD recommendations • Taxonomy-aligned loans
	Audit findings	<ul style="list-style-type: none"> • Number of outstanding high-risk climate findings
Own operations	Operations	<ul style="list-style-type: none"> • GHG emissions of own business operations • Business continuity exposure due to physical risk events

Source GARP/UNEP-FI (2022) “Steering the Ship: Creating Board-Level Climate Dashboards for Banks”

conditions and in times of stress. This is because one cannot exclude the sudden and accelerated transition to a low-carbon economy for certain sectors or the impacts of localized physical events on the operations of specific clusters or individual counterparties.

Regarding informational content, reporting to governance bodies must be revised to select the most relevant and closely correlated climate-related information based on the bank's specific characteristics, processes, and objectives. Additionally, identifying quantitative and qualitative indicators related to climate and environmental factors and risks to be included in internal reporting should align with the regulatory framework on disclosure, ensuring consistency between the entire ESG risk management and monitoring process and market disclosure.

In details:

- in the decision-making process of strategic and financial planning, it is relevant for the Board to have metrics that measure not only the impacts of climate-related risks on the bank's business model but also the impacts of the business model on climate and the environment. Identifying the set of KPIs (Key Performance Indicators) to measure these impacts should start with an analysis of the strategic priorities defined in terms of environmental impacts and outlined in the materiality matrix of the Non-Financial Declaration. This allows for aligning the declared climate and environmental objectives with specific transformation projects/initiatives, typically activated during forecasting processes such as Capital Budget and Forecasting, to guide the bank in achieving what is set out in the Business Plan. In the periodic monitoring reporting directed to the Board, the actual value of each individual KPI should be associated with the target value defined in the budgeting process. This allows for the evaluation and quantification of the impact on the specific indicator of the transformative initiatives identified by the bank's organizational structures that have the relevant steering mechanisms;
- in the credit decision-making process, the Board needs to have additional information and metrics, alongside the traditional ones, regarding potential impacts on estimates of default probability and related loss in case of default of exposures to economic sectors, geographical areas, and individual borrowers based on their exposure to physical and transition risks. For the most significant exposures

associated with higher physical and transition risks, presenting information to the board that allows for an in-depth analysis of the counterparty's business model (business case) becomes relevant. This analysis should consider current and/or prospective impacts of acute or chronic physical risk and/or the adoption of climate and environmental policies and regulations, which are particularly relevant, for example, in the case of project finance and large corporates. Within the monitoring of the sectoral and geographical concentration level of the credit portfolio and the assessment of collateral supporting the loans, the Board also needs access to a set of early warning information/indicators related to the vulnerability to physical risk of borrowers and collateral assets. This information can be obtained, for example, using heatmaps, maps depicting areas with excessive exploitation of natural resources (such as water resources), data on climate-related extreme weather events combined with the geolocation of production sites, and information on the distribution of energy efficiency certificates for residential and non-residential properties used as collateral for exposures. As much as possible, the information/indicators should be structured at various levels of depth and granularity: sector, portfolio, sub-portfolio, and counterparties with common characteristics;

- in investment decision-making processes, in addition to the information already highlighted above regarding counterparties' vulnerability to physical risk, it is relevant for the Board to have information about possible greenwashing practices and analysis of potential polluting activities by companies target of investment, as rapid changes in market preferences and confidence could occur, resulting in the repricing of securities or, more broadly, financial instruments linked to sectors perceived as environmentally unsustainable. Given the specific characteristics of market risk, an analysis of a sudden shock scenario could be a useful tool for better understanding and assessing the financial risks related to climate for the bank's trading and investment portfolio;
- in the decision-making process related to liquidity management, it is relevant for the Board to conduct scenario analyses of potential net cash outflows in the event of unfavorable climate or environmental events (e.g., increased use of credit lines, accelerated withdrawals of deposits for restructuring needs) or the sudden reduction in the value of certain financial instruments and assets held by

the bank, in order to incorporate their impacts into the calibration of liquidity reserves. These evaluations should be carried out with a forward-looking perspective, considering both normal operating conditions and stress scenarios, and should consider severe but plausible scenarios that could occur in combination;

- In the risk management process, it is necessary to permanently incorporate the results of the climate stress testing process, improving it over time as more granular and reliable data becomes available. In the climate stress testing process, in addition to the immediate advantage of identifying and quantifying these risks, reporting to decision-making bodies, with reference to the analysis and correct interpretation of results, offers a series of potential benefits that financial institutions and governance bodies responsible for overseeing and managing climate risk can fully leverage in many activities, as summarized in Table 6.2.

It is also worth noting that while regulatory scenarios are a good starting point, each bank should establish its own set of climate scenarios, increasing the level of detail in sectors and geographic areas most relevant to its portfolio and ensuring a significant variety of pathways for

Table 6.2 Wide-ranging impact of climate stress testing on bank governance

A. Climate risk management and risk appetite	<ol style="list-style-type: none"> 1. Better understanding of vulnerabilities (opportunities) to be incorporated into the Risk-Appetite Framework (RAF)) 2. Development of mitigation strategies and deeper stress analysis
B. Business strategy, customers, investments	<ol style="list-style-type: none"> 3. Evaluation of possible changes in the overall strategy 4. Assessment of possible changes in customer strategy, especially in vulnerable sectors 5. Evaluation of investments in data management and technological infrastructures 6. Development of deep dive analytics and advanced reporting

Source AIFIRM (2022)

key factors to explore. Integrating climate stress tests into regular risk management practices is essential.

Furthermore, the “Reverse Stress Test” approach could be a valuable tool for identifying extreme events (tail events) that could generate high-impact/disruptive adverse effects without any relevant historical event. It involves identifying scenarios that would undermine the validity of the business model, causing severe damage to the bank. These extreme scenarios can help identify vulnerabilities that may have been overlooked by other stress test approaches and are well-suited to the current climate context characterized by an increasing frequency and acute severity of adverse climate events.

In the GARP/UNEP-FI publication, it is highlighted that while climate awareness issues have been present in the discussions of corporate bodies in virtually all banks since 2021, the topics more specifically related to climate stress testing have only been discussed by around one-third of financial institutions, which explicitly include them, for example, in their ICAAP/ILAAP/ORSA processes.

In the risk management process, it is necessary to identify and understand the bank’s vulnerabilities to climate and environmental risks and then define risk appetite, objectives, and limits. Once climate vulnerabilities, risk factors, and sensitivities are identified, these data are expected to guide the choice of which indicators to include in the Risk-Appetite Framework, what controls to establish, which metrics to use, and what constraints or activation levels (triggers) to apply. This should necessarily include materiality for other risk classes, from financial to non-financial risks, with a primary focus on reputational and legal risks, especially in areas where the number of climate-related lawsuits is increasing or where there is potential for greenwashing.

As a result, it is essential for governing bodies to integrate information about climate-related objectives for selected sectors, along with their associated operational limits, into existing reporting. Once a picture of the dimensions of climate risk exposure begins to emerge from risk assessments, climate scenarios, and stress tests, governing bodies will also seek to identify opportunities alongside risks. This allows them to develop risk management and mitigation strategies comprehensively.

Once a framework for the dimensions of climate risk exposure emerges from risk assessments, climate scenarios, and stress tests, governing bodies will also strive to identify opportunities in parallel with risks. This allows them to develop strategies for risk management and mitigation

comprehensively. The Risk-Appetite Framework, rather than being a mere aggregation of risks, represents an institution's vision of how much risk it can or should accept to enhance current business opportunities in a controlled manner. This can take many forms, from a planned reduction of activities that contribute negatively to climate risk in a particular sector to active hedging of climate-induced counterparty risk to developing "green" financing products.

6.4 COMMUNICATION WITH THE MARKET AND INVESTORS

Article 449a of Regulation (EU) No. 575/2013, by which the EU adopted the rules introduced by Basel III, requires large institutions with securities traded on a regulated market of any Member State to disclose prudential information on environmental, social, and governance risks, including physical risks and transition risks. Article 434a of that Regulation mandates EBA to develop implementing technical standards (ITS), creating homogeneous standards for the publication of disclosure, to provide sufficiently complete and comparable information for the assessment of the risk profile of institutions.

The Pillar 3 framework on prudential disclosure of ESG risks is a support tool for preparing public disclosure of meaningful and comparable information. It supports institutions in monitoring ESG risks, particularly climate change, and how these can effectively exacerbate other previously considered risks. Pillar 3 will enable investors and stakeholders to compare institutions' sustainability performance and financial activities. Additionally, it will help entities provide transparency about the actions taken to mitigate these risks, including information on how they support their clients and counterparts in adapting to climate change and transitioning to a more sustainable economy. However, the EBA's third pillar package on ESG issues goes a step further to address the shortcomings of NFRD, particularly the need for more consistent and comparable information. In this regard, it establishes mandatory, consistent, and standardized disclosure criteria, providing ten templates and detailed tables to facilitate the preparation of disclosure reports.

The types of information required by Pillar 3 can be condensed into 4 categories:

1. Qualitative information on environmental, social, and governance risk. The ITS provides three tables (one for environmental hazards, one for social risks, and one for governance risks) that specify the information institutions must provide, focusing on climate change and the broader scope of environmental, social, and governance risks.
2. Quantitative information on climate-related transition risk. The EBA requires institutions to disclose information about exposures to sectors contributing significantly to climate change, with a differentiation between exposures to fossil fuel or carbon-related companies and exposures aligned with the taxonomy. This information is combined with data on financed GHGs (Greenhouse Gases) and the probability of specific environmental scenarios occurring. Information on the energy efficiency of the real estate portfolio of the institution is also required. (Template 1: Banking portfolio, credit quality of exposures by sector, Scope 3 emissions, capital buffer; Template 2: Loans secured by real estate; Template 3: Alignment metrics related to Scope 3 emissions; Template 4: Banking exposures to high-carbon intensity companies).
3. Quantitative information on physical climate-related risk: Institutions must identify exposures to sectors and geographic areas that may be negatively impacted by events related to physical climate change risks, both acute and chronic (Template 5: Exposures subject to physical risk).
4. Quantitative information and Key Performance Indicators (KPIs) on climate change mitigation measures: Institutions are encouraged to disclose quantitative information about the actions they are taking to mitigate climate change risks, including information on investments aligned with the taxonomy: Green Asset Ratio (GAR) for companies publishing the NFRD and the Banking Book Taxonomy Alignment Ratio (BTAR) for others) and other mitigation actions. In particular, the GAR indicates how much of an institution's investment portfolio is aligned with the EU Taxonomy. Credit institutions should determine on a case-by-case basis the level of alignment of exposures with the taxonomy, based on the alignment with the screening criteria of the financed activity, through ad hoc information provided by the counterparty. The scope of companies to be considered for the GAR calculation resides within the NFRD scope, so all companies are subject to disclosure requirements. (Template 6–7–8: GAR;

Template 9: BTAR; Template 10: Other climate change mitigation actions).

From a qualitative information perspective, the ITS includes three tables specifying the information institutions must provide, focusing on climate change and ESG risks. This disclosure aligns with the EBA report on “*Management and Supervision of ESG Risks for Credit Institutions and Investment Firms*” (EBA/REP/2021/18).

Significant impacts for the banking sector can be assumed, given the need to calculate the GAR and the BTAR. Indeed, these indicators involve using a significant amount of relevant information for measuring the bank’s positioning about specific parameters, but above all, for using them to reposition the loan portfolio to become increasingly aligned with the EU Taxonomy. Both indicators are based on the EU Taxonomy and serve as a measure to assess whether banks are financing activities considered “sustainable”. They allow for the identification of the bank’s assets and exposure to be considered sustainable and thus contribute to the goals of climate change control.

The GAR reflects the bank’s positioning/disclosure regarding Article 8 of the Taxonomy. It measures the share of assets in the bank’s portfolio (including loans and advances, debt securities, and equity instruments) aligned with the EU Taxonomy regarding environmental sustainability. Meanwhile, the BTAR provides additional information regarding the alignment of exposures to non-financial companies not subject to the disclosure requirements of the NFRD.

The information from these indicators must be interpreted with a forward-looking perspective. It should be viewed as strategic, dynamic, and not static, as it outlines the path the bank intends to take for achieving ESG and climate risk control objectives. In particular, the information for determining the BTAR should be acquired starting from the relationship between the bank and counterparties, confirming the importance of a “concerted” disclosure. These are ambitious but necessary objectives if banks want to become active participants in controlling climate change and its effects.

The information obtained and codified in this way becomes the means to identify environmental risks appropriately and also to identify activities that can reduce them. Therefore, all information related to high fossil fuel intensity sectors, GHG emissions, and net-zero metrics becomes essential for evaluating and measuring activities exposed to physical

risks. Conversely, banks are required to communicate their current and prospective measures to mitigate ESG and climate risks similarly.

Therefore, the communication issue is relevant for banks and all financial intermediaries in disseminating ESG initiatives with the aim of profoundly changing corporate behavior regarding sustainability and risk management resulting from a lack of adaptation. Indeed, one of the assets of this change is associated with the opportunities for banks to gain a significant market position and reputation regarding environmental awareness, social initiatives, and good governance practices.

6.5 CONCLUSIONS

From what has been illustrated, it is evident that disclosure related to ESG factors is essential for an effective market discipline that allows all stakeholders to assess the ability and adequacy of banks to address environmental risks and define a sustainable financial strategy (NGFS, 2022). Therefore, of relevance is the attention stakeholders pay to banks' exposure to physical and transition risks arising from climate change and the strategy defined to support the transition to a zero-impact economy.

Investors are becoming increasingly sensitive to ESG issues, and it is, therefore, imperative for operators to commit more to strengthening compliance with regulations. Indeed, ESG factors and the study of related risks can have a positive impact on society, contributing to sustainable development and promoting positive financial results in the long term.

This means that to be compliant with regulations, but especially with the market, banks will need to concretely adopt appropriate methodologies to integrate the analysis of ESG parameters into their business processes (financing, investment, product creation, distribution, advisory) and risk management, communicating them to clients and the market according to standardized rules, providing indications regarding ESG performance and achievements. This implies that applying ESG disclosure rules can affect business strategies and internal organization (risk management, data governance, IT).

In addition, it should be noted that the completion of the implementation of EU regulations and progress in the implementation of the Sustainable Finance Action Plan will significantly impact all market operators, not limited to those subject to regulatory disclosure and communication to the market. It will instead involve considering a real revolution in the rules governing the financial market, requiring each

operator to analyze their ESG positioning based on the characteristics of the products/services offered and to implement a strategy to integrate ESG factors into business and control processes.

Managing the various ongoing changes related to ESG disclosure and information requires strengthening governance and corporate culture with respect to ESG issues. It is not to be excluded that a bank or financial intermediary could be penalized by the market, for example, with additional costs in resource acquisition (funding and capital), based on the perception of inadequate control of climate and environmental risks. To establish a virtuous circle of communication beyond mere regulatory compliance, it is necessary to appropriately review corporate governance and operations and improve the data underlying the information.

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