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Climate-related financial risks as a threat to financial stability: what role for central banking and supervisors to build a climate and environmental resilient financial system

Dissertation to obtain a Master's Degree in Law, in the speciality of Law and Financial Markets

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Dedication and acknowledgments

This work is dedicated to my family and friends to all of whom I am very grateful for their unconditional support throughout my master's degree journey and for believing in my potential

I also wish to express my gratitude to Professor Lúcio for his guidance and supervision throughout the course of this work. His commitment and insights have been invaluable in helping me complete this project.

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I declare on my honour that the dissertation I am submitting is original and that all citations are correctly identified. I am aware that the use of non-identified elements from others is a serious ethical and disciplinary fault.

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Acronyms and abbreviations

BCBS – Banking Committee on Banking Supervision

BIS – Bank of International Settlements

CDP – Carbon Disclosure Project

CRD – Capital Requirements Directive

CRR – Capital Requirements Regulation

CSRD – Corporate Sustainability Reporting Directive

EBA – European Banking Authority

ECB – European Central Bank

ESG – Environmental, Social and Governance

ESRB – European Systemic Risk Board

EU – European Union

FSB – Financial Stability Board

FSB – Financial Stability Board

GAR – Green Asset Ratio

GHG – Green House Gas

ICAAP – Internal Capital Adequacy Assessment Process

IMF – International Monetary Fund

IPCC – Intergovernmental Panel on Climate Change

ITS – draft Regulatory Implementing Standards

LGD – loss-given-default

NFRD – Non-Financial Reporting Directive

NSAs – National Supervisory Authorities

OECD – Organisation for Economic Cooperation and Development

PD – Probability of default

RTS – draft Regulatory Technical Standards

SDGs – Sustainable Development Goals

SFAP – Sustainable Finance Action Plan

SFDR – Sustainable Finance Disclosure Regulation

SREP – Supervisory Review and Evaluation Process

SSM – Single Supervisory Mechanism

TCFD-FSB – Task Force on Climate-Related Disclosures of the Financial Stability Board

TEU – Treaty on the European Union

TFEU – Treaty of Functioning of the European Union

UNGPs – United Nations Guiding Principles on Business and Human Rights

Statement of characters

I hereby declare that the body of the dissertation, including spaces and notes, occupies a total of 199 933 characters.

Resumo

O conceito de 'Finanças Verdes' surgiu como uma resposta à necessidade de compatibilizar a economia global com os esforços para combater as alterações climáticas e assim, prosseguir um desenvolvimento ambientalmente sustentável. Para o sistema financeiro, esta abordagem implica tratar dos riscos financeiros relacionados com o clima, que resultam dos impactos adversos das alterações climáticas, assim como das externalidades negativas decorrentes da transição para uma economia neutra na emissão de carbono. No entanto, os bancos centrais e os quadros regulamentares existentes negligenciaram até então estas fontes de risco, resultando numa ausência de informação financeira e não-financeira relativa à exposição dos bancos a riscos climáticos e numa potencial falta de credibilidade em produtos financeiros verdes e sustentáveis.

Esta pesquisa visa definir, caracterizar e analisar os riscos financeiros relacionados com o clima no sector bancário, incluindo os desafios de adaptação das carteiras de empréstimos aos fatores de transmissão micro e macroeconómicos de riscos físicos e transitórios. Em particular, centra-se no papel da regulação e supervisão financeira, bem como dos bancos centrais no panorama internacional e, em particular, da União Europeia, a fim de assegurar um sistema financeiro sólido e estável face aos crescentes impactos adversos das alterações climáticas, nomeadamente na transformação dos fundamentos económicos e na mudança das preferências dos consumidores em direção a uma economia sustentável. Esse papel poderá implicar um alargamento dos mandatos dos supervisores financeiros e dos bancos centrais a fim de considerarem fatores de sustentabilidade nas suas tomadas de decisão. Seguindo uma abordagem tradicional baseada no risco, analisam-se os principais instrumentos micro e macroprudenciais à luz dos três pilares dos Acordos de Basileia, bem como possíveis alterações à política monetária e aos seus instrumentos financeiros tradicionais.

Palavras-chave: Risco climático; Sistema bancário; Política financeira climática; Regulação financeira; Supervisão financeira; Regras prudenciais; Regulação macroprudencial; Requisitos de capital diferenciados; Requisitos de divulgação de informação climática; Dever de identificação e diligência climática; Banco central; Política monetária.

Abstract

The concept of "Green Finance" emerged as a response to the need of aligning the global economy with the efforts to fight climate change and thus, pursuing an environmentally sustainable development. For the financial system, this includes addressing climate-related financial risks, which arise from the adverse impacts of climate change, and the negative externalities of the transition to a carbon-neutral economy. However, central banks and the existing regulatory frameworks have traditionally neglected these sources of risk, resulting in a lack of financial and non-financial information on banks' exposure to climate risks and a lack of trust in green and sustainable financial products.

This research aims to define, characterise and analyse climate-related financial risks in the banking sector, including the challenges in adapting lending portfolios to physical and transitional micro and macroeconomic transmission channels. In particular, it focuses on the role of financial regulation and supervision, as well as central banks, in the international landscape (especially in the context of the European Union) to ensure a sound and stable financial system in light of the rising negative effects of climate change, the changing economic fundamentals, and shifting consumer preferences towards a sustainable economy. Furthermore, supervisors and central banks may be persuaded to prioritise sustainability factors in their decision-making processes, which may entail an extension of their mandates. Using a traditional risk-based approach, key micro and macroprudential instruments are analysed in the light of the three pillars of the Basel Accords, as well as possible changes to monetary policy and its traditional financial instruments.

Keywords: Climate risk; Banking system; Climate financial policy; Financial Regulation; Financial Supervision; Microprudential regulation; Macroprudential regulation; Differentiated Capital Requirements; climate disclosure requirements; climate due diligence; Central Banking; Monetary Policy.

Introduction

During the last century, the scientific community has reinforced warnings about the effects of the human-caused environmental and climate change to the Earth – for the first time in ten thousand years the planet's stable domain (known as the Holocene) has changed, mostly due to human-caused Carbon Dioxide (CO2) and other Green House Gas (GHG) concentrations on the atmosphere that are causing global warming. The latest Intergovernmental Panel on Climate Change (IPCC) report[1] warns that many of the consequences of global warming are already irreversible, and events such as extreme weather conditions, permafrost thaw, and sea level rise are expected to intensify in the coming years. The report emphasises, in line with the Paris Agreement[2], the urgency of stepping up efforts to cut anthropogenic CO2 and GHG emissions towards a *net zero* in order to limit global warming well below 1.5ºC above pre-industrial levels, to lessen human-caused climate and environmental change, and to improve air quality.

The undeniable role of the global economy in achieving a sustainable development, leads to the concept of 'Green Finance', which is built upon the need to make public and private *"finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development"*[3].

In addition, the increasing adverse impacts of the climate emergency, coupled with the efforts to transition to a carbon-neutral economy and shifts in consumer preference towards more sustainable products, create negative externalities that ultimately threaten the stability and soundness of the financial sector – these draw attention to the existence of climate-related and environmental financial risks. Indeed, market participants have traditionally and persistently ignored climate change and environmental protection in favour of the short-term low-risk returns

[1] **IPCC** - Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.
[2] **UNITED NATIONS (2015)** - FCCC/CP/2015/L.9/REV.1 - Framework Convention on Climate Change: Adoption of the Paris Agreement – [The Paris Agreement].
[3] *Ibid.,* Article 2(1)(c).

offered by the fossil fuel industry and associated sectors, thus resulting in the current significant investment gap in sustainable products.

Against this background, efforts put in place to align the banking system with the net zero targets while addressing climate-related financial risks have revealed several limitations. Particularly, a lack of financial and non-financial information on the CO2 emissions of banks' counterparties, and their own exposure to climate risks, as well as the absence of a labelling and certification scheme to identify green and sustainable financial products upon which investors can rely in their decision-making.

In this regard, financial supervisors and central banks are well placed to support the banking system in overcoming the existing challenges, while supporting the transition to a sustainable (and, notably, green) economy. On the one hand, such role raises questions around an overstretching of their mandates. On the other hand, it is undeniable that the current regulatory landscape has overlooked climate risks, thus requiring significant changes in order to understand, identify, and assess the impact of these sources of risk to the stability of the financial sector. Nonetheless, emerging regulatory and supervisory reforms may be struggling to prioritise the main limitations identified by the banking sector in this context, namely the lack of a comprehensive and robust database and adequate risk management methodologies. These are contributing to a weak macroprudential treatment of climate-related risks, while preventing the financial regulator from obtaining the level of expertise required to adopt a stricter climate policy.

Having in mind the challenges posed by climate change to financial regulation, this research initial goal is to determine the current state of the art in the field by searching how climate change is currently a market failure on the financial system. To this end, starting from the definition and delimitation of climate-related financial risks, this research also aims to show the main transmission channels of these sources of risk to the banking system. These, by reason of their novelty, multidisciplinary nature, and urgency to build a reliable and comprehensive database reveal an innovative subject of interest to the academic and scientific community.

Climate-related risks can be found in each of the key risk drivers of the current risk management frameworks – credit, market, operational and liquidity risks. However, in light of their systemic importance, it is not clear whether they should be addressed independently. In this respect, this paper seeks to analyse the adequacy of existing microprudential and macroprudential regulatory and supervisory tools to identify, measure, prevent and mitigate climate-related financial risks. Additionally, climate change and the net zero transition have strong transmission channels in economic variables that are essential to maintain price stability, thus impacting how centrals banks are incorporating these factors within their primary objectives. Similarly to the global financial crisis, climate change is a global issue that calls for a coordinated and collective strategy from all market participants, rendering the work done by international initiatives of great importance to develop specific prudential solutions. Here, it is of particular relevance the discussion on establishing climate-related mandatory disclosure and differentiated capital requirements, within the existing prudential frameworks.

Overall, focusing on the work of the main standard setter of the banking sector - the Basel Committee on Banking Supervision (BCBS) - and the European Union (EU) – this research intends to highlight the main limitations that financial institutions are facing to address climate-related financial risks, while emphasising the role of the financial regulation, supervisors and central banks to overcome many of the related challenges.

1. Sustainable finance

The current climate and environmental crises create health, food, and energy crises which are inherently correlated with humanitarian, financial and economic crises[4].

The scientific community, building on a framework of nine planetary boundaries[5] beyond which the effects to the earth are irreversible, has reaffirmed the warning that humanity is living beyond its capacities. Indeed, some of these boundaries – respectively, climate change, the loss of biosphere integrity, land-system change, altered biogeochemical cycles like phosphorus and nitrogen runoff – have exceeded the thresholds of a "safe operating space"[6]. More recently, the planetary boundary for novel entities was also found in a zone of exceedance, where plastic pollution holds the main responsibility[7].

Even though each of the nine boundaries contributes to the safe operating state the earth system requires for the humankind to develop, **STEFFEN** et al.[8] suggest a *"two-level hierarchy of boundaries, in which climate change and biosphere integrity should be recognized as core planetary boundaries through which the other boundaries operate".* As a result, efforts worldwide have been directed at reducing the anthropogenic emissions of CO2, which is the main indicator used to define climate change, along with the concentration of other GHG and atmospheric radiative forcing that act as heat-trapping gases, ultimately causing global warming. Although CO2 is not the most harmful gas to the atmosphere, its concentrations do persist for the longest time while, at the same time, its emissions have substantially increased since the industrial revolution, owing

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[4] **IPCC (2022) -** Summary for Policymakers. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, p.9.
[5] These are, respectively, Climate change, Biosphere integrity, Freshwater use, Land-system change, Ocean acidification, Stratospheric ozone depletion, Atmospheric aerosol loading, Biogeochemical flows and novel entities. See **ROCKSTRÖM**, Johan *et al.* - A safe operating space for humanity, p.472.
[6] **STEFFEN**, Will *et al.* - Planetary boundaries: Guiding human development on a changing planet, p.1259855-8.
[7] **PERSSON**, Linn *et al.* - Outside the safe operating space of the planetary boundary for novel entities.
[8] **STEFFEN**, W. *et al* – cit.**Erro! Marcador não definido.**, p. 1259855-8.

mostly to the burn of fossil fuels, deforestation, and intensive livestock and agriculture.

Acknowledging that the time to act on climate change is now, 196 countries signed the Paris Agreement at the COP21 which targets the Sustainable Development Goals (SDGs)[9]. The signatory parties have committed to limit global warming to 1.5ºC compared with pre-industrial levels, especially by significantly reducing GHG emissions. Signatory parties highlighted the role of the economy to achieve this goal and the need to make *"finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development"*[10] – indeed, the goal outlined calls for concerted efforts by all parties to build a long-term strategy, in which the financial sector will play a pivotal role by supporting a massive investment in technological developments, climate migration and adaptation.

The Paris Agreement draws attention for the concept of *Sustainable Finance* which can be broadly defined as *"finance to support sectors or activities that contribute to the achievement of, or the improvement in, at least one of the relevant sustainability dimensions"*[11]. In this vein, the EU Commission adopted in 2018 the Sustainable Finance Action Plan (SFAP)[12], which aims to take action in three categories: reorienting capital flows towards a more sustainable economy; mainstreaming sustainability into risk management; and fostering transparency and long termism[13]. Additionally, in 2019, the EU Commission set out the European Green Deal aiming a *"fair and prosperous society, with a modern,*

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[9] The Sustainable Development Goals (SDGs) were recognised in the UNs' 2030 Agenda for Sustainable Development. The 17 SDGs are committed with the People, the Planet, Peace, Prosperity, and Global Solidarity, aiming at eradicating poverty and hunger, ensuring the respect of all human rights recognised by the UN, but also, promoting the protection of the planet by targeting climate change and the preservation natural species and resources. The Agenda also recognised that a sustainable development is only possible with peace and solidarity between all countries around the globe – see: **UNITED NATIONS (2015)** - A/RES/70/1. Transforming our world: the 2030 Agenda for Sustainable Development Transforming our world: the 2030 Agenda for Sustainable Development.

[10] **The Paris Agreement** - cit.2, Article 2(1)(c).

[11] **MIGLIORELLI**, Marco - What do we mean by sustainable finance? Assessing existing frameworks and policy risks, p.2.

[12] COM(2011) 681 final - Communication From The Commission To The European Parliament, The European Council, The Council, The European Central Bank, The European Economic And Social Committee And The Committee Of The Regions Action Plan: Financing Sustainable Growth. 2018. – [SFAP].

[13] *Ibid.,* p.2.

resource-efficient and competitive economy where there are no net emissions of greenhouse gases in 2050 and where economic growth is decoupled from resource use"[14].

To accomplish the EU's SFAP and Green Deal objectives, the Commission stressed the need for a transition mechanism, which will involve a shift from GHG intensive sectors and regions towards green sources of energy. Specifically, through massive investments in climate-friendly transports, energies, and infrastructures. These will be facilitated through the alignment of the EU budget with climate targets, as well as through incentives to redirect private capital flows towards sustainable goals.

1.1. Challenges for the banking sector

The banking sector has an undeniable role to play in achieving long-term sustainable finance targets. Indeed, economic development does not happen without an efficiently functioning financial system. For this reason, banks have a delicate responsibility to allocate funds in business, activities and sectors that meet the necessities of each society and economy in a given time.

Banks support the wider economy through their various functions, such as aggregating short-term deposits (mainly paid on demand) to provide long-term external funding to businesses and individuals, while offering a payments system that allows for and facilitates economic transactions. **GORTSOS** suggests that as financial intermediaries, banks perform three main transformations: first, banks play a pivotal role in collecting small value funds from a large amount of savers units and channel them collectively into large investments, thus performing *size transformation* functions; secondly, as financial intermediaries, banks stand between savers and borrowers units, thus performing a *credit risk transformation* by assuming the risk of default on the loans they grant; thirdly, banks perform a

[14] COM(2019) 640 final - Communication From The Commission To The European Parliament, The European Council, The Council, The European Economic And Social Committee And The Committee Of The Regions - The European Green Deal, p.2.

maturity transformation function by converting short-term liabilities (deposits) into long-term receivables (loans), which is the main source of liquidity risk[15].

Against this background, banks have been challenged to use their pivotal role in the economy to channel capital flows towards more sustainable, low carbon and ethical activities. In particular, many financial institutions have since made a commitment to align their business with targets such as those set in Paris Agreement, which, in turn calls for structural changes in their business model. In this respect, **MOYNIHAN** refers to the need for banks' new job, new tools and new culture[16], where sustainability is not a simple add-on to the existing business, but rather is a new core banking principle implemented to dedicate banks' business to the green transition and a sustainable economy. **DOMBRET** highlights that *"the baseline requirement for all financial institutions is to ensure that financial risks and opportunities presented by climate change are reflected adequately in their decision making"*[17].

Bank lending, especially in bank-based financial systems are of the most important sources of external finance for corporations, leaving banks in a prominent position to accelerate the transition to a low-carbon economy. Indeed, re-allocating lending portfolios towards Paris-aligned sectors and activities is an opportunity as much as it is a necessity[18]. The consequences stemming from climate change and environmental degradation, as well as the economic adjustments deriving from transition plans will increasingly affect the value and performance of banks' portfolios, requiring banks to incorporate such factors in their risk management strategies.

Consequently, in line with **SCHOENMAKER** and **SCHRAMADE** [19] two main challenges arise for the banking sector. On the one hand, banks are incentivised to reduce carbon emissions in their lending strategies and develop a *values-based approach* where lending is provided according with a sustainable

[15] **GORTSOS**, Christos V. – GORTSOS, Christos V. - European Central Banking Law - The Role of the European Central Bank and National Central Banks under European Law, p.7.
[16] **MOYNIHAN**, Ted - How Banks can help Achieve the Paris Agreement, p.31-33.
[17] **DOMBRET**, Andreas - The Financial Services Sector needs to be an important Driver for the Corporate Decarbonization Trajectory in Europe, p.14.
[18] See in this vein **DE HAAS, Ralph and POPOV, Alexander A.** - Finance and carbon emissions. ECB Working Paper Series No 2318/ September 2019, p.37.
[19] **SCHOENMAKER**, Dirk; **SCHRAMADE**, Willem - Principles of Sustainable Finance.

strategy[20]. On the other hand, banks are required to develop a *risk-based approach* towards climate change and the green transition which also demands reducing carbon emissions and steering away from environmentally harmful projects in their lending portfolios[21].

Overall, the relationship between the banking sector and climate change can be described through a concept of *"double materiality"* referring, on the one hand, to the impact of climate change on financial institutions' operations across its value chain (disrupting the value of its assets) and, on the other hand, to the contribution of financial institutions' investment decisions to climate mitigation and the net zero transition[22].

Building on this concept, **PIETIKÄINEN** categorises the feedback loop between climate change and the banking system within a concept of *"triple materiality"*[23]. On the first level are financial and technical risks mostly affecting the credit and liquidity of the company. The second level of materiality is composed by environmental risks on the company's operations, such as physical damages or hazards emerging from climate change that have a direct impact on the business. The last level relates to the company's position towards climate change, whereby if the company increases or intensifies climate and environmental damage through its operations, it will be destroying economic fundamentals and ultimately destroying itself, whereas if it chooses to be part of the solution and adopt a sustainable business model, it will contribute to and profit from sound and resilient economic fundamentals.

1.2. Shifting lending strategies

Historically, banks have neglected the existence of climate-related factors and sources of risk in their lending activities, which resulted in the current evidence that the banking sector has an overwhelming carbon footprint. Indeed, the Carbon Disclosure Project (CDP) – a non-profit organisation pioneering a global voluntary

[20] *Ibid.,* p.288.ff.
[21] *Ibid.,* p.292.ff.
[22] **EBA/REP/2021/18** - EBA Report On Management And Supervision Of ESG Risks For Credit Institutions And Investment Firms, p.32.
[23] **PIETIKÄINEN**, Sirpa - Green is becoming the new Black, p.125,126.

disclosure system on the environmental impact of companies, also targeting financial institutions – reported that the portfolio emissions of its disclosing financial institutions are 700 times larger than their direct emissions steaming from operational activities[24] and that *"banks' portfolio temperature ratings are higher than the pathway of the European economy as a whole, indicating that their loan distributions are skewed towards companies that are less advanced in their transitions"*[25].

Banks are thus faced with the responsibility to shift their lending portfolios to finance projects that are either sustainable or following decarbonisation programmes. In this respect, the CDP highlights that even though banks (representing 95% of all lending to European corporates) have made a commitment to be Paris-aligned, there still is an investment gap of more than 4 trillion euros between the available Paris-aligned lending and the current market demand for it, given that less than 10% of European companies are effectively in line with the goal of limiting global warming to well-bellow 2ºC[26]. As a result, in hypothetical terms, banks may need to adjust 20-30% of their portfolios and clients to fulfil their commitment to be Paris-aligned[27].

SCHOENMAKER and **SCHRAMADE**[28] argue that banks are in a position to integrate sustainability factors into their core activities, namely through a values-based business approach whereby lending is provided to individuals and companies that deliver value or have a positive impact in Environmental, Social and Governance (ESG) factors – such as promoting economic inclusion, the respect and promotion of human's rights, or environmentally-driven investments in renewable energy, water efficiency, or sustainable agriculture.

A key challenge for banks in this context is to set purpose-led strategies without abruptly cutting their long-lasting relationships with polluting companies, which will also need investment capital to develop transition plans[29]. At the same time,

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[24] **POWER**, Joseph et al. - The Time To Green Finance - CDP Financial Services Disclosure Report 2020, p.34.
[25] **DOMBRET**, A**. –** cit.17, p.15.
[26] **CDP** and **OLIVER WYMAN** - Running Hot - Accelerating Europe's Path To Paris. CDP Europe. Report (March 2021), p.7,8
[27] *Ibid.,* p.24.
[28] **SCHOENMAKER,** D. and **SCHRAMADE**, W. – cit.19, p.288.
[29] In this vein, see **POWER**, J. et al. – cit.24, p.34.

such strategies require structural changes in the traditional short-term risk and financial performance profiles sought by shareholders and investors, which are inconsistent with the necessary long-time horizon to address climate change impacts and transition plans. Therefore, a values-based approach necessarily requires long-term sustainable strategies.

For this purpose, banks still need to develop tools and processes to measure clients' environmental impact and, more specifically, the carbon emissions on their portfolios. Current initiatives, such as the mentioned CDP and the European Commission's SFAP, advocate transparency in the form of corporate disclosures and reporting on current emissions and sustainability strategies[30] as the main route to foster the flow of investment capital and, in particular, banks' lending portfolios towards the green transition[31].

1.3. Climate change and environmental degradation as a source of financial risk

Climate change and environmental degradation can have a significant impact on the financial system through the risks they pose to financial institutions. These risks may arise from different sources, such as the costs and financial losses caused by adverse climate events, the impact of climate mitigation and transition policies, technological progress and changing consumer preferences towards environmentally friendly products and services[32].

The specific linkage between economic growth and climate change is not a novelty. The long-term impact of anthropogenic carbon emissions was, for example, analysed by **NORDHAUS** in 1977, concluding that economic activities deriving from the agriculture and energy sectors were the most harmful for the climate, and thus suggesting the need for nations, producers and consumers to implement control strategies, either by reducing their carbon emissions *a priori,*

[30] **SFAP -** cit. 12, Objective 4, p.9-11.
[31] See *infra* Section 3.6.
[32] See **BCBS** - Climate-related risk drivers and their transmission channels.

or offsetting its effects on the atmosphere *ex post*[33]. However, the efforts undertaken as a result of these findings have been limited.

In fact, the economy has only recently begun to internalise the externalities associated with carbon-intensive emissions, which are becoming more intensive as the economy maintains a *business as usual* approach. In the same vein, the European Central Bank (ECB) recognised that it is of paramount importance that financial institutions perceive climate and environmental risks impact on their business strategies, specifically by considering how such risks affect their portfolios and balance sheets over the medium and long-term[34].

Currently, climate and environmental risks materialisation is a certainty, although unknown about when it will take place, the severity of its impact, and the costs associated. Such uncertainty is highly correlated with the pace at which the transition to a green economy and financial system will take place.

[33] **NORDHAUS**, William D.- Economic Growth and Climate: The Carbon Dioxide Problem, p.343,344.
[34] **ECB** - Guide on climate-related and environmental risks Supervisory expectations relating to risk management and disclosure, p.16.

2. Definition of climate-related and environmental financial risks

Climate-related and environmental financial risks in the banking system can be broadly defined by all sources of geographical, social, political, and economical risks derived from both physical impacts on the climate and environment, and the net zero transition policies, bringing microeconomic and macroeconomic transmission channels that affect banks' financial risks, directly or indirectly.

The climate and the environment are indeed intrinsically connected – the climate is a part of the environment – but the latter is broader, comprising all conditions and systems that allow all living and non-living species to exist and interact. Environmental risks incorporate all climate-related risks, but also all risks stemming from human impacts on the biosphere integrity, freshwater use and land system-change which compose the nine planetary boundaries[35], and are as well a source of economic and financial risk. However, governments, policymakers, and regulators have directed their attention and resources to fight climate change and its related sources of financial risk as the first priority in the short term for two main reasons.

First, anthropogenic climate change is the primary cause of environmental harm – for example, air, land and water pollution caused by manufacturing and use of final products, such as plastics, leads to reduced availability of fresh water, increases the severity of weather events and ultimately endangers and destroys natural and human systems. Secondly, while GHGs (and particularly, CO2) emissions can be narrowed down to specific metrics that facilitate the measurement of the climate impact of economic activities, a similar exercise is not possible in relation to environmental impact and biodiversity loss, which lack a unique metric that allows such an assessment.

Because climate change is currently the most well-known planetary boundary, the management of climate and environmental risks is often limited to the risks stemming from climate change, which once properly targeted will bring positive

[35] Cf. *supra* Chapter 1.

externalities for the entire environment and biosphere. Meanwhile, biodiversity and nature-related metrics are being created and are expected to be integrated into the existing climate-related risks framework in the near future[36]. For this reason, the following sections are focused on climate-related financial risks, although natural and environmental risk drivers are also implicit.

In the banking system, climate-related risk drivers are broadly typified into three categories: physical risks, transition risks, and liability risks[37]. These affect the traditional categories of credit risk, market risk, liquidity risk, operational and reputational risk[38], notably through the transmission channels described in Figure1, which are analysed in detail in the following sections.

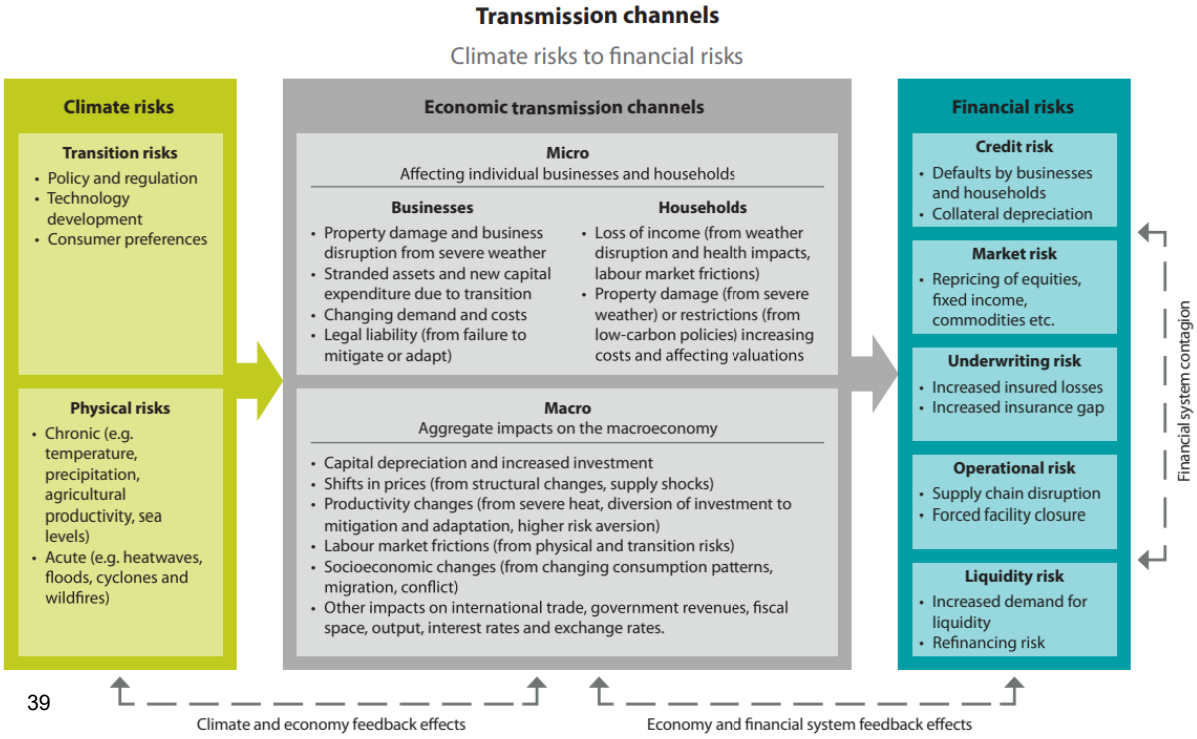

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Figure 1 - Schematic illustration of transmission from environmental risks to financial risks

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[36] The NGFS and INSPIRE study group highlight emerging initiatives and methodologies that target individual elements of biodiversity to assess nature and biodiversity-related risks in the financial system – e.g. the Corporate biodiversity footprint (CBF); Biodiversity footprint financial institutions (BFFI); and the Biodiversity footprint financial institutions (BFFI) – although recommending, among others, creating a dashboard of biodiversity metrics, conducting biodiversity-related risk management and scenario analysis to properly address such risks. See **NGFS-INSPIRE** - Central banking and supervision in the biosphere: An agenda for action on biodiversity loss, financial risk and system stability, Table 1, p.29-31.

[37] See **CARNEY**, Mark - Breaking the Tragedy of the Horizon – climate change and financial stability, p.5,6.

[38] These risks are defined *infra* in Section 3.2.1., *footnotes 98,99,100.*

[39] Figure 1 is adapted from NGFS - NGFS Scenarios for central banks and supervisors, p.10.

2.1. Characterization

Climate-related financial risks have four main characteristics which make them unique. First, climate-related risks are **global in nature.** Indeed, climate change and environmental degradation are a global problem, and although its effects are heterogeneously dissipated geographically, all countries are affected, either directly through physical impacts, or indirectly through related costs that are transferred into their economies (e.g. through energy and food supply shocks)[40]. No financial institution can avoid climate risk, despite the fact that their exposures change depending on each risk driver.

Secondly, climate-related risks are **multidisciplinary and intersectional**, which requires a coordinated and cooperative approach between economic and scientific experts to gather information that is capable to be translated into economic boundaries and targets suitable for the wide range of regions, factors, and business activities it affects. As a result, climate-related financial risks interact with all existing sources of financial risks.

Furthermore, as any planetary boundary, climate change has a threshold beyond which the effects to the humanity are **irreversible**, which ultimately might transfer unbearable costs to economies and financial systems globally. In a direct analogy, **PIETIKINEN** argues that while the consequences of a company operating illegally or evading taxes are limited and compensable, the same is not true for companies whose economic activities are damaging the environment and making it unviable, since such damage is irreparable[41].

Lastly, the **uncertainty** about the materialisation and magnitude of climate impacts, their costs and the policies adopted to mitigate them, coupled with a lack of historical data to analyse climate-related financial risks, poses them as a potential *black swan*[42] in the financial system.

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[40] **BOLTON**, Patrick et al. - The green swan - Central banking and financial stability in the age of climate change, p.11-15.
[41] **PIETIKÄINEN**, S. – cit.23, 124,125.
[42] Nassim Taleb refers to black swans as unprecedent, unpredicted and unexpected high impact events, thus figuring as hidden tail risks in financial institutions' risk management systems and processes, which once materialised cause disproportionated costs that ultimately transfer to the

BOLTON et al. build on the concept of *black swans* to develop the concept of "*green swans*"[43], which share the typical characteristics of fat-tailed distributions, profound uncertainty and non-linearity, so much so that their materialisation cannot be predicted from historical data, thus rendering traditional risk management models irrelevant in their context. However, *green swans* differ from typical sources of financial risk in that, while *black swan* crises can be overcome, the same may not be true in the context of climate-induced financial shocks, where the irreversible effects of climate change may be impossible to recover from, just as a sudden transition may paralyse sectors and economies exposed to carbon-intensive assets after such assets become stranded[44].

2.2. Physical risks

CARNEY defines physical risks as *"the impacts today on insurance liabilities and the value of financial assets that arise from climate- and weather-related events, such as floods and storms that damage property or disrupt trade"*[45]. The Task Force on Climate-Related Disclosures (TCFD-FSB) created by the Financial Stability Board (FSB) further typifies physical risks between acute risk and chronic risk[46], where the first refers to risks materialising from specific events (e.g. wildfires, floods, heat waves) and the second includes the risks arising from long-term adverse impacts from climate change (e.g. sustained global warming, causing sea level rise, droughts, and biodiversity loss). Both risks impact infrastructures and buildings, which may not resist to severe weather conditions (e.g. floods, extreme high and low temperatures, winds), or may be located in areas exposed to the sea level rise or landside avalanches. Furthermore, physical hazards have potential impacts on agricultural production, where natural catastrophes (e.g. hurricanes, floods, wildfires) cause devasting losses in infrastructures, crops, livestock and fisheries. At the same time, these may also

greater economy (e.g. through a bank bailout). See - **TALEB**, Nassim - The Black Swan: The Impact of the Highly Improbable.

[43] **BOLTON**, Patrick et al. - The green swan - Central banking and financial stability in the age of climate change. p.3; See *infra* Section 3.6.

[44] *Ibid.,* p.17-20.

[45] **CARNEY**, M. – cit.37, p.5.

[46] **TCFD-FSB** - Recommendations of the Task Force on Climate-related Financial Disclosures, p.6.

not survive the progressive extinction of half-seasons and consequent extension of winters and summers with increased temperature extremes.

Microeconomic transmission channels

At the microeconomic level physical risk channels impact banks individually, directly or indirectly, through credit, market, liquidity, and operational risks.

Banks are mostly impacted indirectly, through their counterparties or financial assets performance. Acute and chronic physical hazards potentially impact banks' credit risk through their counterparties[47]. Physical damage or destruction in properties, infrastructures or equipment may lead to lower collateral valuations which hinder the banks' ability to fully recover the value of a loan in the event of default, increasing the probability of loss-given-default (LGD)[48]. Additionally, households, corporations and sovereigns exposed to geographies or activities vulnerable to physical hazards (e.g. real estate, agriculture) may find their incomes negatively affected – since individuals and entities incur increased living and production costs as a result of health, food, and energy interruptions, as well as expenditures associated with property destruction or damage – thus increasing their probability of default (PD) on borrowing.

Secondly, physical risks can create market risks through banks' financial assets performance[49]. Indeed, sovereigns, governments and firms exposed to regions and/or activities potentially vulnerable to physical hazards lead to higher volatility in financial markets (e.g. stocks, corporate and sovereign bonds, currencies or commodity prices), and lower return on investments (as the issuers might suffer financial losses from physical impacts that largely impact their revenue).

Banks' liquidity might also be indirectly impacted by physical risks[50] as, for example, acute physical hazards result in a high and collective amount of deposit withdrawal requests that may cause liquidity constrains. Furthermore, the BCBS holds that banks' liquidity risk is directly affected by assets' valuation, as these

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[47] **BOLTON**, P. et al. – cit.43, p.19.
[48] The estimated amount of a bank's average loss per claim in the event of a borrower's default, including capital losses, loss of interest income and operating expenses – see **GORTSOS**, Christos V. – cit.15, p.150 (note 18).
[49] **BOLTON**, P. et al. – cit.40, p.20.
[50] *Ibid.*

limit banks' ability to liquidate assets, as well as natural disasters sharply increase the demand for lending in affected areas, which shows a negative effect in liquidity buffers[51].

Differently, banks' operations, infrastructures and other assets might be directly affected by physical hazards, leading to financial losses associated with damages in infrastructures, and increasing operating costs from energy, food and employment disruptions, thus representing operational risks. On the other hand, banks might also be directly impacted through reputational risks where they are found to have caused or contributed to climate change through their operations and relationships – e.g. when providing lending to entities which have an environmentally harmful business conduct.

Macroeconomic transmission channels

As climate change and environment degradation cause food, energy, transportation and infrastructure disruptions, its consequences pose social and economic threats. The health quality of the population decreases with the diseases associated air, water, soil and food contamination, and the increasing mortality associated with extreme temperatures. Vulnerable and lower income societies have increased distress to bear the costs of increasing prices and damages in their properties, as they are also more exposed to health impacts, thus increasing socioeconomic discrepancies. As a result, workforce availability and productivity potentially decrease, while vulnerable geographies and activities (e.g. agriculture) might lead to poor and unstable working conditions, which altogether, severely impact economic growth and increase sovereign debt, ultimately spilling over to the financial system as a whole, through credit risk and higher market volatility[52].

2.3. Transition risks

Because the financial sector is inextricably linked to economic fundamentals such as inflation and economic output, as these fluctuate as a result of climate change

[51] **BCBS** – cit.32, p.18.
[52] See **NGFS** - A call for action: Climate change as a source of financial risk - First comprehensive report, p.13,14; **BOLTON**, P. et al. – cit.40 p.11.

mitigation and adaptation, so do market and banking principles, resulting in both microeconomic and macroeconomic contagion effects on financial variables such as asset prices and inflation.

These give rise to the concept of climate-related transition risks, which **DIKAU** and **VOLZ** define as *"the uncertainty associated with policy, price, and valuation changes that may occur in the process of mitigating climate change and reducing carbon emissions"*[53]. Therefore, transition risk drivers usually arise from three cannels: government policy; technological development and consumer sentiment changes[54].

Microeconomic transmission channels

Transitional impacts on banks' individual businesses and portfolios bring higher exposures in credit, market, liquidity and operational risk stemming from each of the above mentioned channels.

First, the introduction of new government and international policies aimed at curbing carbon (and other GHG) emissions and protecting the environment, have direct consequences on the financial operations and revenues of companies, negatively affecting their solvency and leading to increased market price volatility in equities, debt instruments and commodities. At this level, climate policies such as a carbon tax entail higher burdens especially on high-emitting sectors and activities. On the other hand, carbon trading schemes lead to restrictions on production in those sectors, such as in energy supply, where the increased costs will affect all economic activities and households. Although the ultimate goal is to shift to renewable energy sources and more sustainable and less environmentally damaging activities, in the short term such policies carry increased costs for all.

Furthermore, as the ultimate goal is to phase-out from specific sectors and activities, such policies will imply that, in the long-term, carbon-intensive assets will become stranded (e.g. as oil reserves are expected to remain underground, they become unusable)[55]. As a result, banks exposed to such assets will see the

[53] **DIKAU**, Simon; **VOLZ**, Ulrich - Central Banking, climate change, and Green Finance. p.5.
[54] See **BCBS** – cit.32. p.vi.; **NGFS** – cit.52, p.15-17.
[55] See **ESRB** - Too late, too sudden: Transition to a low-carbon economy and systemic risk, p.11; **BOLTON**, P. et al. – cit.40, p.19.

value of collateral and financial assets sharply decreasing and becoming illiquid, thus increasing the probabilities of default and LGD, as well as increased exposure to liquidity risks.

Similar risks will arise from carbon-intensive technologies which will become increasingly unprofitable, as being exposed climate policies and consumer preference changes will lead to higher price volatility in the financial markets and poorer creditworthiness of related entities and commodities. On the other hand, environmentally friendly and carbon-neutral technologies (e.g. electric vehicles, solar energy) require large investments in Research & Development and higher production costs, which lead to lower, slowly growing, long-term profitability. As a result, borrowing and investment to carbon-neutral entities is often associated with higher credit risks for banks.

Transitional risk drivers also arise from the consumers and overall market sentiment changes (prioritising renewable and sustainable sources of energy, low-emissions vehicles, or more sustainable-built buildings), which might lead to a sudden decline in profitability of carbon-intensive sectors and activities, thus reflecting poorer creditworthiness. Furthermore, changing consumer preferences towards more sustainable products and services also carry operational and reputational risks, impacting banks *modus operating* directly. Indeed, such sentiment change challenges banks to offer more sustainable products and adopt a social and environmentally responsible business conduct, that would otherwise be perceived as a poor climate strategy by continuing to provide finance to carbon-intensive or environmentally harmful activities or entities[56].

[56] See **BCBS** – cit.32, p.25.

Macroeconomic transmission channels

Transitional risks vary significantly at the macroeconomic level, depending on the pace of the transition itself.

Policymakers and regulators have the responsibility to ensure that climate and environmental regulation is introduced in a timely manner (so that it can promptly mitigate the humanitarian crisis), but nonetheless gradually to ensure that population, governments and economies have enough time to adapt their living and business conditions and are not faced with excessive price instability in their goods and services. Nevertheless, in the short-term, transitional risk drivers will bring unavoidable disruptions in the real economic output, employment, income, property prices, and governments debt.

Whereas in a late and abrupt scenario the costs will be higher, reflecting the sudden repricing of assets, in a gradual and soft landing, the transition costs could be covered by the economic growth arising from new sources of energy and technological development[57].

In particular, if the banking system timely addresses potential stranded assets, and progressively, but not abruptly, phases out from carbon-intensive sectors or support exposed GHG-intensive entities to transition their business models, the financial losses could be minimised – such approach demands a gradual transition[58].

2.4. Liability risks

Another type of risk considered by **CARNEY** is liability risk, defined *as "the impacts that could arise tomorrow if parties who have suffered loss or damage from the effects of climate change seek compensation from those they hold responsible. Such claims could come decades in the future, banks have the potential to hit carbon extractors and emitters – and, if they have liability cover, their insurers – the hardest"[59].*

[57] In this vein, **ESRB** – cti.55, p.5,11.
[58] See in this vein, **SCHOENMAKER**, Dirk and van **TILBURG**, Rens - What Role for Financial Supervisors in Addressing Environmental Risks?, p.8.
[59] **CARNEY**, M. – cit.34, p.6.

This type of risk primarily affects the insurance sector, reflecting the uncertainty regarding the financial losses incurred form physical hazards, as well as the number of compensation claims an insured firm may be subject of, from having environmental, social and governance harmful practices.

Within the banking sector, liability risks will mostly appear as a subset of physical or transition risks. They may arise from a breach of fiduciary duties[60] by failing to consider long-term sustainable factors (particularly those related to environmental, social and governance issues) in investment decision making[61].

In addition, the banking industry may be held accountable for failing to conduct proper due diligence procedures, or failing to engage with counterparties to mitigate, adapt or disclose climate-related risks in their supply chain.

In the prevailing regulatory landscape, the responsibility of banks for climate-related adverse impacts is mostly raised through soft law instruments – which do not have legal repercussions but expose firms to reputational risk – of which are noteworthy the United Nations Guiding Principles on Business and Human Rights (UNGPs)[62], the Organization for Economic Cooperation and Development **(**OECD) Guidelines for Multinational Enterprises[63], and the related Due diligence for Responsible Lending and Securities[64].

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[60] The delimitation of fiduciary duties in the banking system is not unanimous, although it broadly encompasses the obligation of bankers and investment advisors to act in the best interest of depositors.

[61] See **UN Global Compact**, **UNEP Finance Initiative, UN Principles for Responsible Investment Initiative**, and **UN Environment Inquiry into the Design of a Sustainable Financial System**: Fiduciary Duty in the 21st Century.

[62] The UNGPs, developed by John Ruggie and unanimously endorsed by the UN Human Rights Council in 2011, are a soft law instrument introducing a first global standard on business and human rights, resting on three main pillars with regards to human rights: state duty to protect; corporate responsibility to respect; provide victims access to effective remedy. See the **Office of the High Commissioner for Human Rights [OHCHR]** (2011) - HR/PUB/11/04 - Guiding Principles on Business and Human Rights: Implementing the United Nations “Protect, Respect and Remedy” Framework.

[63] The OECD Guidelines for multinational enterprises are a soft law instrument adopted by governments, introducing minimum standards for enterprises operating internationally with respect to the pursuit of a ‘responsible business conduct’ across a variety of matters such as human rights, labour rights, and the environment. See **OECD** (2011), OECD Guidelines for Multinational Enterprises.

[64] The OECD Due diligence for Responsible Lending and Securities underwriting are a soft law instrument providing financial institutions guidance on how to consider human rights and environmental impacts through their lending and underwriting services in their operations. See **OECD**, Due Diligence for Responsible Corporate Lending and Securities Underwriting: Key considerations for banks implementing the OECD Guidelines for Multinational Enterprises.

MACCHI and **BERNAZ** argue for the application of the UNGPs framework to environmental and climate due diligence within banks' risk assessment when conducting their operations, offering products and providing services[65]. In this context, when engaging with clients and providing financing, banks might be found to have either contributed or to have had a direct linkage to environmental harm and climate change if failing provide a minimum level of screening within their portfolios aimed to identity, prevent, mitigate or provide remediation for climate-related risks posed by their clients in their operations and supply chain, or failing to exercise leverage over their clients to address or cease potential risks[66].

These instruments, although not legally enforceable per se, are the source of high reputational risks for banks held accountable under their respective frameworks, whilst providing a policy tool for future legal developments[67].

[65] **MACCHI**, Chiara; **BERNAZ**, Nadia - Business, Human Rights and Climate Due Diligence: Understanding the Responsibility of Banks, p.112.ff.
[66] **OHCHR** - OHCHR Response to Request from BankTrack for Advice Regarding the Application of the UN Guiding Principles on Business and Human Rights in the Context of the Banking Sector, p.6.
[67] See, in this respect, *infra* Section 4.3.2.

3. Regulation and supervision of climate-related financial risks

Historically, financial regulation and supervision of banks were accepted with a view to correct market failures inherent to the banking system. Market failures are in fact intrinsic to every sector, activity, or industry of an economy, and require external intervention (usually from governments) when its participants are unable to overcome them with their own resources.

In the specific case of the banking system, its stability is heavily reliant on the public's trust. A banking crisis deriving from market inefficiencies and banks' inherent exposure to credit and liquidity risks has the potential not only to hinder the effective allocation of funds in the economy, but also to lead to economic shocks, given the prominent role of banks in the economy[68].

Having in mind the correction of market failures coupled with the attainment of the goals of ensuring financial stability, the protection of retail consumers and investors, and the prevention of systemic risks, public intervention in the form of financial regulation and supervision is accepted with a view to achieving specific goals and objectives. In this respect, **ARMOUR** et al. outline seven strategies available to financial regulators and supervisors, organised into ***ex-ante strategies*** aimed at preventing excessive risk taking, moral hazards and adverse selection – these are entry, conduct, informational, prudential and governance regulation -, and ***ex post* strategies** which seek to mitigate the costs and consequences of the materialisation of risk[69].

Because climate and environmental degradation have transmission channels to the financial system[70], they unveil specific climate-related market failures, arising from the baking system’s challenges in adapting to changing economic fundamentals, as well as from new sources of unaccounted climate-related risks to which banks are highly exposed through traditionally carbon-biased portfolios.

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[68] Cf. *supra* Section 1.1.
[69] **ARMOUR**, John et al. - Principles of Financial Regulation. Chapter 3.5, p.142.ff.
[70] Cf. *supra* Section 2.2, 2.3, 2.4.

As a result, financial policy and regulation has a responsibility to improve the resilience of the financial system to such risks, as it can play a pivotal role in fostering the action of financial institutions to support the transition to a low-carbon economy. Additionally, as a globalised problem, climate change intensifies the need for a coordinated approach among national financial regulators, supervisors and central banks internationally.

The next sections proceed with a review of the typical market failures in the banking system and the integration of climate-related financial risks as a new one. In light of these results, the goals and strategies of financial regulation are developed with a focus on international solutions, with a particular emphasis on the work of the BCBS and the EU, which frameworks are briefly introduced in the following sections.

3.1. Market failures in the banking system and strategies of financial regulation

Typically, market failures in the banking system can be categorised into five although integrated, main market inefficiencies of the banking system[71] that lead to financial instability and systemic crisis[72].

Incomplete or **asymmetric information** between two parties in a financial relationship prevent the unfavoured side from making an accurate decision, leading to adverse selection or moral hazards, depending on whether the asymmetric information problem occurred before or after the transaction took place, respectively. Asymmetries of in information arise for both parties in a banking relationship: whereas consumers and investors are ofttimes found in a weaker position mostly due to lack of financial literature and are therefore prone to engage in unwanted products or services, banks, on the other hand, are also prone to adverse selection problems in their lending operations if they do not have all the relevant information to assess the borrower's risk of default. For this

[71] See *Ibid.*; **SCHINASI**, Garry J. - Safeguarding financial stability: theory and practice, p.47-58.
[72] Some authors focus specifically on agency problems arising from imperfect of asymmetric information as the main rationale for financial regulation which can lead to secondary market failures. See **MISHKIN**, Frederic S. - The economics of money, banking, and Financial Markets, p.34-37. **ALEXANDER**, Kern - Principles of Banking Regulation, p.34-37.

purpose, **informational regulation**[73] is deemed necessary to improve transparency and disclosure of information among market participants, as well as to reduce the social costs of financial crisis, by ensuring that the financial system remains resilient to external and internal shocks.

A second market failure are **negative externalities**, which are intimately related with the so-called systemic risk. **SCHINASI** defines negative externalities as *"situations in which many individual market participants take independent actions that would benefit them separately and collectively only if a small number were engaged in the activity, and would be harmful to everyone if a large number engaged in the activity simultaneously"*[74]. The pragmatic example are *bank-runs* where depositors losing trust in the financial system engage in massive withdrawals which ultimately result in constrains for the entire banking system's liquidity and disruptions on the payments systems. The global financial crisis that unfolded in 2007-2008 put in evidence the negative externalities arising from systemic risks, defined by the International Monetary Fund (IMF), the FSB and the Bank of International Settlements (BIS) as *"a risk of disruption to financial services that is (i) caused by an impairment of all or parts of the financial system and (ii) has the potential to have serious negative consequences for the real economy"*[75]. Indeed, the failure to identify broad and interlinked banking risk exposures and fragilities, coupled with the absence of a macroprudential policy and effective recover and resolution mechanisms, led individual banking failures to spread to the financial system, through major non-performing loans, coupled with massive a loss in trust over the banking system which called for a strong presence of financial regulation to address systemic risks in particular[76].

The global financial crisis revealed an excessive misalignment of interests between shareholders (and managers), who are more prone to take risks, and depositors, who usually prioritise protecting their savings. This led to the implementation of rules on banking corporate governance, namely the

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[73] **ARMOUR**, J. et al. – cit.69, p.147.
[74] **SCHINASI,** G. J. – cit.71, p.49.
[75] **FSB; IMF; BIS** - Guidance to Assess the Systemic Importance of Financial Institutions, Markets and Instruments: Initial Considerations: Report to the G-20 Finance Ministers and Central Bank Governors, p.2.
[76] **LASTRA**, Rosa M. - Multilevel Governance in Banking Regulation, p.5.

introduction of remuneration and compensation policies[77]. In this respect, **governance regulation and supervision[78]** provide good governance practices with requirements regarding board members, shareholders decision powers, remuneration policies, and business strategies that prevent the adoption of selfish decisions and practices which could jeopardise the efficient allocation of resources, and risk taking in the banking system.

In addition, the excessive misalignment of interests between managers and depositors, coupled with **biases in individual decision-making**[79] has highlighted the need to address mis-selling practices and irrational investment decisions leading to unaccounted risk exposure. Consequently, **market conduct** regulation[80] primarily aims to protect consumers, investors, and depositors, by requiring banks mandatory disclosure and standardised information practices on their marketing, advertising and sales practices, but also obligations and restrictions regarding fiduciary duties, and conflict of interests between banks and its customers.

Thirdly, a ***public good problem***[81] is a consequence of the positive externalities captured by the banking system as a provider of a payments system and through the role of financial institutions as financial intermediaries in the economy. Both functions meet the properties of a *public good*, being inexhaustible through their consumption (non-rival), while their access cannot be restricted to those who pay their fair share (non-excludable), thus depriving private players from returns to cover the marginal costs of their production. Ultimately, a *public good problem* is identified as a market failure, because although the free market has no incentives to provide the good (e.g. payments system), it is deemed essential for a developed economy, so that a society cannot afford to be deprived from one. Likewise, **SCHINASI**[82] regards finance and financial stability as a public good, such that while it is of everyone's interest to preserve it, no private participant has an incentive to bear the costs associated with bank failures, market dysfunctions

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[77] Cf. *infra* 4.2.1.
[78] **ARMOUR**, J. et al. – cit.69, p.149.
[79] *Ibid.,* p.127.
[80] *Ibid.,* p.146.
[81] *Ibid.,* p.125.
[82] **SCHINASI**, G. J. – cit.71, p.58.

or systemic risks. Furthermore, *"the provision and maintenance of financial stability would provide benefits to all individuals, and the fact that one person incurs these benefits does not prevent others from doing so. Thus, the principles of no excludability and nonrivalry would apply to financial stability (…)*"[83].

In this vein, financial regulation appears necessary to restrict excessive risk exposures, shift the incentives towards the protection of financial stability, and support part of the costs which the banking system alone cannot bear without failing at large. Consequently, *"[f]inancial infrastructures (rules, laws, and regulations) are required to ensure that finance provides a maximum of benefits and a minimum of costs to the economy. Financial safety nets, such as deposit insurance and taxpayer-financed payments and settlement systems, are an important part of this infrastructure and are designed to encourage risk-taking and financial activity beyond a certain minimum threshold to create efficiency gains for society at large"*[84].

In a utopian perfect market, businesses operate in a level playing field, based on free market access and exit, absence of asymmetries of information and goods are perfect substitutes, so that the rise in one's price increases the demand on the other. These conditions are never meet in the free market and, the banking system in particular operates under **imperfect competitive assumptions**[85]. In order to ensure that the banking system participants operate in a level playing field, **entry-level**[86] regulation is an *ex ante* strategy that establishes the requisites banks have to meet in order to access and be maintained in the market, proving the banking licenses authorisation and withdrawals.

Differently, *ex post* strategies are fulfilled with **insurance and resolution**[87] regulation, which mostly address the negative externalities induced by systemic risks and the financial stability public good problem. Because the failure of one financial institution can lead to a widespread loss of trust in the financial system, several mechanisms must be in place to ensure that the financial system remains

[83] *Ibid.*
[84] *Ibid.,* p.141,142.
[85] **ARMOUR,** J. et al. – cit.69, p.126.
[86] *Ibid.,* p.144,145.
[87] *Ibid.,* p.150,151.

resilient to shocks. A deposit insurance scheme allows depositors and investors to preserve their trust in the financial system, even during a crisis, ensuring that, up to a certain extent, their credits will be covered. In addition, to ensure that financial institutions remain resilient to credit and liquidity shocks, central banks are typically the lender-of-last resort. Furthermore, governments often intervene to rescue financial institutions through bailouts, or although assuming their failure, implementing a **resolution mechanism** that prevent spillover effects to healthy institutions.

In more recent history, as a consequence of globalisation, financial systems became more complex and interconnected, which left banks vulnerable to market abuse activities, including the use of banking services for criminal purposes such as fraud, money laundering, terrorism financing, bribery and corruption. As a result, **financial crime prevention**[88] has become a new regulatory goal, with rules governing mandatory due diligence procedures aimed at identifying customers and transactions, as well as mandatory reporting responsibilities to relevant judicial authorities.

Furthermore, the time horizon mismatch that characterises the banking business model gives rise to several sources of financial risks such as credit, liquidity, market and operational risks which can build up at the micro and macroeconomic levels and lead to economic disruptions and financial crisis. As a result, **prudential regulation**[89] and supervision is aimed at addressing how banks identify, assess and manage their risk exposures individually, and within the whole banking system, with the ultimate goal to protect the financial system against systemic risks. More broadly, financial regulation and supervision can be organised into two approaches: micro-prudential regulation and supervision and macroprudential regulation and supervision (oversight)[90].

ALEXANDER states that *"banking regulation refers to the body of rules and standards established by regulatory authorities or self-regulatory bodies to limit or control the risk assumed by banks or other financial institutions, while*

[88] *Ibid.,* p.137.
[89] *Ibid.,* p.148.
[90] Cf. Section 4.2.1.

supervision refers to the process of ensuring and monitoring compliance with regulatory rules and standards"[91]. Indeed, financial regulation alone is not sufficient to ensure that banks are meeting its goals and strategies. To this end, financial supervision arises in the form of one or more entities responsible to assess if banks are complying with the set of rules, laws and requirements they are subject to, as well as to intervene to prevent potential failures.

In this regard, a distinction arises according to whether the objective of a regulation is at the bank-level or systemic level[92]. Microprudential banking regulation targets market failures at the firm-level, seeking to enforce the safety and soundness of banks, limiting their vulnerability to solvency or to liquidity risks, by imposing limits on individual risk exposure while increasing their capacity to absorb losses incurred in the event of the materialisation of such risks. Differently, macroprudential regulation aims to limit the financial system's exposure to systemic risk arising from factors which are not associated with individual financial firms or structures of the financial system, but of a more broader, system-wide nature. Both microprudential and macroprudential regulation can only be effective when coupled with microprudential supervision of financial institutions and macroprudential oversight of the financial system[93].

3.2. International Banking Regulation

The globalised environment in which banks currently operate, through financial conglomerates where banks expand their activities geographically and provide services typical of other financial sectors, places them as transmitters of macroeconomic risks, which also increases their exposure to systemic risks.

Against this backdrop, the effectiveness of financial regulation, which remains limited across borders, is weakened. Consequently, it becomes increasingly important for regulators and supervisors to coordinate their actions to ensure the financial system's robustness at the international level. However, because jurisdictions have conflicting economic and political interests that impair a full

[91] **ALEXANDER,** K. – cit.72, p.34.
[92] *Ibid.*
[93] *Ibid.*

harmonisation of rules, the international landscape of financial regulation is built around soft-law, non-binding mechanisms. In the context of international banking regulation, the Basel Committee on Banking Supervision (BCBS) is a prominent global standard setter, bringing together central banks and supervisors among jurisdictions to create a common set of non-binding principles, standards, and guidelines, which adherent jurisdictions pledge to integrate within their regulatory frameworks with the ultimate goal to improve coordination and harmonisation among national authorities. Its most notable work is the adoption of the Core Principles for Effective Banking Supervision and the *Basel Capital Accords* (Basel I, Basel II, and Basel III).

The Basel I was first adopted in 1988, after the Latin American Debt crisis and suffered two main reforms in 2004, adopting the Basel II. The current Basel III[94] regulatory framework, which was adopted in the aftermath of the global financial crisis, is built on three pillars consisting of in (1) minimum capital and liquidity requirements; (2) a supervisory review (and evaluation) process; and (3) market discipline (additional/ enhanced disclosure requirements). The primary goal is to determine regulatory capital using a risk-sensitivity approach whereby the capital required varies according with the weighted exposure of defined categories of risk – credit risk, market risk, operational risk, and liquidity risk[95].

The revisions undertaken in the aftermath of the crisis focused on addressing the banking system's failure to handle systemic risks, particularly in the international context. The Basel III framework not only tightened the existing capital requirements, as it introduced liquidity standards, risk measurement and monitoring tools, as well as it imposed new rules on banking governance and accounting practices. Its main goal, is to ensure that banks hold enough capital to meet its liabilities when experiencing losses on assets, large exposures or

[94] BCBS - Basel III: A global regulatory framework for more resilient banks and banking systems. December 2010, revised June 2011.

[95] More recently, the Basel III suffered new reforms in 2017, labelled as the new Basel IV, which will be gradually implemented from January 2022 to 2027. It is primarily focused in reducing the reliance of banks on internal risk models to calculate regulatory capital, as it also imposes an additional leverage ratio buffer Systemically Important Banks. See **BCBS** - Basel III: Finalising post-crisis reforms; **ALEXANDER,** K. -cit.72, p.119-135; **BODELLINI**, Marco - The long 'journey' of banks from Basel I to basel IV: Has the banking system become more sound and resilient than it used to be?.

experiencing systemic risks. At the same time, it aims to ensure the trust and confidence of the general public in the financial system through proper supervision, good governance practices and disclosure requirements. Furthermore, as the crisis was driven by excessive leverage, the Basel III introduced a leverage ratio to ensure banks' resiliency to abrupt withdrawal requests.

3.2.1. Pillar I - minimum capital & Liquidity requirements

The founding pillar of the Basel Capital Accords addresses both micro and macroprudential regulatory tools aimed at banks' capital and banks' liquidity, with a view to ensure the quality and quantify of banks' assets to absorb losses.

The rationale behind capital requirements is that "*shareholders' equity should fund a minimum proportion of the current value of the bank's assets, in order to increase the chances that a bank will be able to absorb losses on the assets side of its balance sheet without becoming insolvent and, more importantly, without triggering a run on its deposits or other short-term funding"*[96]. Furthermore, the greater the liquidity of a bank's assets – net cash or assets easily convertible to cash without incurring significant discounts on their value – the less constraints it will face in meeting its liabilities. In this respect, the key micro and macro prudential regulations are represented in the Figure 2.

Minimum Capital Requirements

The core instrument of capital agreements concerns the requirement for banks to retain a percentage of capital (currently 8%) sorted into tiers according to a criterion of the type of capital. The regulatory capital is determined as a percentage of the bank's exposure to risk (i.e. against the possibility of unexpected losses in assets)[97] – taking into account the bank's own funds to its total risk-weighted assets (RWAs) on credit risk[98], market risk[99], and

[96] **ARMOUR,** J. et al. – cit.69, p.449.
[97] **ALEXANDER,** K. – cit.72, p.94,95.
[98] Credit risk refers to the probability of economic loss as a result of counterparty's failure to fulfil its contractual obligations, either from the non-payment on a future obligation or on an ongoing transaction. See Basel Framework.
[99] Market risk comprises the risk of losses due to movements in market prices.

operational[100] risk exposure – the higher the bank total RWAs, the higher is the amount of capital it is required to retain.

The largest requirement is a minimum of 4.5% of Common Equity Tier 1 (CET1) – largely composed of shareholders' common equity, retained earnings and disclosed reserves – and it is followed by an Additional Tier 1 capital (AT1) of 1.5% - including less-absorbent capital such as non-redeemable or non-cumulative preferred shares – and, at last, a minimum of 2% of Tier 2 capital – it is the less absorbent type of capital, made up of subordinated debt, undisclosed reserves and hybrid capital instruments. With the exception of operational risks, the current Basel III framework allows banks to chose between a standardised approach or use internal models (that are approved by supervisors) to calculate their total RWAs.

Secondly, in order to avoid the build up of systemic risk, a Capital Conservation Buffer (CCB) is added to require an additional CET1 regulatory capital (currently 2.5%) during times of economic growth and credit expansion in order to absorb losses generated during stressful times in the economic cycle without recourse to other regulatory capital elements to absorb losses.

Differently, a Counter-Cyclical Buffer (CCyB) may de added taking into account the macroeconomic environment in which each bank operates, against the build up of excessive risk during times of economic growth and credit expansion. As such, banks might be required to hold up to 2.5% of CET1 regulatory capital during good times allow them to hold less capital during downturn in the economic cycle[101].

Following the 2008 global financial crisis, the Capital Accords revisions introduced an additional capital buffer specifically for global and domestic systemically important banks (G-SIBs), which – according with their size, interconnectedness, complexity, lack of substitutability or global scope – pose either cross-border or domestic system-wide risks and thus, are deemed "too big

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[100] Operational risk is defined by the current Basel framework as "the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk" – internal and external fraud, human error, poor business conduct, damages on physical assets, and technological failures are examples of operational risk drivers. See Basel Framework OPE10 – 10.1.
[101] **ALEXANDER,** K. – cit.72, p.114.

to fail". These institutions, and only these, are subject to a higher absorbent capital requirement as an extension of the capital conservation buffers which vary according with the bank's score of systemic importance from 1% to 2.5%[102].

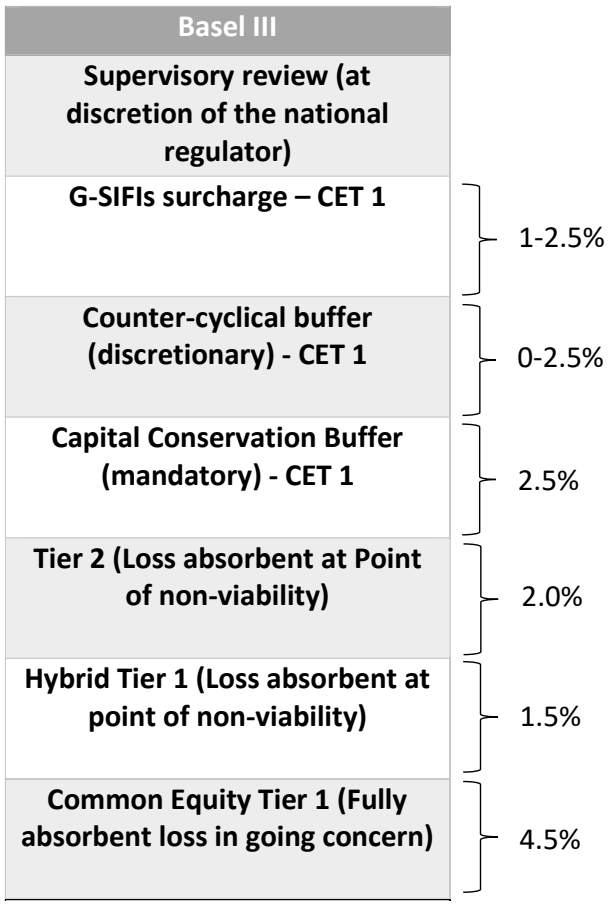

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***Figure 2** - Basel III regulatory capital*

[102] The revised Basel III (Basel IV) adds an additional leverage ratio buffer for G-SIBs which must be met with Tier 1 capital, which will be set at 50% of a G-SIB's higher loss-absorbency risk-based requirements. – see BCBS - Basel III: Finalising post-crisis reforms.
[103]Figure 2 is adapted from **ALEXANDER,** K. – cit.72, p.107.

Leverage ratio

The leverage ratio is defined as the minimum amount of Tier 1 capital as a percentage of total assets and off-balance sheet exposures without weighting – under the Basel III framework banks are required to hold a minimum ratio of 3%. The leverage ratio imposes a cap on the amount of leverage each bank is allowed to have, thus preventing the excessive build-up of leverage in the banking system.

Liquidity Coverage ratio

In addition to the minimum capital requirements, the Basel III addresses liquidity risk, stemming from banks' maturity transformation function, where the inherent mismatch between short-term liabilities and long-term assets may result in a bank's inability to meet its liabilities without incurring unacceptable losses n this regard, the Basel III regulation established the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR) as two instruments to mitigate liquidity risk[104].

3.2.2. Pillar II – Supervisory review (and evaluation) process

The second pillar of the Basel III framework concerns the supervision of banks' compliance with the applicable regulatory framework, especially concerning the Pillar I capital and liquidity requirements and the Core Principles for Effective Banking Supervision (Core Principles)[105] .

The Core Principles establish a set of 29 principles, aiming to ensure that banks, and the financial system, remain resilient to financial shocks and avoid the build-up of systemic risks. For this purpose, it establishes minimum standards aimed to assess banks' compliance and adequacy of its governance polices and practices, risk assessment and management processes, internal controls, capital adequacy, liquidity, leverage, reporting and disclosure requirements.

[104]**BCBS** - Basel III, LCR, and NSF, p.831 – 983.
[105]**BCBS** - Core Principles for Effective Banking Supervision.

The Pillar II aims to improve dialog between banks and competent supervisory authorities while monitoring on a continuum basis the adequacy and soundness of the banking corporate and risks management practices. In this context, three important tools under Pillar II are the Supervisory Review Process (SRP), the Internal Capital Adequacy Assessment Process (ICAAP) and the performance of Stress Tests and Scenario Analysis.

Supervisory review process

Under the Supervisory Review and Evaluation Process (SREP) competent authorities assess and analyse each bank's key indicators that measure the soundness and effectiveness of its business model, as well as the compliance with the applicable regulatory framework, namely in terms of risk exposure and capital adequacy[106].

For this purpose, supervisors collect the necessary information in order to: analyse the viability of the bank's business model; assess the effectiveness of the governance structure and the internal controls put in place; evaluate the bank's risk appetite profile and risk management framework; identity and measure the exposure to material risks; as well as to assess the suitability of regulatory capital held by the institution to cover potential losses. Following this assessment, supervisors identify the main challenges to the institution's banking activities, as well as necessary measures to adopt, namely regarding the necessity to impose higher minimum regulatory capital.

Internal Capital Adequacy Assessment Process

The ICAAP is a quantitative and qualitative process performed by each bank on a consistent and regular basis order to identify and measure risk exposures while performing an analysis of its risk management framework and its suitability to accurately assess the level of capital it should hold to cover risks in a timely manner.

Under the ICAPP each bank is required to implement a regular process in which it defines its own risk taxonomy aimed at identifying all material risks it is currently exposed to, as well as those which might arise from pursuing its strategies or

[106] **ALEXANDER**, K. – cit.72, p.156.

from relevant changes in its operating environment, in order to either allocate capital to cover material risks or to document a justification for not holding capital[107]. In this respect, a *"risk could be regarded as material if its materialisation, omission or misalignment would significantly change or influence the capital adequacy, profitability, or continuity of the institution from an economic perspective, irrespective of the accounting treatment applied"*[108]. Furthermore, the bank is expected to assess how the identified and quantified exposures might impact is own funds and total risk concentrations in the future and withdraw conclusions on potential weaknesses and necessary precautionary measures.

In effect, the ICAAP is the starting point of the supervisory process, where each individual bank is required to perform a self-assessment of its risk management framework, risk profile and related exposures, which will be further assessed by the supervisory authorities within the SREP to identify potential vulnerabilities, inconsistencies or the inadequacy of the ICAAP to properly assess bank's risks.

Stress testing and scenario analysis

Stress testing is an essential instrument to identity and measure the impact of adverse or changing economic conditions and other events on the overall financial system and to individual banks. Stress testing takes place both at the firm-level and at the supervisory level. In this respect, a crucial component of the stress testing framework is the development and definition of adverse scenarios, for general or risk specific events, typically within a two to three years time horizon, with a wide range of severity to identity, quantify and measure macroeconomic vulnerabilities in the banking system and, most notably, banks.

Bank stress testing is integrated within the ICAAP for banks to identify and measure the impact of potential vulnerabilities to their business viability, especially in terms of capital adequacy, liquidity adequacy, regulatory compliance, risk identification, risk bearing capacity, and recovery planning[109]. Banks are expected to develop a stress testing framework that is able to capture all material risks that may arise from macroeconomic stress conditions and

[107] See **ECB** - ECB Guide to the internal capital adequacy assessment process (ICAAP).
[108] *Ibid.,* p.27.
[109] See the **BCBS** - Supervisory and bank stress testing: range of practices, p.23.

events (for example, a financial recession, liquidity constraints, or market risk events) that negatively impact the bank's business operations. In this respect, banks should include macroeconomic shocks, industry-specific shocks, institution-specific shocks and risk-specific shocks in their scenarios.

Supervisory stress tests are performed by supervisory authorities at firm-level and system-wide level. Supervisory authorities conduct stress tests under the SREP to assess the health and soundness of individual banks under different adverse scenarios, typically on a yearly basis, mostly intended to assess and adjust bank's ICAAP, minimum capital requirements, business and governance strategies and recovery plans. On the other hand, system-wide stress testing is aimed at assessing the resilience of the banking system under different adverse scenarios, identify and target possible systemic risk exposure concentrations, as well as policy and macroeconomic policy changes.

Traditionally, stress testing and scenario analysis are highly dependent on historical data to identify and replicate the behaviour of the current banking system conditions and internal risk management processes to past events. During the past global financial crisis, the reliance on historical scenarios revealed inadequate to identify new sources of risks. Subsequently, hypothetical scenarios based on statistical data are now used to estimate new possible adverse stress scenarios that cover tail and unknown risks.

3.2.3. Pillar III – Market discipline – additional/ enhanced disclosure and transparency

In addition to the establishment of corporate and risk management governance standards in the Pillar II, the Basel framework introduced a third pillar regarding market discipline. The main purpose of the Pillar III is to increase transparency regarding the bank's exposure to risk, as well as concerning its compliance with Pillar I capital requirements. In this context, the main regulatory instrument used is the imposition of disclosure requirements that allow investors and supervisors to be informed on the bank's, risk profile, risk exposure, capital adequacy, governance and risk management strategies and how these are aligned with

broader consumer/investor protection rules, as well as with the macroeconomic environment and system-wide objectives[110].

At the same time, the disclosure of information among banks is a powerful tool to target the main market inefficiencies arising from asymmetries of information[111]. Indeed, if all banks operating in a financial market are disclosing a set of key indicators of their business in a comprehensive and comparable manner, it ends up being simpler to assess the overall banking system risk exposures and vulnerabilities.

3.3. The European Union prudential framework

In the European Union, banking regulation and supervision is performed within two systems and two mechanisms, which are build upon the Treaty of Lisbon as well as under a set of key legislative acts – European System of Central Banks (ESCB); the European System of Financial Supervisors (ESFS); the Single Supervisory Mechanism (SSM); and the Single Resolution Mechanism (SRM).

The ESCB, also labelled the Eurosystem, consists of the ECB and the National Central Banks (NCBs) of the Member States whose currency is the Euro[112].

In the aftermath of the Global Financial Crisis, the publication of the '*De Larosière Report*'[113] lead to the establishment of the ESFS which is build upon two pillars of microprudential supervision and macroprudential oversight of the financial system (fulfilled by the European Systemic Risk Board (ESRB)), respectively.

The first pillar is composed by the European Supervisory Authorities (ESAs), the Joint Committee of the ESAs and the competent National Supervisory Authorities (NSAs). The ESAs were created under the former existing committees, maintaining a sectoral organisation approach – the European Banking Authority

[110] **BCBS** – cit.105, Principle 28: Disclosure and transparency.
[111] **ALEXANDER**, K. – cit.72, p. 160.
[112] The mandate of central banks, including the ECB is developed *infra* in the Chapter 5.
[113] See: The High-Level Group on Financial Supervision in the EU, Chaired by Jacques de Larosière - De Larosière Report. Brussels, 25 February 2009. p.42.

(EBA)[114], the European Securities and Markets Authority (ESMA)[115] and European Insurance and Occupational Pensions Authority (EIOPA)[116]. These are sectoral regulatory authorities, in which each Board of Supervisors is composed of the head of the NSAs from each Member State, as well as observers (without voting rights) from the ESRB and the other ESAs. In addition, being the lack of coordination among the financial sectors a crucial vulnerability of the financial system to address financial conglomerates, and system-wide risks, the Joint Committee of the ESAs is a forum responsible for the overall and cross-sectoral coordination between the three ESAs, including ensuring consistency in their supervisory practices and solving disputes on cross-sectoral matters.

A second pillar of the ESFS is the ESRB, which is a Union Group *"responsible for the macro-prudential oversight of the financial system within the Union in order to contribute to the prevention or mitigation of systemic risks to financial stability in the Union that arise from developments within the financial system and taking into account macroeconomic developments, so as to avoid periods of widespread financial distress"*[117]. The ESRB is especially responsible for the identification and assessment of systemic risks, namely through the collection and analysis of all relevant and necessary information. It should work in close cooperation with the ESAs, the Joint Committee of the ESAs, as well as with international financial organisations (among which, the FSB) in exchanging information for the development of a common set of quantitative and qualitative indicators (risk dashboard)[118].

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[114] Regulation (EU) No 1093/2010 of the European Parliament and of the Council of 24 November 2010 establishing a European Supervisory Authority (European Banking Authority) – [EBA Regulation].
[115] Regulation (EU) No 1095/2010 of the European Parliament and of the Council of 24 November 2010 establishing a European Supervisory Authority (European Securities and Markets Authority).
[116] Regulation (EU) No 1094/2010 of the European Parliament and of the Council of 24 November 2010 establishing a European Supervisory Authority (European Insurance and Occupational Pensions Authority).
[117] Regulation (EU) No 1092/2010 of the European Parliament and of the Council of 24 November 2010 on European Union macro-prudential oversight of the financial system and establishing a European Systemic Risk Board. [ESRB Regulation], Article 3, (1).
[118] *Ibid.,* Article 3, (2).

3.3.1. The EBA

The EBA is the responsible EU Agency for the implementation of a common framework of regulatory and supervisory standards, while ensuring the consistent application of EU banking Law rules among the NSAs and financial institutions. The main responsibilities of the EBA are to improve the functioning of the internal market and ensure the integrity, transparency, efficiency, and orderly functioning of financial markets, while also strengthening international supervisory coordination, preventing regulatory arbitrage, promoting equal conditions of competition, ensuring the regulation and supervision of credit and other risks, enhancing customer and consumer protection, promoting supervisory convergence, and preventing money laundering and terrorist financing[119].

Its tasks include, taking due consideration for the objectives of ensuring the safety and soundness of financial institutions[120]: developing high-quality regulatory standards, contributing to the consistent application of EU financial law, facilitating the delegation of tasks among NSAs, cooperating with the ESRB for the achievement of its tasks, conducting peer reviews of NSAs, monitoring market developments, and promoting consumer protection[121].

For this purpose, the EBA builds on the banking single rulebook – the set of financial law provisions aiming the harmonisation of the EU prudential framework – through the development of draft Regulatory and Implementing Technical Standards (RTS and ITS, respectively), along with the issuance of Guidelines and Recommendations[122]. Currently, the core legislative framework of the single rulebook includes the Capital Requirements Regulation (CRR II)[123], the Capital Requirements Directive (CRD V)[124] – which reflect and fully implement the

[119] EBA Regulation (cit.114), Article 1(5).
[120] *Ibid.*, Article 8(1a), (b).
[121] *Ibid.,* Article 8(1).
[122] *Ibid.,* Article 8(2).
[123] Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms.
[124] Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms.

regulatory framework develop by the BCBS –, the Bank Recovery and Resolution Directive (BRRD)[125], and the Deposit Guarantee Schemes Directive (DGSD)[126].

3.3.2. The ECB responsibilities under the Single Supervisory Mechanism

Following the 2010 sovereign crisis, the 'Van Rompuy Report'[127] recommended the creation of a Banking Union, aiming to increase financial integration through the development of a common and harmonised framework on which banks and supervisors should operate. The Banking Union (BU) project is built upon three pillars - (1) Single Supervisory Mechanism (SSM), (2) a Single Resolution Mechanism (SRM), and (3) a '*European Deposit Insurance and Resolution Authority'* (EDIRA), although only the first two pillars are currently completed.

The SSM

The Single Supervisory Mechanism is a centralised supervisory model, operating between the ECB and the NSAs. The Single Supervisory Mechanism founding regulation (SSMR)[128] activated, for the first time, the Article 127(6) of the TFEU which allows to the ECB to be conferred specific *tasks "concerning policies relating to the prudential supervision of credit institutions and other financial institutions"*[129], with the main objective of ensuring the stability of the financial system and preventing regulatory arbitrage.

Through the SSM, the ECB is part of the ESFS where, working in in cooperation with the NSAs it is responsible for the micro and macro-prudential regulation and micro-prudential supervision of credit institutions. In addition, the ECB is exclusively responsible for the granting and withdrawal of licenses to institutions

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[125] Directive 2014/59/EU of the European Parliament and of the Council of 15 May 2014 establishing a framework for the recovery and resolution of credit institutions and investment firms.
[126] Directive 2014/49/EU of the European Parliament and of the Council of 16 April 2014 on deposit guarantee schemes.
[127] **VAN ROMPUY**, Herman - Towards A Genuine Economic And Monetary Union. p.4.
[128] Council Regulation (EU) No 1024/2013 of 15 October 2013 conferring specific tasks on the European Central Bank concerning policies relating to the prudential supervision of credit institutions.
[129] *Ibid.,* Article 1.

operating in the EU, and the assessment of applications for the acquisition and disposal of *qualifying holdings* in a credit institution[130].

The main criteria for the allocation of tasks between the ECB and the NSAs rellies in the distinction between institutions of "significant relevance" and "less significant" ones, according with their size, economic importance, and cross-border activities[131], as well as secondary qualification criteria established under the SSM framework regulation[132]. The following table summarises the allocation of tasks, according with the qualification.

	Significant supervised entities	*Less significant supervised entities*
Granting and withdrawal of authorisation	ECB	ECB
Assessment of applications for the acquisition and disposal of 'qualifying holdings'	ECB	ECB
Conduct of micro-prudential supervision	ECB	NCA
Conduct of macro-prudential regulation	ECB/NCA or NDA	NCA or NDA
Carrying out supervisory tasks in relation to recovery plans and early intervention	ECB	NCA
Conduct of stress tests	ECB	NCA
Participation in colleges of supervisors	ECB	NCA
Protection of the economic interests of consumers transacting with financial service providers	NCA	NCA
Supervision of (retail) payment services	NCA	NCA
Prevention of the use of the financial system for the purposes of money laundering and terrorist financing	NCA	NCA

[133]

Table 1 – *Allocation of tasks between the ECB and the national competent authorities (NCAs)*

3.4. Climate related risks as a market failure

The economic costs of climate change and environmental harm and the transition to an environmentally sustainable economy not only challenge the baking system to adapt to new economic fundamentals and internalise physical and transition

[130] *Ibid.,* Article 4(1).
[131] *Ibid.,* Article 6(4).
[132] Regulation (EU) No 468/2014 of the European Central Bank of 16 April 2014 establishing the framework for cooperation within the Single Supervisory Mechanism between the European Central Bank and national competent authorities and with national designated authorities (SSM Framework Regulation).
[133] **GORTSOS**, Christos V. – cit.15, p..355.

hazards as a new source of financial risk, but also carry new threats for the protection of consumers with regards to the promotion of sustainable products, thus unveiling specific climate-related market failures.

Particularly, the banking system is mostly faced with informational challenges with regards to the definition, identification, measurement and assessment of climate-related physical and transitional risk drivers, thus exacerbating asymmetries of information in the financial system that leave lending portfolios with unaccounted risk exposures. Indeed, surveys to financial institutions identify a lack of a harmonised definition of climate-related risks, rendering the construction of a comparable and granular data set more challenging[134]. Particularly, *"data that help explain the crucial link between these sustainability factors and financial fundamentals"*[135].

Furthermore, the typical methodologies used by banks' risks management are backward-looking and heavily reliant on historical data, which are not suitable to the uncertainty, irreversibility, nonlinearity and fat-tailed distribution that characterises climate-related risks[136]. The prudential treatment of climate-related risks thus requires forward-looking models less reliant on historical data and adopting an extensive time-horizons that can capture both physical and transition risks[137].

On the other hand, asymmetries of information also arise from banks to clients as a result of missing harmonisation regarding the definition of terms such as *sustainable* or *green*, allied with the lack of reporting on sustainability metrics which can make investors and consumers victims of *"greenwashing"*[138] practices.

Secondly, the engagement of the banking system in fostering the transition to a carbon-neutral and sustainable economy bring undeniable positive externalities

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[134] Working Group on Climate Risk of the **DNB Sustainable Finance Platform** (July, 2020) - Climate risk and the financial sector: sharing of good practices, p.55; **COLETON**, Adrienne, et al. - Sustainable Finance Market Practices, p.8,10, 39.
[135] **ZETZSCHE**, Dirk Andreas and **ANKER-SØRENSEN**, Linn, Regulating Sustainable Finance in the Dark. p.23.
[136] In this vein, **ALEXANDER**, K. – cit.72, p.4,9; **BOLTON**, P. et al. – cit.40, p.29.
[137] **NGFS** (May, 2020) - Guide for Supervisors Integrating climate-related and environmental risks into prudential supervision, p.53,56,57.
[138] See **DRIESSEN**, Marieke - Sustainable Finance: An Overview of ESG in the Financial Markets, p.330,331; Cf. *infra,* Section 4.4.

for societies and economies, whereas in the short-term is also associated with financial costs from food and energy disruptions or research and development which may not see a return in the near-future, hence making sustainable investments economically uninteresting for banks. Therefore, climate and environmental protection may unravel a *"public good problem"*[139] in the banking system, where the positive externalities of fighting climate change accrue for all and cannot be limited to those who paid their fair share – i.e. who beared its costs – (non-excludable) and are not exhaustible in their consumption (non-rival).

Additionally, some banks may adopt a business approach which makes them less vulnerable to climate-related physical and transitional risks, namely by completely abandoning the highest exposed regions, sectors, activities and entities, while others may remain exposed to such risks by adopting a gradual transition approach, which leads to an unlevelled competitive playing field. Unfair competition might also arise from regulatory arbitrage where some banks chose to operate and expose their business to regions with less climate-related policy and regulations.

3.5. Climate-related financial risks as a source of systemic risk

The globalised threat of climate change and environmental degradation hinder economies from subsisting in a planet with increasingly declining living conditions. The pace and way societies and policymakers react to the climate crisis might as well have devasting effects in the whole economy.

Furthermore, physical and transitional, micro and macroeconomic, transmission channels if not effectively internalised by the financial system as a whole, can endanger its stability. Indeed, climate-related risks meet the definition of systemic risks[140] as they can impair the financial sector from efficiently and smoothly allocate resources, identify, assess, price and manage risks, and to absorb financial shocks, thus affecting the economy as a whole.

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[139] As defined *supra, Section 3.1.*
[140] Cf. *supra,* Section 3.1.; **FSB; IMF; BIS** - cit.75.

BOLTON et al. highlight that the fat-tailed probability of physical hazards can ultimately put financial institutions in *''situations in which they might not have sufficient capital to absorb climate-related losses"*[141], which can trigger contagion effects and asset devaluation spreading throughout the financial system.

On the other hand, transition risks arising from a sudden transition, lead to carbon-intensive assets to become stranded as a consequent of abrupt policy changes, technological breakthroughs or limitations and sudden shifts in market and consumer sentiment. Indeed, the resulting sudden devaluation and uselessness of such assets and related sectors and activities, can carry systemic consequences and trigger financial crisis[142]. In this vein, **CARNEY** states that a *"too rapid a movement towards a low-carbon economy could materially damage financial stability. A wholesale reassessment of prospects, as climate-related risks are re-evaluated, could destabilise markets, spark a procyclical crystallisation of losses and lead to a persistent tightening of financial conditions (…)"*[143].

3.6. Climate-related risks within the goals and strategies of financial regulation and supervision

In the context of banking regulation, the previous sections demonstrated how climate change and the transition to a sustainable economy represent a market failure in the banking system, ultimately exacerbating a *public good problem* and systemic risks. Financial regulation and supervision certainly have a role to play in ensuring that the banking sector fully and comprehensively considers the materiality of climate-related financial risks both at the firm and system levels.

A different question arises as to whether the power of financial regulation and supervision can be used to pursue specific climate mitigation and sustainable transition objectives, under a principle of *'Think Sustainability First'*[144]. Such novelty would allow financial regulators and supervisors to adopt specific

[141] **BOLTON**, P. et al. – cit.40, p.26.
[142] **ESRB** – cit.55, p.11,12.
[143] **CARNEY**, Mark - Resolving the climate paradox, p.2.
[144] **HLEG** - Financing a Sustainable European Economy: Final Report 2018 by the High-Level Expert Group on Sustainable Finance, p.61.

measures aiming to accelerate the decarbonisation of the economy by discouraging banks to have carbon-intensive sectors or activities in their portfolios.

In the EU, the regulation and supervision of the banking system is conducted within the ESFS as a shared responsibility between the EBA, the ECB (under the SSM), the NSAs and the ESRB, which mandates are delimited in their respective governing regulations[145].

Recently, the founding regulations of the ESAs, including the EBA, have been amended with a view to underline its role in the identification and reporting of ESG risks to financial stability, but also in *"rendering financial markets activity more consistent with sustainability objectives"*[146] and providing *"guidance on how sustainability considerations can be effectively embodied in relevant Union financial legislation and promote coherent implementation of those provisions upon adoption"*[147].

Pursuant to Article 8 (1a) (f) of the EBA's regulation, the EBA is now tasked with the responsibility *"to monitor and assess market developments in the area of its competence (…) duly considering developments relating to environmental, social and governance related factors".* Additionally, the Article 8 (1a) (c) is added, requiring the EBA, when carrying out its tasks, to *"take account of technological innovation, innovative and sustainable business models, and the integration of environmental, social and governance related factors"*. **ARRIBA-SELLIER** highlights that with these changes in the mandate of the EBA, *"[t]he onus is not on the risks that are material to the business or to which financial firms are exposed, but, more widely, on the contribution of investments and businesses to*

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[145] Cf. *supra,* Section 3.3.ff.
[146] Regulation (EU) 2019/2175 of the European Parliament and of the Council of 18 December 2019 amending Regulation (EU) No 1093/2010 establishing a European Supervisory Authority (European Banking Authority), Regulation (EU) No 1094/2010 establishing a European Supervisory Authority (European Insurance and Occupational Pensions Authority), Regulation (EU) No 1095/2010 establishing a European Supervisory Authority (European Securities and Markets Authority), Regulation (EU) No 600/2014 on markets in financial instruments, Regulation (EU) 2016/1011 on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds, and Regulation (EU) 2015/847 on information accompanying transfers of funds, Recital (8).
[147] *Ibid.*

sustainability"[148]. Nevertheless, as the EBA regulation's Article 1(5) – which outlines the agency's primary objectives[149] – was left untouched, these revisions should not be interpreted as supporting a EBA's sustainable (or green) mandate, nor for any EU financial regulatory or supervisory authority as the mandates of the ECB (under the SSM) and the ESRB remain unchanged.

The amendments adopted could find its rationale in protecting the actions of the EBA in matters of sustainability from the challenges raised by the *'Meroni doctrine"*[150], according to which *"discretionary powers implying a wide margin of discretion (which may, according to the use made of them, make possible the execution of economy policy) cannot be delegated by an EU institution, given the risk of prejudice to institutional balance; only clearly defined executive powers, subject to strict review in light of objective criteria determined by the delegating authority, may be delegated"*[151]. It should therefore be ensured that supervisory agencies do not become *"uncontrollable centres of arbitrary powers"*[152], but rather act within their legal boundaries. As a result, the EBA has now a direct legitimacy to issue draft RTS and ITS to build on the Single Rulebook to make the banking system more resilient to climate-related financial risks, but also to introduce considerations of the impact of banks' activities to climate change and the transition.

Using the Basel Capital Accords and the European Union Regulatory and Supervisory frameworks as proxies for the global landscape, it follows that financial regulators and supervisors do not currently hold climate mitigation or sustainable growth objectives within their primary objectives[153], which have traditionally been limited to the promotion of financial stability, protection of

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[148] de **ARRIBA-SELLIER**, Nathan - Turning Gold into Green: Green Finance in the Mandate of European Financial Supervision, p.1103.
[149] Cf. *supra* Section 3.3.1.
[150] Established by the Court of Justice of the European Union (CJEU) in the Case 9-56 Meroni & Co., Industrie Metallurgiche, SpA v High Authority of the European Coal and Steel Community [1958] ECLI:EU:C:1958:7.
[151] **MOLONEY**, Niamh - EU Securities and Financial Markets Regulation, p.909.
[152] **SCHIAVO**, Gianni Lo; **TÜRK**, Alexander - The Institutional Architecture of EU financial regulation: The case of the European supervisory authorities in the aftermath of the European crisis, p.97.
[153] Some central banks (particularly from emerging economies) which have supervisory powers, have more extensive mandates which adopt specific "sustainable" objectives", as in the case of Brazil. In this respect see **DIKAU**, Simon and **VOLZ**, Ulrich - Central Bank Mandates, Sustainability Objectives and the Promotion of Green Finance, Table 1, p.21.ff.

consumers and investors, and the prevention of system risks. Accepting sustainability goals within the primary mandate of regulatory authorities runs the risk of *quack regulation*, potentially leading to further distortions in the market, undermining the primary goal of safeguarding financial stability[154].

Indeed, physical and transition risks pose potential threats for financial stability, which requires a prompt action from financial regulators and supervisors to address the main deficiencies in the current regulatory framework. As **GOULARD** emphasises *"[i]f these actions are lacking or fall short of the required ambition in the implementation, the action of central banks and the mobilization of the financial system will be severely impeded or could even be irrelevant"*[155]. However, such action should be taken with due regard to – and not to the detriment of – the primary objectives of financial regulation and supervision.

Climate policy is ultimately a task of governments which can be achieved through policies aiming a proper pricing of carbon assets (e.g. a carbon tax) and the limitation of carbon-intensive activities and the promotion of *green investments* (e.g. subsidies to *green firms or projects*)[156], while respecting a soft-landing scenario. Banks are then expected to integrate these policies in their governance and risk management strategies.

In turn, the financial policy adjustments to render the financial sector more resilient to climate-related financial risks can deliver positive externalities in the transition to a sustainable economy – by disincentivising banks to '*fuel'* climate change, financial regulation and supervision contribute to the desired divestment in carbon-intensive sectors and activities[157], thus fulfilling the triple materiality feedback loop argued by **PIETIKÄINEN**[158] in a positive manner.

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[154] In this vein, **ALEXANDER**, Kern and **FISHER**, Paul - Banking Regulation and Sustainability, p.30,34; **ZETZSCHE**, D. A. and **ANKER-SØRENSEN**, L. – cit.135, p.30; de **ARRIBA-SELLIER,** N. – cit.148, p.1129.

[155] **GOULARD**, Sylvie - Climate Change and Central Banks: From Financial Stability Considerations to a global Response?. p.183.

[156] See **DRAIJER**, Wiebe and **de VRIES**, Bouke - Greening the Economy: The Role of Banks in the Climate Transition and Challenges. p.26,27.

[157] **SILVA**, Luiz Awazu Pereira da. - How are Central Banks helping to make the Recovery from the Covid-19 Pandemic more sustainable and inclusive?. p.196.

[158] See *supra* Section 1.1., cit.23.

This has been the strategy generally accepted among the internal community. See, for example, the first comprehensive report[159] of the NGFS – a group uniting 121 central banks and supervisors aiming to adopt a coordinated approach to climate change in the financial system. Recognising that climate change is a source of financial risk, the report endorsed a set of recommendations designed to provide guidance to policymakers and supervisors so they can act without jeopardising the current mandates of central banks and supervisors[160]. The same approach has been adopted by the ECB (that, along with the EBA is a member of the NGFS), which issued in November 2020 a "Guide on climate-related and environmental risks"[161], adopting a set of expectations relating to bank's integration of climate-related risks within the EU current regulatory and supervisory framework[162].

In this context, central banks[163] and supervisors have indeed been cautious about the prudential treatment of climate-related risks, showing some reluctance to implement far-reaching reforms that could jeopardise the primary objectives outlined in their mandates[164]. However, by adjusting their current frameworks to consider climate change in a risk-based approach, central banks and supervisors are already playing a strong soft power, encouraging banks to adapt their lending strategies and phase-out from carbon-intensive activities and sectors in their investment decision-making[165]. It is against this background that the following chapter analyses the role of financial regulation and supervision in rendering the financial system more resilient to climate change.

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[159] **NGFS** – cit.52.
[160] *Ibid.,* p.4,28.
[161] **ECB** – cit.34.
[162] *Ibid.,* p.3.
[163] See *infra* Chapter 5.ff.
[164] In this vein, **ZETZSCHE**, D. A. and **ANKER-SØRENSEN**, L. – cit.135, p.34; **SMOLEŃSKA**, Agnieszka and **van 't KLOOSTER**, Jens - A Risky Bet: Should the EU Choose a microprudential or a Credit Guidance Approach to Climate Risk?, p.12.
[165] In this vein, **VOLZ**, U. - On The Role Of Central Banks In Enhancing Green Finance: Inquiry Working Paper 17/01, p.17.

4. Integration of climate-related risks in the current microprudential and macroprudential regulation and supervision frameworks

4.1. Pillar I – Green differentiated capital requirements

One of the core problems within the current international regulatory and supervisory frameworks is the failure of a prudential treatment of climate-related financial risks. On the one hand, climate-related hazards have physical and transition transmission channels that have a direct impact on the classic risk drivers of credit, market, liquidity, and operational concerns[166]. On the other hand, the unique characteristics of climate risks[167] require substantial modifications of the current micro and macroprudential regulatory and supervisory frameworks in order to adequately capture their potential materiality for the financial system. Currently, the main limitations to the identification and measurement of banks' carbon footprint in their portfolios arise from insufficient data, misaligned time horizons, unsuitable processes and methodologies, absence of climate scenarios and lack of expertise knowledge[168].

Under the Basel Pillar I, the capital adequacy of banks is determined according with a risk-weight assessment based on credit risk, market risk, and operational risk exposure, each of which are directly and indirectly impacted by physical and transition climate-related transmission channels. However, the current Basel framework does not adopt a dedicated risk-weight to climate-related exposures, nor does it consider them under the risk parameters used within the risk-weights assessment approaches recommended, with the exception of specific liability risks[169].

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[166] Cf. *supra* Sections 2.2, 2.3, 2.4.
[167] See *supra* Section 2.1.
[168] See in this respect, EBA/DP/2020/03 - EBA Discussion paper On management and supervision of ESG risks for credit institutions and investment firms (30 October 2020), p.49; **BCBS** - Climate-related financial risks: a survey on current initiatives, p. 4.
[169] **ALEXANDER**, Kern - Stability and Sustainability in Banking Reform: Are Environmental Risks Missing in Basel III?, p.15.

More recently, the literature[170] has questioned the possibility to incorporate climate and environmental factors into the banks' capital requirements under Pillar I. In particular, questions are raised about the introduction of a Green Supporting Factor (GSF), a Brown Penalising Factor (BPF), or a combination of both, which would encourage banks to reduce the carbon footprint of their lending and investment portfolios by adjusting minimum capital requirements according to a *green* or *dirty* asset grading.

A GSF lowers the risk weight of eligible *green* assets, which reduces minimum capital requirements for banks providing *green* loans. This incentivises banks to lend to projects, activities, or sectors that are either green (e.g. renewable energies) or supportive of the transition to a sustainable economy (e.g. carbon capture and storage). By doing so, a GSF ultimately encourages banks to support environmentally friendly initiatives and industries. A BPF, on the other hand, disincentivises banks to have a high carbon footprint on their portfolios by introducing a *penalising* factor on the risk weight of carbon-intensive (*brown*) assets, thus leading to additional capital requirements.

At first glance, the biggest obstacle to the implementation of green differentiated capital requirements (GDCRs) is the need to adopt a classification scheme of what is *green*, what is *greening*, and what is *brown* within the minimum capital requirements framework, for each class of assets. While, for example, the EU the Taxonomy Regulation[171] could be used as a reference, it would still require screening criteria to assess banks' compliance with the taxonomy[172].

On the other hand, if the risk assessment is based on data regarding the scope 1,2, and 3 emissions[173] of the banks' counterparties – the methodologies for which have so far been left to banks' discretion –, the introduction of GDCRs

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[170] See **CAMPIGLIO**, Emanuele et al. - Climate change challenges for central banks and financial regulators. **D'ORAZIO**, Paola; **POPOYAN**, Lilit - Fostering Green Investments and tackling climate-related financial risks: Which role for macroprudential policies? p.10; **HLEG** – cit.144, p.68.; **BOLTON**, P. et al. - cit.40, p.52.

[171] Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment and amending Regulation (EU) 2019/2088.

[172] In this vein, **RISO**, Antonio Luca - Which role for the Prudential Supervision of Banks in Sustainable Finance?, p.289,290.

[173] The definition of scope 1,2,3 emissions is provided *infra* in footnote 251.

could give banks an incentive to underestimate risks[174], whether derived from their own limitations in obtaining data, or the possibility of modelling their internal controls in this direction.

Secondly, **BOLTON** et al. emphasise that *"the "greenness" or "brownness" of assets do not necessarily correspond to their vulnerability to climate-related risks. For instance, "green" assets are subject to both transition risks (eg because of the technological and regulatory uncertainty related to the transition) and physical risks (eg a renewable power plant could be impacted by extreme weather events)"[175].*

Additionally, the introduction of a GSF or a BPF does not necessarily imply that banks choose to reallocate more or less capital towards *green* or *brown* assets. Overall, the introduction of GDCRs has macroeconomic effects, impacting credit supply and reallocation, as well as the cost of borrowing[176]. Indeed, the introduction of a GSF (BPF) increases (decreases) the supply of credit for *green* (*brown* and *conventional*) assets, but the reallocation of capital towards *green credit* is not always linear. However, because the capital adequacy ratio is higher (lower) for *green* (*brown*) assets, the loan spread is expected to decrease (increase)[177].

DAFERMOS and **NIKOLADI** demonstrate that the effects of the implementation of GDCRs are not qualitatively strong, despite the fact that *"they can play a supportive role in mitigating climate risks for the financial system"[178].* The isolated introduction of GDCRs does not significantly change the allocation of capital[179] – for example, a GSF does not result in a significant credit rationing of *conventional* and *dirty* loans, but rather increases the bank's credit supply towards green loans. These effects could be counterbalanced if the GSF and the BPF were implemented simultaneously, and could be even stronger if applied together with *green fiscal policies[180]* (e.g. carbon tax or green loan subsidies). Furthermore, the

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[174] In this vein, **SMOLEŃSKA**, Agnieszka and **van 't KLOOSTER**, Jens - cit.164, p.17.
[175] **BOLTON**, P. et al. - cit.40, p.52.
[176] See **DAFERMOS**, Yannis; **NIKOLAIDI**, Maria - How can green differentiated capital requirements affect climate risks?. p.6,7.
[177] *Ibid.*
[178] *Ibid.,* p.16.
[179] *Ibid., p.11-13.*
[180] *Ibid., p.13-16.*

authors highlight the dangers of an isolated national implementing of GDCRs, which may trigger *'regulatory arbitrage'* practices, whereby banks relocate operations into countries using a GSF and out of jurisdictions employing a BPF[181].

Against this background, the trade-off between the positive impact of GDCRs to the environment and the risks of creating market distortions can raise questions as to the compatibility of these type of policies with the mandate of financial supervision to safeguard the stability of the financial system[182]. In this vein, **ARRIBA-SELLIER** considers that *"[i]ntegrating sustainability considerations in the conduct of financial supervision could run against the supposed market neutrality of supervision, a concept imported from monetary policy"[183].* Although the existence of the principle is disputable, supervisors are expected to *"remain neutral in their operations impacting on market sectors and market players, to preserve free and fair competition, as well as economic and technological innovation"[184].* The respect for this principle could draw a red line for the introduction of GDCRs, where the different prudential treatment on *green* or *brown* assets may have a negative impact on the stability of the banking system. For example, the implementation of a GSF could lead banks to increase their leverage as a result of the increased credit supply to *green* assets[185].

Nonetheless, a number of studies in favour of the implementation of a BPF find support in evidence that the current short-termism of the Pillar I shows a *carbon-bias* in favour of the carbon intensive sector[186]. In light of these findings, a penalising factor could reflect a more risk-based approach in tackling the exposure of banks to climate-related financial risks, instead of rewarding banks that are financing the sustainable transition[187].

Overall, the introduction of differentiated capital requirements, even considering the risk-based approach of a BPF would be prompting a different treatment of

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[181] *Ibid*., p.16,17; In the same vein, **ALEXANDER**, K. and **FISHER**, P. – cit.154, p.13.
[182] **ALEXANDER**, K. and **FISHER**, P.- cit.154, p.13.
[183] **ARRIBA-SELLIER**, N. – cit.148. p.1129.
[184] *Ibid.,* p.1130.
[185] **DAFERMOS**, Y.; **NIKOLAIDI**, M. – cit.176, p.4.
[186] See **LIEBREICH**, Michael - Financial Regulation – Biased against Clean Energy and Green *Infra*structure?. Discussion paper prepared by the Global Agenda Council on New Energy Architecture. p.3; **ALEXANDER**, Kern - cit.169, p.15.
[187] See **SYMON**, Julia - A silver bullet against green swans: Incorporating climate-related financial risk into bank and insurance prudential rules. A Finance Watch report, p.8.

climate-related financial risks from the typical risk drivers of credit, market, liquidity and operational risk in which physical and transmission channels exist[188]. Therefore, although the current Pillar I capital requirements do not specifically target climate-related risks, the existing framework is well placed to integrate them within the existing risk weighted assets assessment, provided that some adjustments are made as to adopt a long-time horizon that reflects the materiality of climate risks for future generations.

Furthermore, given the banking system's current lack of a reliable and standardised source of data, introducing differentiated capital requirements would be premature and could lead to inconsistencies in the prudential treatment of climate-related financial risks[189].

Recently, the BCBS issued the *"Principles for the effective management and supervision of climate-related financial risks"*[190] which not only endorses a set of recommendations to banks, but also embed climate-risks within the supervisory review process. The principles follow a cautious regulatory approach by encouraging banks and supervisors to identify and quantify climate-related risks within the existing capital and liquidity assessment.[191] In this respect, the EU prudential framework, which adopts the Basel capital requirements, reflects a similar treatment to climate risks, although the EBA has been requested under Article 501c of the CRR to assess (in consultation with the ESRB) the need to adopt a specific prudential treatment regarding banks' exposure to climate risk, which report is expected to submit to the EU Commission by June, 2025.

4.2. Pillar II – Integration of climate risks in the Supervisory Review Process

Against this background, the first-best approach to the prudential treatment of these risks has been to request banks to adapt their risk management

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[188] In this vein, **FERIDUN**, Mete; **GÜNGÖR**, Hasan - Climate-related prudential risks in the Banking Sector: A review of the emerging regulatory and supervisory practices, p.9.
[189] See, in this vein **ZETZSCHE**, D. A. and **ANKER-SØRENSEN**, L. - cit.135, p.4,40; **WEIDMANN**, Jens - What Role should Central Banks play in Combating Climate Change, p.162,163.
[190] **BCBS** - Principles for the effective management and supervision of climate-related financial risks
[191] *Ibid.,* p.4.

frameworks in order to incorporate climate-related risks exposures. This approach, however, has been criticised for the inconsistent treatment of climate risks within the microprudential framework[192], where banks are required to disclose information while facing with the limitations inherent to the collection of data, especially from their counterparties[193]. The position of the regulator in this matter might find its rationale in the inherent limitations of the supervisor to have the desired level of knowledge to adopt far-reaching legislation. As a result, supervisors are relying on banks to develop their own models for incorporating climate-related risks into their risk management frameworks, adopting a "test-and-learn" approach[194]. See, for example, the ECB's recommendation for banks to *"incorporate climate-related and environmental risks as drivers of existing risk categories into their 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"*[195].

The prudential treatment of climate-related financial risks in current regulatory and supervisory frameworks has relied on Pillar II of the Basel Framework, which is based on the ICAAP and stress testing exercises.

The guidance provided by the ECB is not yet binding for banks, but rather takes a soft law approach to incentivise banks to quickly adapt their governance, business strategies, and risk methodologies to climate-related risks. For this purpose, the SREP is the main supervisory tool that allows supervisors to monitor banks' resilience to potential shocks from climate risks on an ongoing basis.

The ICAAP is the main assessment tool used by supervisors within the SREP, where banks are expected to consider any sources of risk that may arise from their business strategy, products, and services. In this context, institutions are expected to document and thoroughly analyse the materiality of climate-related risks within the different risk drivers, including credit, market, liquidity, and

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[192] **SMOLEŃSKA**, A. and **van 't KLOOSTER**, J. – cit.174, p.8.
[193] See *infra* section 4.3.2.
[194] **ZETZSCHE**, D. A. and **ANKER-SØRENSEN**, L. - cit.135, p.41.
[195] **ECB** – cit.34, p.31.

operational risks. In particular, they should consider "*their transmission channels and impact on the risk profile. Moreover, institutions are expected to justify an assessment of non-materiality, specifying and documenting the qualitative and quantitative information underlying that assessment"*[196].

Furthermore, as part of the ICAAP, banks are expected to perform stress tests with a view to identify and assess vulnerabilities within their internal controls. However, the main limitation of this approach is that typical stress testing methodologies rely on historical data to estimate the probability and severity of future risk materialisation. This limitation may not be sufficient for accurately assessing the potential impact of climate-related risks on banks, due to the lack historical data to extrapolate information and the uncertainty that characterises this source of risks, thus requiring a forward-looking approach[197].

The development of a climate scenario-based risk management approach can thus provide banks with more reliable information with regards to their resilience to future climate and transition shocks. However, **BOLTON** et al. stresses that given the uncertainty and fat-tailed distribution of climate-risks, a "*climate-related scenario analysis cannot by itself enable a financial institution or the financial system as a whole to avoid and withstand "green swan" events"*[198]*.* Furthermore, the typical time horizon in which scenarios are typically build (1-3 years) must be adapted to capture the long-term reality of climate change and the transition[199].

The BCBS recent supervisory guidance for the prudential treatment of climate-related financial risks include recommendations for banks to 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"*[200] reflecting physical and transition channels over a wide range of time horizons.

Currently the main limitations to the identification and measurement of banks' carbon footprint in their portfolios were related with insufficient data[201],

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[196] *Ibid.*
[197] **BOLTON**, P. et al. – cit.40, p.10.
[198] *Ibid.,* p.31.
[199] **SMOLEŃSKA**, A. and **van 't KLOOSTER**, J. – cit.174, p. 20.
[200] **BCBS** - cit.191. Principle 12, p.7.
[201] See *infra* Section 4.3.2.

methodological challenges, time horizon misalignments, absence of climate scenarios and lack of expertise knowledge[202]. Against this background the development of scenario analysis and stress tests methodologies that banks could use to accurately assess their own vulnerabilities both at sector and regional level could be a key supervisory tool to support banks' climate risk assessment[203].

4.2.1. Corporate governance

A key component of the Supervisory Review Process concerns the governance of banks, with a focus on the company structure and business strategy, board and management members, remuneration policies, internal controls, and risk management procedures. In this regard, it is critical to answer the question of what the bank's purpose is when carrying out its activities. Typically, such a purpose is found in corporates' charters along with the delimitation of their economic activities[204]. Because banks have a pivotal role to play in the economy at large, banking corporate governance goals should be extended to ensure the alignment of the incentives of *"bank managers and shareholders with the brother interests of societal stakeholders in ensuring that systemic risks are limited"*[205] and, thus, to limit negative externalities to the broader economy in case the bank fails.

The regulation of bank corporate governance came under particular scrutiny after the 2009 Global Financial Crisis. The misalignment of incentives between management, shareholders, and creditors was one of the failures that led to the banking system's collapse, by following an excessive risk-taking approach based on unsound compliance and risk management internal controls, remuneration

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[202] EBA/DP/2020/03. Cit.168, p.4.
[203] Cf. *infra* Section 4.5.
[204] The purpose of a corporation is not universally agreed upon in different legal systems. Some prioritise the interests of shareholders by maximising the value of the firm, while others consider moral or ethical obligations to stakeholders and society as a whole. This can involve the adoption of a Corporate Social Responsibility approach, which raises questions about how to balance profit maximisation and social value in a capitalist system. See in this respect, **FISCH**, Jill E. and **DAVIDOFF** Solomon, Steven - Should Corporations have a Purpose; and **FERRARINI,** Guido - Redefining Corporate Purpose: Sustainability as a Game Changer. p.86.
[205] **ALEXANDER**, K. – cit.72. p.128.

policies promoting short-term profits, and a general lack of accountability of bankers towards their customers[206]. As a consequence, the reforms undertaken in the international regulatory framework seem to have limited banks' corporate purpose to a primarily stakeholder-driven approach, aiming to protect depositors. Indeed, the BCBS adopted a set of principles on good corporate governance practices, of which the current version places stakeholders at the heart of the primary corporate governance goals, and among these, *"particularly with respect to retail banks, shareholders' interest would be secondary to depositors' interest"*[207].

In the EU although the regulatory landscape reflects to a large extent the Basel Capital Accords framework, thus adopting a similar approach in the CRD[208], the EU Commission has adopted in 2011 a new business approach focused on Corporate Social Responsibility (CSR)[209] which is also binding for banks. Respectively, corporations should seek to incorporate a responsible business conduct where processes are put in place *"to integrate social, environmental, ethical, human rights and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders, with the aim of: – maximising the creation of shared value for their owners/shareholders and for their other stakeholders and society at large; – identifying, preventing and mitigating their possible adverse impacts"*[210]. In particular, the renewed strategy encourages corporations *"to carry out risk-based due diligence, including through their supply chains"*[211].

Currently, the bank's board of directors and senior management are subject to 'fit and proper' assessments to guarantee a wide range of skills, expertise and

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[206] See **ERKENS**, David Hendrik and **HUNG**, Mingyi and **MATOS**, Pedro - Corporate Governance in the 2007-2008 Financial Crisis: Evidence from Financial Institutions Worldwide.
[207] **BCBS** - Guidelines: Corporate governance principles for banks, p.3.
[208] Respectively, Chapter 2, Sub-section II, Sub-section 3 (Articles 88.ff.). of the CRD.
[209] COM(2011) 681 final, COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS - A renewed EU strategy 2011-14 for Corporate Social Responsibility.
[210] *Ibid.*, p.6.
[211] *Ibid.*; In this respect, see *infra* section 4.3.2.

experience backgrounds that promote a diversity of views which are conductive to a full understanding of the bank's business complexity and risk profile[212].

In light of these requirements, the "triple materiality" feedback loops involving climate change, the transition, and the financial system[213] might provide the rationale for the incorporation of a CSR approach into the corporate governance of banks within the current regulatory framework.

Recognising that climate change is the new source of '*fat-tailed*' financial risk of the century, avoiding the mistakes of the past requires the development of sound corporate governance structures capable of capturing climate-related financial risks in their full spectrum. In this respect, considering the multidisciplinary nature of climate-related financial risks, regulation and supervision have a role to play in ensuring the presence of sustainability expertise among members of the board and senior management, capable to realise the impact of different climate scenarios and the pathway to a sustainable economy within the bank's business strategy and risk appetite[214]. Indeed, the exposure of banks to climate risks can be minimised if the latter are under the obligation to particularly consider this source of risk within the adopted business strategy, risk management framework and internal controls, including the management body composition and remuneration policies[215].

International policymakers' first regulatory response to climate-related financial risks has, however, been cautiously implemented. Rather than enacting legislative changes, it first chooses to create guidelines or supervisory expectations that banks are required to follow[216].

For example, the UK Regulatory Authority (PRA), *"expects a firm's board to understand and assess the financial risks from climate change that affect the firm,*

[212] **BCBS** – cit.207, Principle 2, p.13,14,39; **CRD,** Article 91.
[213] See *supra* Section 1.1., in fine.
[214] **ZETZSCHE**, D. A. and **ANKER-SØRENSEN**, L. - cit.135. p.36.
[215] See in this vein, **SCHOENMAKER**, D. and **van TILBURG**, R. – cit.58, p.13; **ALEXANDER**, K. and **FISHER**, P.- cit.154 p.7,8,9.; **RISO**, A. – cit.172, p.321.
[216] **SMOLEŃSKA**, A. and **van 't KLOOSTER**, J. – cit.174, p.18-21.

and to be able to address and oversee these risks within the firm's overall business strategy and risk appetite"[217].

The ECB, acting within its supervisory responsibilities, issued the *"Guide on climate-related and environmental risks"*[218], whereby building upon the Article 74 of the CRD, it expects the management body of banks 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"*[219]. Furthermore, the ECB expects banks' management bodies to *"consider the knowledge, skills and experience of its members in the area of climate-related and environmental risk in its assessment of the collective suitability of such members"*[220].

In the same vein, the BCBS *"Principles for the effective management and supervision of climate-related financial risks"*[221] advise banks to develop and implement processes to understand and evaluate the potential impacts of climate-related risks on their businesses, including possible adjustments in the board and senior management with a view to ensure an adequate understanding and expertise in managing these risks. Furthermore, banks should also consider whether changes to compensation policies may be necessary and ensure that their risk management frameworks are consistent with their stated goals and objectives.

Banks' compliance with the aforementioned recommendations is then assessed under the SREP. While there are no sanctions strictly attached to banks' failure to comply with such recommendations, the high level of transparency and dialogue in which banks and supervisors are expected to operate[222] facilitates the leverage that supervisors can exercise to promote the incorporation of climate-related factors into banks' governance frameworks.

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[217] **PRA** (April, 2019) - Supervisory Statement SS3/19 Enhancing banks' and insurers' approaches to managing the financial risks from climate change, p.4.
[218] **ECB** – cit.34.
[219] *Ibid.,* Expectation 3, p.21.
[220] **ECB** – cit.34, p.22.
[221] **BCBS** - cit.191, Principles 1 and 2, p.3, and Principle 13, p.8.
[222] **BCBS** - Overview of Pillar 2 supervisory review practices and approaches (June 2019), p.9; See *infra* section 4.3.

4.3. Pillar III – Disclosure of climate-related financial risks

The disclosure of climate and environmental considerations in the banks' governance, internal risk management and business strategy can reveal a powerful tool both in a macroprudential and a macroprudential perspective.

From a microprudential perspective, it is of paramount importance that financial supervisors have the necessary information to measure the soundness and effectiveness of each bank operating system in terms of business strategy, risk appetite and compliance with the applicable regulatory framework to remain resilient to potential financial shocks.

Under the Basel framework, the prudential treatment concerning bank's disclosure requirements is found under the Pillar 3 of the Basel Framework. Although it is primarily a tool of market discipline, it is an important supplement to Pillar 2 by providing information necessary under the SREP assessment[223], where banks are expected to operate in a high level of transparency and dialogue[224].

Although the main aim of the SREP is to assess the need of additional capital requirements, there is an array of corrective actions that supervisors might take in the outcome of the assessment envisaging to address to specific deficiencies identified in the bank's business operations and activities, governance structure or internal controls[225].

In this respect, projects promoting the disclosure of corporation's business models' alignment with the Paris Agreement[226] are already being used by banks as a reputational tool[227], through which banks are incentivised to decarbonise their portfolios. However, as emphasised by **ALEXANDER** and **FISHER**, *"information is not consistent across markets and countries, lacks comparability, and is often unreliable"*[228].

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[223] Cf. *Supra* Section 3.2.2.
[224] **BCBS** - Overview of Pillar 2 supervisory review practices and approaches. June 2019. p.9.
[225] *Ibid.,* p.17.
[226] For example, the CDP and TCFD-FSB. Cf. *supra* Section 1.2.
[227] **BCBS** cit.168, p.6.
[228] **ALEXANDER**, K. and **FISHER**, P.- cit.154, p.6.

At the present moment, as the financial sector primarily aims to identify its exposure to climate and transition financial risks, the enforcement of disclosure requirements proves to be the regulatory tool of choice to meet this objective. The integration of climate-related disclosure requirements under the prudential regulatory framework is deemed necessary for two reasons. First, it can complement the SREP by allowing for ongoing monitoring of banks' exposure to climate-related financial risks through the assessment of their governance and risk management frameworks[229]. Second, it can provide a reliable, standardised, and comprehensive source of information about the overall banking system's exposure to climate risks, which can serve as a powerful macroprudential tool for managing climate-related risks in the financial sector[230].

In the context of the EU, the disclosure requirements that reflect the Basel framework pillar III are laid down in the Part Eight of the CRR (Articles 431 et. seq.), which require banks to publicly disclosure information that is material for the economic decision-making, but that is not proprietary or confidential. The assessment of materiality is up left up at the discretion of each bank, but the EBA issues guidelines on the constituting factors of such assessment[231]. With respect to climate-related risks, the ECB expects banks to *"duly consider reputational and liability risks associated with institutions' impact on the climate and environment"*[232], and *"not to prematurely consider climate-related and environmental risks as immaterial owing to their long term nature"*[233].

In case the bank *"deems climate-related risks to be immaterial, the institution is expected to document this judgement with the available qualitative and quantitative information underpinning its assessment"*[234], pursuant to the definition of materiality present in the Article 432(1) of the CRR.

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[229] **CAMPA**, Jose Manuel - Enhancing ESG Governance, Disclosure and Risk Measurement in Credit Institutions. p.171.
[230] **BARANOVIĆ**, Ivana, et al. - The challenge of capturing climate risks in the banking regulatory framework: is there a need for a macroprudential response?.
[231] EBA/GL/2014/14 Guidelines on materiality, proprietary and confidentiality and on disclosure frequency under Articles 432(1), 432(2) and 433 of Regulation (EU)No 575/2013. December 2014.
[232] ECB – cit.34, p.41.
[233] *Ibid.,*
[234] *Ibid.,*

In this context, the EBA published in January 2022, biding standards on Pillar 3 disclosures on ESG risks[235] where, aiming to establish a standardised disclosure criteria for climate-related financial risks, it adopted a Key Performance Indicator (KPI) to measure banks' alignment with the objectives of climate change adaptation and mitigation. For this purpose, the EBA introduced a Green Asset Ratio (GAR), which builds upon the Taxonomy Regulation[236] to measure the proportion of the bank's total eligible assets that are currently taxonomy compliant. Under the draft ITS, banks are thus required to disclosure both qualitative and quantitative information on their mitigating actions and exposures of on their lending and financing activities – which include loans, advances and debt securities, equity holdings, commercial services that generate commission income (e.g. advisory services), and off-balance-sheet operations – to ESG risks. In particular, banks are required to disclose the scope 3 GHG emissions[237], in line with the work developed by the FSB-TCFD[238]. As a result, banks are expected to disclose information on the current and expected future carbon-footprint of the portfolio, the volume of exposures by sector and counterparty, as well as credit risk exposures and volume of collateral considering the geographic allocation of the activity or collateral (with indication of the geographies highly exposed to physical risks). In addition, banks are required to disclosure qualitative information on the integration of climate and environmental factors and alignment with the Taxonomy in their governance, business strategy and processes, and risk management metrics and targets[239]. The main limitation to the effective accomplishment of these reporting requirements is the lack of relevant data from counterparties, which "*may not be in a situation to provide the information needed by credit institutions to properly classify and report the risks"*[240].

Furthermore, the revision of the Accounting Directive[241] introduced a mandatory non-financial statement for large corporations of *"public interest*" (i.e. listed

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[235] **EBA/ITS/2022/01** Final draft implementing technical standards on prudential disclosures on ESG risks in accordance with Article 449a CRR. January 2022.
[236] See *infra* Section 4.4.
[237] See *infra* note 215 for the definition of scope 1,2,3 GHG emissions.
[238] **TCFD-FSB** – cit.46.; Cf. *infra* Section 4.5.1.
[239] **EBA/ITS/2022/01** cit.239. p.26.
[240] **CAMPA**, Jose Manuel – cit.229, p.172.
[241] Directive 2013/34/EU of the European Parliament and of the Council of 26 June 2013 on the annual financial statements, consolidated financial statements and related reports of certain types

enterprises) exceeding 500 employees, including banks and insurance companies, requiring mandatory public disclosures on four main subjects: environment, social and employee issues, human rights, and bribery and corruption. It introduces the concept of *"double materiality"*[242] where subject entities must report both on how they are affected by ESG-related issues and the impact of their business on the climate, the environment and the society.

The Non-Financial Reporting Directive (NFRD)[243] which entered into force in 2018 revealed as insufficient to achieve the ambitious EU net zero by 2050 target. Indeed, the lack of standardised reporting (despite the non-binding guidelines published by the EU Commission[244]), limited scope (only covering approximately 11700 enterprises) and the lack of an auding mechanism, adopting a *comply or explain approach* (ultimately resulting in a political tool rather than a mandatory system) are at the core of its main critics[245].

Recently, the EU Commission adopted a proposal for a Corporate Sustainability Reporting Directive (CSRD)[246] introducing a mandatory, and subject to auditing, EU sustainability standards for all listed enterprises (including SMEs but excluding micro-enterprises) on regulated markets, thus aiming to replace the NFRD and establish a legally binding framework for sustainability reporting in the EU. Although these requirements are not adopted within the ESFS, they bind banks to adopt forward-looking beyond risk-based approach towards a value-based approach, as advocated by **SCHOENMAKER** and **SCHRAMADE**[247]. By requiring corporates to publicly disclose their sustainable agenda, the NFRD incentivises banks to lend *"to companies that are changing, or have changed,*

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of undertakings, amending Directive 2006/43/EC of the European Parliament and of the Council and repealing Council Directives 78/660/EEC and 83/349/EEC.

[242] Cf. *supra* Section 1.1.

[243] Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial
and diversity information by certain large undertakings and groups.

[244] **Communication from the Commission** — Guidelines on non-financial reporting (methodology for reporting non-financial information). Official Journal 2017/C 215/01; **Communication from the Commission** — Guidelines on non-financial reporting: Supplement on reporting climate-related information. Official Journal 2019/C 209/01.

[245] See **KENADJIAN**, Patrick - What we meant by "The Chance for Europe": Betting on the Brussels Effect, p.75,82,83.

[246] COM(2021) 189 final - Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2013/34/EU, Directive 2004/109/EC, Directive 2006/43/EC and Regulation (EU) No 537/2014, as regards corporate sustainability reporting.

[247] **SCHOENMAKER**, D. and **SCHRAMADE**, W. – cit.19, p.303 – 311. See *supra Section 1.1.*

their business model from the linear to the sustainable economy"[248]*.* Furthermore, pursuant to the Taxonomy Regulation[249], enterprises subject to the NFRD must disclose, in their non-financial report, how and to what extent their activities qualify as environmentally sustainable.

4.3.1. Climate-related due diligence in lending operations

The main limiting factor identified by banks to effectively incorporate climate-related financial risks in their lending strategies is the availability of data and the inadequacy of traditional methodologies to quantify the impact of climate change in their portfolios[250].

Because physical and transition climate-related risks differ from traditional types of financial risks in terms of uncertainty, lack of historical data, and long-time horizons, banks are being compelled to make significant changes to their risk management models in order to determine how exposed their current and future activities are to these risks. There is indeed an informational hazard that impairs banks from obtaining information which has been mostly addressed through non-binding voluntary disclosures.

In this context, the FSB-TCFD developed a voluntary system of climate-related financial disclosures where companies across sectors, including banks, would identify, assess and manage climate-related financial risks and opportunities[251].

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[248] *Ibid.*, p.305.
[249] Cf. *infra* Section 4.5.1.
[250] **BCBS** – cit.168, p.4.
[251] The definition of Scope,1,2, and 3 emissions is adopted with the GHG Protocol. Scope 1 emissions account for direct emissions from "operations that are owned or controlled by the operating company", such as fossil fuel combustion and chemical production from the company's facilities and vehicles. Scope 2 and scope 3 emissions measure indirect emissions, where the first accounts for GHG "emissions from the generation of purchased electricity, steam, heating, and cooling that is consumed by the reporting company", while the latter is defined as "all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions" – upstream emissions arise from purchased or acquired goods and services such as capital goods, fuel and energy-related activities not accounted in scope 1 or 2, waste generation, transportation and distribution, employee commuting and business travel. On the other hand, downstream emissions are indirect GHG emissions that arise after the sale of produced goods and services provided, namely those relating with the distribution and storage, further processing, use, and end-of-life treatment of sold products, leased assets, franchises and investments. See **Greenhouse Gas Protocol** - Corporate Value Chain (Scope 3) Accounting and Reporting Standards, p.69, 149.

In order to assess the carbon footprint on their lending portfolios it is of particular importance that banks can obtain information primarily on their clients' scope 1 and scope 2 emissions and assess their own scope 3 emissions[252]. Currently corporate disclosures on GHG emissions are limited or optional which results in a major issue for banks to set Paris-aligned targets, assess risks and opportunities.

In the same vein, **MACCHI** and **BERNAZ** find support on the UNGPs and the e OECD Guidelines to argue that banks have been contributing to climate change by representing the main investors of fossil fuel projects and having minority shareholding of carbon-intensive corporates[253], thus emitting a large amount of Scope 3 emissions. In line with **DOMBRET**, which notes that Scope 3 emissions in one corporate are Scope 1 and 2 emissions of corporates in their value chain[254], it is necessary to build an integrating framework of corporate disclosures that allow the measure of scope 3 emissions in their full spectrum.

Within the financial sector, **MACCHI** and **BERNAZ** argue that since the adverse impacts of climate change and environmental damage target human rights, climate change due diligence fits into the framework of UNGPs and likewise, it should be understood as an ongoing process that start in a pre-contractual phase with a risk assessment which *"entails a double challenge, namely, identifying the impact of a client's activities on the climate and, consequently, assessing its own involvement in such impacts by means of its financing or lending to that client"*[255].

Secondly, it follows from the UNGPs framework that enterprises and institutional investors should exercise leverage over businesses enterprises in order to prevent or mitigate potential or on-going adverse impacts. For banks, this entails a responsibility to engage with clients to build a long-term sustainable strategy which adequately identify, assess, address and mitigate climate change and environmental harm within their own activities as well as within their business relationships, namely by disclosing on indicators such as their Scope 1 and 2 emissions. In this context, key regulatory contributions, including those

[253] **MACCHI**, C.; **BERNAZ**, N. - cit. 65, p.4-6.
[254] See **DOMBRET**, A. – cit.17. p.13,14.
[255] **MACCHI**, C.; **BERNAZ**, N. – cit.65, p.8.

developed by non-governmental organisations, can be mentioned, as the CDP[256], and the GRI standards developed by the Global Sustainability Standards Board (GSSB)[257].

The Sustainability Banking Network (SBN) brings together financial regulators and central banks aiming to improve the bank's risk management and governance with regards to the management and disclosure of climate risks. For this purpose, it developed a measurement framework encouraging regulators to develop and Environmental and Social Risk (E&S) management framework where banks are required to carry out E&S due diligence within their lending decision-making[258].

These voluntary schemes, while admirable in their efforts to bridge the date gap, are unable to ensure a standardised approach in the models used or the information collected among market participants. Banks adopt the systems they see fit, which hinders a homogeneous and coordinated assessment of the banking system's overall exposure to climate-related financial risks. Financial regulation and supervision could therefore have a role to play in developing standardised metrics and methodological standards that allow a comprehensive, granular and reliable data set[259].

In the EU context, **KOPP** and **MASSOW** report that the Taxonomy has been a useful tool for banks to assess their clients' economic activities sustainability or substantial contribution to climate and environmental harm mitigation, based on the performance thresholds present in the screening criteria for *"substantial contribution" or "do no significant harm"* [260]. Although the taxonomy is not limiting for banks' lending activity, it is proving to be a powerful regulatory instrument to encourage the transition of their portfolios towards sectors and activities more aligned with European objectives, which will include changing their strategy[261], but also exercising leverage on their counterparts to encourage them to reduce

[256] Cf. *supra* Section 1.1.
[257] **GRI** - GRI Standards Consolidated Set of the GRI Standards. GRI 305: Emissions 2016.
[258] **SBN** - Global Progress Report February 2018.
[259] **NGFS** (July, 2012) - Final report on bridging data gaps.
[260] **KOPP,** Matthias and **MASSOW**, Valentin von - Setting the Scene and Speed for Greening the Finance Sector – what Governments must do, p.140.
[261] Cf. See 1.2.

emissions in their activities and adopt a sustainable strategy. However, such a change should not entail withdrawing from relationships with polluting companies, but rather engaging with them to develop transition plans, such as investing in new technologies and processes that are aligned with the Paris goals[262]. **MACCHI** and **BERNAZ** argue, in this regard, that banks should not compensate their failure to exercise leverage on a non-compliant or high-emitting company by increasing its share in *green investments*, underlining that outcome to a non-compliant client should be the termination of the business relationship[263].

However, in the EU regulatory landscape, the prudential treatment of climate-related financial risks is inconsistent. On the one hand, banks are now required, under the Article 449a of the CRD to disclose information on their counterparties' Scope 1,2, and 3 emissions. On the other hand, the existing prudential framework leaves to banks the responsibility to develop their own methodology and sources of information, only requiring qualitative disclosures as to the choice of such methods[264]. Indeed, pursuant to the EBA ITS[265] on ESG prudential disclosures, only loans or assets classified as *taxonomy aligned* can be reported by banks under the GAR, however, specific guidance to obtain this information from counterparties is not provided.

Recently, the EU Commission adopted a EU Parliament Directive proposal on corporate due diligence and corporate accountability, requiring corporates (including financial institutions) operating in the internal market to conduct human rights and climate due diligence within their risk assessment framework aimed at *"identify, assess, prevent, cease, mitigate, monitor, communicate, account for, address and remediate the potential and/or actual adverse impacts on human rights, the environment and good governance that their own activities and those of their value chains and business relationships may pose"* [266]. However, the proposal leaves companies' discretion as to the processes to be used in this

[262] **DOMBRET**, A. – cit.17, p.15.
[263] **MACCHI**, C.; **BERNAZ**, N. – cit.65, p.15.
[264] EBA/ITS/2022/01. Cit.235, p.10.
[265] *Ibid.*
[266] European Parliament resolution of 10 March 2021 with recommendations to the Commission on corporate due diligence and corporate accountability (2020/2129(INL)). Annex to the resolution, Recital (20).

context, while requiring that these are adequately outlined within the scope of Article 5 (1) (c).

4.4. Pillar III – Market conduct and protection of investors

An important component of building a sound and resilient banking system requires consumer and investor protection. The last global financial crisis, however, revealed a number of mis-selling banking practices where investors were faced with erroneous or overly complex information that prevented them from thoroughly understanding and assessing the risks associated with financial products[267]. These were overcome through the regulation of marketing practices and disclosure of information.

Recently, the shift in preference towards more sustainable investment products has led to the emergence of an increasing number of financial packages claiming to be aligned with climate change mitigation or the sustainable transition. Usually, the main criteria to distinguish these products from conventional ones is the use of proceeds, for example, *"a bond or a loan the proceeds of which (i.e. the monies borrowed by the issuer of the bond or by the borrower(s) under the loan) are to be used to finance a certain "green" or "social" project (e.g. construction or renovation of environmentally friendly buildings, means of transport, energy plants or construction of social housing) are commonly referred to as "green bonds/loans" or "social bonds/loans", respectively"[268].*

However, the lack of a harmonised set of definitions of what is green, sustainable or transition-aligned has prompted concerns about "*"greenwashing"* of financial products. The term *"greenwashing"* encompasses disloyal business practices which take an advantage on the market sentiment change towards sustainability and marketing certain products or services as *sustainable*, *green*, or *environmentally friendly,* without specifically following any of those strategies[269].

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[267] **ALEXANDER**, K. - 72, p.238.
[268] **DRIESSEN**, Marieke – cit.138, p.331.
[269] Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088, Recital (11).

Against this background, the creation of labelling schemes aiming to establish a harmonised definition of climate-related sustainable terms is of particular relevance to maintain the desired level of transparency in the market. In this context, the EU has been a pioneer through the adoption of two regulations: The Taxonomy Regulation, and the Sustainable Finance Disclosure Regulation (SFDR)[270].

The Taxonomy Regulation accomplishes the EU SFAP aim of establishing a *"unified classification system for sustainable activities"*[271], thus aiming to provide clarity on activities that can be considered *sustainable* for investment purposes based on four main criteria: the substantial contribution to one of the environmental objectives laid down in its Article 9; the Do No Significant Harm (DNSH) to other environmental objectives principle; the compliance with the OECD Guidelines and the UNGPs; and compliance with minimum screening criteria established by the Commission. The Taxonomy is therefore a powerful tool for investors, which can trust the sustainable label of a financial product, service or asset and thus better protected against *"greenwashing"* practices[272].

The SFDR aims to accomplish the EU Commission SFAP through enhancing disclosure requirements *"on the integration of sustainability risks, on the consideration of adverse sustainability impacts, on sustainable investment objectives, or on the promotion of environmental or social characteristics, in investment decision-making and in advisory processes"*[273]. Pursuant to the SFDR, banks providing financial products and advice are required to provide pre-contractual disclosures specially directed at end-investors regarding the consideration of sustainability risk on an array of categories such as the on the expected return of financial products, remuneration policies and marketing communications.

In practice, the effectiveness of the disclosures arising from Taxonomy Regulation and SFDR may be hampered by the absence of a strong prudential

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[270] Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector
[271] SFAP, cit.12, Objective 2.1, p.4.
[272] **GORTSOS**, Christos - The Taxonomy Regulation: More Important Than Just as an Element of the Capital Markets Union. p.355-358.
[273] Regulation (EU) 2019/2088, cit.270, Recital (10).

framework that closes the data gap necessary to achieve the desired level of reliability regarding the quantification of climate risks. In this vein, **KENADJIAN** holds that *"[i]n sustainability, the financial intermediaries are dependent on the companies they invest in to provide them the needed information on their operations outside EU. (...) [I]f they are unable to classify an investment as Taxonomy compliant, this will negatively affect the green rating of their own products and portfolios which include asset"*[274].

Indeed, the biggest flaw in the EU's approach is that "*European politics started to implement its SFAP at the back end of the financial services value chain, while information flows need to start at the front end*"[275]. Therefore, a robust regulatory role may be required to *"develop and make publicly accessible a set of data and methodologies that promote "simple and transparent investment products to attract more stable investment in 'green' assets"*[276].

4.5. Green macroprudential policy instruments

The globalised nature, heterogeneity and uncertainty of climate-related financial risks are potentially disruptive for the financial system as a whole[277]. In this respect, the adjustment of the microprudential instruments can simultaneously fulfil macroprudential objectives. For example, climate-related disclosure requirements are a useful tool for macroprudential authorities, such as the ESRB, to collect information on the financial system's exposure to these risks. Similarly, the introduction of GDCRs, based on a GSF or a BPF, respectively, can promote the reallocation of funds towards green assets or away form brown assets at the system-level[278].

Nonetheless, stronger macroprudential policies are required, which not only impose on banks the reduction of their exposure to climate-related risks, but also contribute to the reduction of climate-related systemic risks[279]. Some authors

[274] **KENADJIAN**, P. – cit.245, p.88.
[275] **ZETZSCHE**, D. A. and **ANKER-SØRENSEN**, L. - cit.135, p.26.
[276] ALEXANDER, K. – cit.72, p.370.
[277] Cf. *Supra* 3.5.
[278] **DAFERMOS**, Y.; **NIKOLAIDI**, M. – cit.176, p.7.
[279] In this vein, see **DAFERMOS**, Yannis and **NIKOLAIDI**, Maria - Greening capital requirements, p.4.

analyse more robust macroprudential tools such as a enhanced liquidity requirements, countercyclical buffers, or a sectoral leverage ratio[280]. However, because banks continue to face several limitations, such as a lack of data, misaligned time horizons, and the inadequacy of current stress testing models to address climate risks, these tools can reveal inconsistencies. Therefore, macroprudential authorities have first and foremost a role to play in developing complementary instruments to microprudential tools[281], assisting banks in overcoming obstacles and, as a result, enabling the implementation of such robust instruments.

4.5.1. Breaching the data gap

From a macroprudential standpoint, it is critical that banks rely on a set of granular and comparable data under their capital adequacy assessment and disclosure requirements. Currently there is an array of voluntary system of climate-related disclosures which banks are free to chose as they see fit. The most relevant is FSB-TCFD recommendation for corporate disclosure of climate-related financial information, in which supervisors are relying on to implement disclosure and reporting requirements[282]. However, the methodologies used by banks to incorporate the relevant data under their risk management framework is not standardised which hinders the possibility to efficiently measure the overall banking system exposure to climate-related risks. Indeed, if information is not being disclosed in a harmonised and comparable manner, financial supervisors will be missing a comprehensive data set of information necessary for that assessment[283].

In light of these findings, the main recommendation made for financial supervisors is the development of legally binding and harmonised global disclosure standards which ultimately lead to publicly available, high-quality, comparable and reliable

[280] For example, see **D'ORAZIO**, Paola; **POPOYAN**, Lilit – cit.170, p.15-19.
[281] **DAFERMOS**, Y.; **NIKOLAIDI**, M. – cit.279, p.7.
[282] See for example in the context of the EBA introduction of the GAR to measure bank's alignment with climate mitigation and transition objectives. Cf. *Supra*. Section 4.3.
[283] In this vein, **ALEXANDER**, K. and **FISHER**, P.- cit.154 p.7; **CAMPIGLIO**, Emanuele et al. – cit.170 p.464; **NGFS** – cit.52, p.32.

data[284]. Such achievement could be possible through already existing regulatory frameworks, such as within the Basel Pillar 3 disclosure requirements.

4.5.2. Forward-looking stress tests and scenario analysis

Secondly, climate-related stress testing performed both at firm and system-level are a recognised important instrument to measure the current and future resilience of the financial system against climate risks[285]. In this respect, further regulatory reforms may be needed to move away from a over-reliance on historical based databases to adopt, *"forward-looking stress testing of bank portfolios against macroprudential or system-wide risks associated with unsustainable economic activity"*[286]. In this context, scenario-based stress testing is viewed as better suited to capturing the long-term and uncertain nature of climate risk[287]. In light of the Mark Carney claim to break "*the Tragedy of the Horizon*"[288], supervisors are required to develop scenarios that go beyond the traditional time horizon of 1-3 years Furthermore, as **BOLTON** et al. emphasise the choice of scenarios is in itself challenging, as it must reflect how *"technologies, policies, behaviours, geopolitical dynamics, macroeconomic variables and climate patterns will interact in the future"*[289].

Supervisors have a key role to play in developing scenario analysis and stress tests methodologies that banks could use to accurately assess their own vulnerabilities – such recommendation is given by the NFGS[290]. The BCBS also recommends supervisors to *"develop scenarios that can inform comprehensive assessments of climate-related financial risks, and should keep abreast of emerging practices in scenario design and implementation"*[291]. In the same vein, the ESRB recognised as a short-term macroprudential policy the incorporation of

[284] **NGFS** – cit.259, p.41.
[285] **SCHOENMAKER**, D. and **van TILBURG**, R. – cit.58. p.9.
[286] **ALEXANDER**, K. and **FISHER**, P.- cit.154, p.13.
[287] *Ibid.,* p.9
[288] **CARNEY**, M. – cit.37, p.4.; Cf. *infra* Section 5.3.
[289] **BOLTON**, P. et al. – cit.40, p.65.
[290] **NGFS** - cit.137, p.30.
[291] **BCBS** – cit.191, Principle 18, (66), p.10.

climate-related risks into the regular stress test exercises which can be improved as the financial supervisor develops a granular and comprehensive data set[292].

4.5.3. A carbon-adjusted countercyclical capital buffer

Having in mind the two dimensions of systemic risk can be noticed: a time dimension and a cross-sectorial dimension. While a time dimension seeks to determine our systemic risk evolves over time, while a cross-sectoral dimension aims to determine the concentration of risk in the financial system at any given point in time[293]. In this context, the use of countercyclical capital buffers has been advocated as possible tool to target possible *carbon bubbles* in the financial system[294]. The countercyclical capital buffer would prevent systemic risks arising from a sudden repricing of carbon-intensive assets[295] . Accordingly, banks would be subject to a buffer add-on, requiring them to hold more capital, during periods of an excessive carbon-intensive growth, which "*contains ex-ante the risk of carbon-intensive credit growth, thus helping building buffers to absorb ex-post shocks to high-carbon loans (e.g., stranded assets), therefore ensuring a smooth transition process"*[296]*.* However, the efficacy of buffer is highly dependent on the information collected by the supervisor on bank's exposure to carbon-intensive assets, which mainly due to the lack of data, raises methodological limitations for the moment with regards to the calibration of this indicator and timely activation (i.e. before the cycle reverses)[297].

[292] **ESRB** – cit.55, p.15,16.
[293] **GORTSOS**, Christos V. – cit.15, p.23, 24.
[294] **DIKAU**, Simon; **VOLZ**, Ulrich – cit.51. p.11.
[295] **SCHOENMAKER**, D. and **van TILBURG**, R. – cit.58, p.22, 23.
[296] **D'ORAZIO**, Paola; **POPOYAN**, Lilit – cit.170, p.15.
[297] *Ibid.,* p.15; **GRUNEWALD**, Seraina - Climate Change as a Systemic Risk – Are Macroprudential Authorities up to the Task?, p.12.

5. The role of central banks

With regards to the assumption of financial stability policy framework, the responsibilities of central banks are mostly directed by macroprudential instruments that have been endorsed above, as depending on the adopted regulatory architecture, these functions may be undertaken by central banks, National Supervisory Authorities or specialised institutions with the core objective of the oversight of the financial system. However, there is evidence that central banks acting within the primary mandate of pursuing monetary stability might have a role to play in addressing climate-related risks, as analysed in the following sections.

5.1. A green mandate for central banks

Central banks are public institutions (national or federal) typically responsible for the amount of money and credit supply in a given economy, with pre-determined objectives and tools set by law[298]. The primary goal of central banks is usually to maintain price stability and to ensure the stability of the financial system through the incorporation of supervisory responsibilities[299]. Oftentimes, secondary objectives are adopted such as the exchange rate stability, the pursuit of employment creation, and the support of general economy policies.

To effectively pursue its objectives, a central bank mandate is typically based in three pillars: rule of law, independence and accountability. First, the operations of central banks are constrained by the objectives specified in their mandates. Furthermore, it is consensual that democratic central banks need institutional independence that allows them to conduct monetary policy independently of political considerations[300], despite the fact that some central banks have a

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[298] **MISHKIN**, F. S. – cit.72, Chapter 14, p.370.ff.

[299] Regarding the assumption of a policy framework for financial stability, central banks' responsibilities are primarily determined by the macroprudential tools that have been endorsed above. Depending on the regulatory architecture that has been adopted, these functions may be carried out by central banks, national supervisory authorities, or specialised institutions, with the primary goal of the supervision of the financial system. similar to how the ECB acquired the aforementioned supervisory responsibilities.

[300] See **AMTENBRINK**, Fabian - The Three Pillars of Central Bank Governance - Towards a Model Central Bank Law or a Code of Good Governance?.

secondary objective to support the general economic policies of the country or monetary union[301]. Finally, central banks are accountable to the elected parliament through effective transparency and communication requirements[302].

The pursuit of central banks' fundamental goals of price stability and financial stability is impacted by the aforementioned macroeconomic transmission channels of physical and transition hazards[303]. Disruptions in the energy, agricultural, and infrastructure sectors brought on by climate-related events or climate mitigation measures result in poor health conditions, higher operating costs, and asset revaluations, which negatively impact labour supply, economic growth and increase inflation volatility[304]. As a result, central banks are expected to tighten their monetary policies, potentially prolonging the negative effects of these risks on economic output.[305].

The current president of the ECB, Christine Lagarde, further highlights the implications of climate change to monetary policy, where an increase in short-term volatility and uncertainty *"hamper central banks' ability to correctly identify the shocks that are relevant for the medium inflation outlook, making it more difficult to assess the appropriate monetary policy stance"*[306]. **DIKAU** and **VOLZ** hold that *"[m]onetary policy therefore has to consider climate-related effects on food or energy prices, as well as the impact of climate change mitigation policies because of potentially important implications for core inflation"*[307]. In order to emphasise the inadequacy of central banks' monetary policy reaction time (2–3 years) to promptly handle the economic shocks of climate change, Mark Carney

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[301] See **DIKAU**, S. and **VOLZ**, U. - cit.153, Table 1, p.3-9 for an overview of central banks that have secondary objectives within their mandates, as it is the case of the Banque de France (within the ESCB) which "shall contribute to the government's general economic policy", the Swiss National Bank "shall pursue a monetary policy serving the interests of the country as a whole", and the Central Bank of Brazil which is mandated to "adapt the money supply to the real needs of the national economy and its development process".
[302] **GORTSOS**, Christos V. – cit.15, p.287.
[303] See *supra* Sections 2.2., 2.3.
[304] See **NGFS** - Climate Change and Monetary Policy: Initial takeaways. June 2020. Table 1, p.45.
[305] **MCKIBBIN,** Warwick J. et al. - Climate Change And Monetary Policy: Dealing With Disruption. p.17,18.
[306] **LAGARDE**, Christine - Climate Change and Central Banking. p.156,157.
[307] **DIKAU**, S. and **VOLZ**, U. - cit.153, p.16.

referred to climate change as *"the Tragedy of the Horizon"*[308], which is indeed one the main obstacles to central banks' operations.

In its impacting speech, Mark Carney remarks that central banks should not *"advocate for one policy response over another"*[309], thus alluding to a second aspect of green central banking.

Recently, a discussion arose on whether central banks should be a key player in the promotion of a sustainable economy through the adoption of policies that primarily aim at influencing the allocation of money and credit towards *green assets*. In this regard, while financial regulatory authorities and even central banks acting within their supervisory responsibilities have powers within their framework to reduce the exposure of the financial system and increase its resilience to climate-related financial risks, the majority of central banks' mandate is limited to the pursuit of price stability and does not include environmental or sustainability within the secondary objectives.

DIKAU and **VOLZ**[310] demonstrate that, currently, sustainability objectives may be pursued by central banks with broader mandates (mostly from developing economies), through secondary objectives specifically endorsing the promotion of sustainable growth, or by supporting general economic government objectives or policies, which, as nations pledge to significantly reducing their emissions, increasingly include the promotion of a sustainable economy. However, such mandates do not give central banks a right to prioritise the promotion of sustainable objectives, but are rather constrained by the primary objective of price stability.

Authors as **VOLZ**[311] and **WEIDMAN**[312] recall the '*Tinbergen rule'* to argue against an adjustment of central banks' mandate to pursue of climate policy objectives, according to which *"the number of policy goals cannot exceed the number of policy instruments"*, and *"for each separate economic target, there must be also at least one sperate instrument"*. As such, accepting the usage of monetary policy

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[308] **CARNEY**, M. – cit.37, p.4.
[309] *Ibid.,* p.12.
[310] **DIKAU**, S. and **VOLZ**, U. - cit.153, p.9.
[311] **VOLZ** – cit.165, p.7.
[312] **WEIDMANN**, J. – cit.189, p.163,164.

instruments, as open market operations, corporate asset purchase programmes with the primary objective of influencing the allocation of capital away form carbon intensive sectors, rather than an adjustment to factor climate-related risks raises *"mission creep"* concerns[313]. In the same vein, **CAMPIGLIO** et al. stress that what central banks can do is limited by what their mandates allow and modifying their mandate to include sustainable goals *"could risk overburdening central banks with excessive responsibilities, which could take up management capacity to the detriment of their primary objectives of maintaining monetary and financial stability"*[314].

Ultimately, endorsing climate policy objectives, which are foremost and above all a responsibility of governments, may entail the loss of central banks' independence from the political system, threatening their reputation as one of the most credible institutions[315]. Similarly, the NGFS concludes that *"making adjustments prematurely, without suitable knowledge, data, or legal clarification regarding the central bank's mandate may undermine its credibility"*[316]. As **VOLZ** emphasizes, the current misallocation of credit towards carbon-intensive sectors and activities is a market failure that is ultimately up to governments to overcome through policies that currently price carbon assets, and the interference if central banks in this respect constitutes a second-best solution to the problem[317].

As in the case of financial regulation, the academia tends to reject the idea of a new mission for central banks in achieving sustainability goals. Although the history shows that the mandate of central banks has not been static, but rather adapting in response to specific failures (as in the aftermath of the Global Financial Crisis), their role has been largely dedicated to ensuring stable and low inflation and safeguarding financial stability. Even though monetary policy instruments can be a powerful tool in redirecting the allocation of credit away from carbon intensive sectors, such intervention would be a second-best solution[318]

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[313] See in this vein, **ISSING**, Otmar - Green Monetary Policy?.
[314] **CAMPIGLIO**, Emanuele et al. – cit.170, p.466.
[315] In this vein, **ȘIMANDAN**, Radu; **PĂUN**, Cristian - The costs and trade-offs of Green Central Banking: A framework for analysis. Energies. p.12,13,22.
[316] **NGFS** - Adapting central bank operations to a hotter world: Reviewing some options. May 2021. p.15.
[317] **VOLZ**, U. – cit.165, p.12; **DIKAU**, S.; **VOLZ**, U. -.cit.53, p.7,8.
[318] In this vein, **VOLZ**, U. – cit.165, p.12.

and ultimately conflict with the central banks' primary task. Therefore, central banks should hold to their existing mandates to consider all threats that might arise in their governance, operations, and risk management from climate-related financial risks and take the necessary measures, within the existing frameworks, to continue the goals of safeguarding financial stability and maintaining price stability.

5.2. Compatibility of an ECB green mandate with the Treaty of Lisbon[319]

In the European landscape, EU Member States adopting the euro as currency agree to a single monetary policy, conducted within the ESCB, composed of the ECB and the NCBs. As a result, the ECB is recognised as one of the EU institutions[320] and its mandate is therefore delimited by the Article 127(1) of the TFEU to the primary objective of maintaining price stability. In this provision, a secondary of objective is endorsed where *"[w]ithout prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union as laid down in Article 3 of the Treaty on European Union"*. It follows from the principle of conferral of powers set out in Article 5(2) TEU, that the ESCB shall act within the limits of the powers conferred upon it by primary law. As a result, to pursue its primary objectives, the ECB shall respect the mandate conferred upon it in the TFEU as well in the ESCB/ECB Statute[321].

In this regard, it is the Governing Council (GC) responsibility the definition of the monetary policy of the Union[322]. Accordingly, its monetary strategy review in 2021[323], the GC defined 'price stability' through a steady rate of inflation, determined by the Harmonised Index of Consumer Prices (HICP), aimed at 2%

[319] This analysis is limited to the role of the ECB within its monetary policy strategy, as considerations relating to its supervisory tasks within the SSM have been taken in the previous chapters.
[320] Article 13(1) of the Treaty on the European Union (TEU).
[321] TFEU, PROTOCOL (No 4) On The Statute Of The European System Of Central Banks And Of The European Central Bank.
[322] Article 12.1, ESCB/ECB Statute.
[323] ECB Press Release (July, 2021) - ECB's Governing Council approves its new monetary policy strategy.

over the medium term. **GORTSOS** outlines two pillars of the ECB's monetary strategy[324]. First, acknowledging that *"as a rule and in the medium term, the origins of inflation are monetary",* control over the supply of credit in the financial system is of crucial importance[325]. Secondly, the ECB must as well consider all surrounding situations threatening price stability, which is based on a wide range of economic and financial indicators, including labour market conditions, exchange rate in the euro area, movements in asset prices, as well as information from macroeconomic projections[326]. In the pursuit of its strategy, the ECB and the NCBs implement a number of monetary instruments: minimum deposit reserves of credit institutions, open market and credit operations through repurchase agreements or credit facilities to credit institutions based on eligible collateral[327].

In addition, the GC may define other unconventional monetary instruments, provided that they respect the primary objective of ensuring price stability[328], such as the implementation of a Covered Bond Purchase Programme (CBPP), Securities Markets Programme (the SMP), and the Outright Monetary Transactions (OMTs). The compatibility of these instruments with the ECB's primary mandate has not always been straightforward. Indeed, the GC decision to pursue OMTs, consisting in purchases of sovereign bonds of in secondary markets with a view to counterbalance the fiscal crisis has given rise to intense debate, culminating in a refence of the German Constitutional Court to the CJEU in the case "Peter Gauweiler and Others v Deutscher Bundestag"[329]. The CJEU highlighted that while such operations may be perceived as an economic policy, they should not be treated as such, considering they fall under the second pillar of monetary policy, primarily aiming "for the purchase of government bonds only in so far as is necessary for safeguarding the monetary policy transmission mechanism and the singleness of monetary policy and that those purchases will cease as soon as those objectives are achieved"[330]. Furthermore, the purpose of

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[324] **GORTSOS**, Christos V. - cit.15, p.284,285.
[325] In this regard, the EBC attributes a reference value for the growth of "M3", comprising monetary institutions liabilities with a high degree of 'moneyness', such as money, deposits and money market instruments – See *Ibid.*, p.284.
[326] *Ibid.,* p.285.
[327] Articles 17 to 29, ESCB/ECB Statute.
[328] ESCB/ECB Statute – article 20.
[329] Case C-62/14, 16 June 2015, ECLI:EU:C:2015:400.
[330] *Ibid.,* pg.112, p.18.

OMTs meets the secondary objective of the ECB laid down in Articles 119(2), 127(1) and 282(2) of the TFEU through which "without prejudice to the objective of price stability, the ESCB is to support the general economic policies in the Union"[331].

In this vein, a similar reasoning can be made regarding the ECB's approach to climate change. Respectively, the mentioned Article 3 of the TFUE entrusts the European Union with the establishment of an internal market seeking the *"sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment. It shall promote scientific and technological advance"*[332]. As a result, without prejudice to the primary objective of maintaining price stability, the ECB is indeed vested with the responsibility to support the transition to a low-carbon economy, considering that such objectives are at the centre of the EU's economic policy through the adoption of the European Green Deal[333]. On the other hand, in light of the Article 3(3) of the TEU, in the pursuit of its monetary policy, the ECB must contribute to the sustainable development of Europe namely through the incorporation of climate change considerations into its policy framework.

In the 2021 Monetary Policy Strategy Review, the ECB's GC adopted a Climate Agenda, aiming to include *"climate change considerations in monetary policy operations in the areas of disclosure, risk assessment, collateral framework and corporate sector asset purchases"*[334] through the adoption of a *"detailed roadmap of climate change-related actions"*. Through the climate agenda, the ECB adopted a strategic objective to *"[c]onsider options for monetary policy operations and assess the impact of climate change on monetary policy"*[335].

In light of these projects the ECB thus recognises climate-related financial risks as a threat for the stability of the financial system, with potential impacts on

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[331] *Ibid., pg.59, p.*12.
[332] Article 3(3), TFUE
[333] COM(2019) 640 final – The European Green Deal.
[334] ECB Press release (July, 2021) - "ECB presents action plan to include climate change considerations in its monetary policy strategy.
[335] **ECB** (July 2022) - Climate Agenda 2022.

inflation and the real economy. Indeed, **LAGARDE** recognised that such strategy enables the ECB to consider how it can protect its mandate in light of climate-related financial risks *"and, at the same time, strengthen the resilience of monetary policy and our [the ECBs']balance sheet to climate risks"* while *"without prejudice to the primary objective of price stability, how it can continue to support the EU's economics policies, as required by the Treaty"*.[336] In light of these observations, the ECB approach is one that respects the existing mandate conferred on it by the Treaties while taking a risk-based approach towards climate change, which ultimately has a positive impact in the pursuit of a sustainable economy, allowing the ECB to adopt green central banking policies without envisaging a green mandate.

5.3. Monetary policy instruments

Central banks and the ECB in particular have the opportunity to adjust their monetary policy instruments to the macroeconomic challenges brought by climate change and the net zero transition.

In the pursuit of the primary objective to maintain price stability, central banks adopt different monetary policies, being inflation targeting the most widely used. For this purpose, central banks have at their disposal a number of conventional policy instruments such as open market operations, minimum reserve requirements for credit institutions within the Eurosystem, and standing facilities to provide and absorb overnight liquidity[337]. Following the 2008 global financial crisis, the ECB adopted unconventional monetary tools to stimulate the economy, through quantitative easing tools as the asset purchase programmes (APP) and the Securities Market Programme (SMP).

MCKIBBIN et al.[338] explore the linkages between climate change and typical monetary policy instruments, including the widely used inflation targeting tools also used by the ECB. The author shows that economic shocks deriving from a

[336] **LAGARDE**, C. - 306, p.157.
[337] **GORTSOS**, Christos V. – cit.15, p.286.ff; **MISHKIN**, F. S. – cit.72, p.374.ff.
[338] **MCKIBBIN**, W. J. et al. – cit.305.

response to climate policies and climate disruption can be mitigated with a coordinated monetary policy[339].

In this respect, central banks can consider developing *green* monetary policy instruments. Three possible policy tools are analysed bellow: green quantitative easing; asset and collateral framework; and soft power.

5.3.1. Asset collateral framework

When requiring credit institutions to hold minimum reserves on deposit accounts held with the central banks, pursuing open market operations through credit or repurchase agreements, or proving lending facilities, central banks adopt a list of eligible counterparties based on categories of assets as collateral[340]. On the one hand, through these operations, central banks' balance sheets are directly affected by climate-related financial risks[341] and must therefore seek to reduce their exposure to these risks. **SCHOENMAKER**[342] outlines that central banks portfolios currently show a carbon bias towards carbon-intensive assets, thus finding support to the incorporation of climate-related criteria in the assessment of eligible collateral[343], for instance through disclosure requirements[344] and *green* credit rating standards[345].

Recently, the ECB has integrated the CSRD's disclosure requirements into the eligibility criteria requirement in collateral framework, and is analysing the introduction of climate risks in credit ratings. With regards to the collateral framework, the ECB is currently monitoring and making the necessary adjustments to ensure the *"adequacy of the collateral valuation and risk control*

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[339] *Ibid.,* p.23.
[340] In light of the Article 18.1 of the ESCB/ECB Stature, the ECB pursues its operations "based on adequate collateral", which is determined under the Eurosystem monetary policy framework through the "Guideline (EU) 2015/510 of 19 December 2014 on the implementation of the Eurosystem monetary policy framework (ECB/2014/60)".
[341] **LAGARDE**, C. – cit.306, p.156.
[342] **SCHOENMAKER**, Dirk - Greening Monetary Policy, p.4.ff.
[343] In the same vein, **CAMPIGLIO**, Emanuele et al. – cit.170, p.466.
[344] **MONNIN**, Pierre - Central Banks and the Transition to a Low-Carbon Economy. Council On Economic Policies, Discussion Note 2018/1 (March 1, 2018). p.5,12
[345] These are measures that have been introduced by Central Banks as the People's Bank of China (PBOC). See in **DIKAU**, S. and **VOLZ**, U. - cit.153, Table 2, p.10-14.

framework to ensure that climate change risks are properly reflected"[346]*.* In September 2020 the ECB has decided to accept sustainability-linked bonds as collateral[347] which was fully incorporated to the collateral framework through Guideline ECB/2022/17.

Although these innovations are praised among the academia, **GIOVANARDI** et al. alert for the adverse side effects that a preferential treatment of a green collateral framework[348], which could lead to an undesired raise in default and leverage risk exposure (as these are often associated with *green firms*), thus reinforcing the idea that central banks should not overstretch their mandates in the promotion of the economic decarbonisation.

5.3.2. Green quantitative easing

Climate risk considerations can be incorporated into central banks' monetary policy through the adjustment of unconventional monetary instruments such as Asset Purchase Programs, which gained traction in the EU following the global financial crisis. In the context of the EU, **SCHOENMAKER**[349] and **CAMPAGLIO** et al.[350] show that the ECB's quantitative easing policies have a carbon bias, favouring carbon-intensive companies, concluding that the ECB has not followed the principle of market neutrality on which its APP should be based[351].

The carbon bias observed in central banks' portfolios leaves them, therefore, inevitably exposed to climate-related financial risks. **SCHOENMAKER** argues that central banks can act within their mandates by tilting the portfolio weights for *green assets*, allowing the reduction of the carbon bias without prejudice of primary objective of price stability. Nevertheless, such adjustment should not result in a preferential treatment towards sustainable assets, but rather seek to

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[346] **ECB** Annex to the ECB action plan to include climate change considerations in its monetary policy strategy - Detailed roadmap of climate change-related actions. July 2021.
[347] **ECB** PRESS RELEASE - ECB to accept sustainability-linked bonds as collateral. September 2022.
[348] **GIOVANARDI**, Francesco et al. - The preferential treatment of green bonds. p.25.
[349] **SCHOENMAKER**, D. – cit.342, p.2.
[350] **CAMPIGLIO**, Emanuele et al. - cit.170, p.465.
[351] The principle of market neutrality in the ECB's market operations was introduced by **Benoît Cœuré.**
In: **CŒURÉ**, Benoît - Embarking on public sector asset purchases.

correct the current carbon bias that is inadequate in light of the principle of market neutrality. In the same vein, **FISHER** et. al[352] argue that there are *"there are good practical and mandate reasons why central banks might prefer neutrality in their asset purchase".* Similarly, **DILUISO** et al. demonstrate that it is possible for central banks to "*align the objective of financial stability with that of environmental sustainability, consistently with their price stability mandate"* [353] by engaging in green quantitative easing policy compatible with the principle of market neutrality. In light of these findings the ECB did commit to assess potential carbon bias in the Corporate Sector Purchase Programme (CSPP) and develop proposals to consider climate change in its framework[354].

[352] **FISHER**, Paul and **ALEXANDER**, Kern - Climate change: the role for central banks, p.14.
[353] **DILUISO**, Francesca, et al. - Climate actions and macro-financial stability: The role of central banks, p.16.
[354] See in ECB Annex: Detailed roadmap of climate change-related actions; and ECB Climate Agenda 2022.

6. Conclusions

This work endeavoured a comprehensive overview of the impact of climate change and the transition to a sustainable (net zero) economy in the financial system with a focus on the role that financial regulation, supervision and central banking may play in addressing the transmission channels of climate to the stability of the financial system and the economy at large.

Indeed, climate change and environmental degradation pose significant financial risks to the banking system. These risks can affect banks' financial risks directly or indirectly and are typified into the three categories of physical risks, transition risks, and liability risks. In particular, physical and transition hazards have micro and macroeconomic transmission channels to the traditional risk drivers of the banking system.

Physical hazards can impact infrastructure and buildings, as well as agricultural production. At the microeconomic level, physical risks can materialise through banks’ counterparties and financial assets performance. At the macroeconomic level, physical risks can impact banks through aggregate economic damage, which can result in reduced demand for loans and higher losses on loan portfolios.

The sustainable transition, on the other hand, carries the uncertainty associated with policy, price, and valuation changes that may occur as a result of mitigating climate change and reducing carbon emissions. Transition risks can have both microeconomic and macroeconomic impacts on the financial sector, affecting variables such as asset prices and inflation. At the microeconomic level, transition risks can lead to higher credit, market, liquidity, and operational risks for banks, as well as reputational risks if they are perceived to be financing carbon-intensive or environmentally harmful activities. At the macroeconomic level, transition risks can lead to economic shocks and financial instability, as well as spillover effects on the broader economy through credit risk and market volatility.

The discussion is ongoing and although some voices are more pushforward that others, there is an overall consensus that while the primary responsibility to tackle climate change is of governments, central banks, financial regulators and

supervisors have a role to play in ensuring the resilience of the financial system against physical and transition risks – either in a scenario where no measures are adopted to fight climate change, or in a scenario where market participants endeavour efforts to build a sustainable and carbon-emissions free economy.

The main singularity about climate-related risks over any source of financial risks is that in the limit, while failures from inadequate inaction in past financial crises could be addressed and corrected, the failure to timely fight climate change and pursue a slow and controlled transition may not be reversed. Ultimately, as the earth reaches its natural planetary boundaries, the solely existence of a global economy can be questioned. Therefore, in light of the famous Mark Carney speech, “Breaking the Tragedy of the Horizon”, it is urgent that governmental and financial authorities adopt policies with extensively large time horizons, capable to respect the next living generations.

At the same time, it is important to respect the legitimacy conferred upon financial authorities to act within the boundaries of their mandates. The adoption of a sustainable agenda where regulators, supervisors and central banks act desperately with a view to contain climate change could lead to a “mission creep” resulting in the adoption of inadequate climate policies that lead to uncontrolled inflationary and negative economic output scenarios, thus contrary to the primary objectives of safeguarding the stability of the financial system and the maintenance of price stability.

This work shows that banks, prudential authorities and central banks can accelerate the transition to a sustainable economy without falling into a “mission creep”, by following a risk-based approach that increasingly aims to understand and capture all climate-related financial risks before these become material to the financial system. The fight against climate change is urgent, so all efforts must be made to adjust the current regulatory, supervisory and monetary frameworks to the reality of climate change, but these adjustments cannot threaten the primary objectives of these entities.

Overall, the main challenge to this mission is to build a comprehensive dataset of information across households, corporates and governments’ exposure to climate risks and develop adequate methodologies that capture these risks. In

this regard, supervisors have relied on the imposition of mandatory disclosure of climate-related financial and non-financial information is the most straight forward instrument to develop a comprehensive dataset.

The prudential treatment of climate-related financial risks into the Basel Accords framework has been very cautiously implemented, focusing on its pillar 2 and pillar 3 instruments. The main goal, above all, is to incentivise banks to adjust their own methodologies and internal controls to this source of risk.

In the near future, there is space to start, at least, incorporating climate-related financial risks into the SREP, which could be at the basis for requiring enhanced capital requirements if a bank is perceived overly exposed to physical or transitional risks. The first approach to enhance banks' risk-based approach towards climate risks is to develop the existing governance requirements in requiring, for instance, the necessary expertise in boards to fully reflect the multidisciplinary nature of climate-related financial risks, the presence of specialised climate risk committees, and the adoption of a sustainable-driven business approach. In this regard, EU adoption of the CSR reporting directive, requires banks to disclosure their current risk exposure, their strategy and specific measures. In light of this regulation, the EBA has an opportunity to adapt the requirements to the specificities of banks businesses. At the same time, the disclosure of climate risks has a double task to increase market transparency and better inform consumers and investors. With regards to the protection of consumers, the Basel III and the EU demand specific information on the investment of "sustainable" products responding to "*greenwashing*" practices.

Additionally, the fact that the overall banking system is heavily vulnerable to physical risks and over-exposed to carbon-intensive assets means that supervisors must play a proactive role in building a macroprudential framework that fully considers climate-related financial risks. The main challenges for banks in this regard are the lack of data, the misalignment of time horizons, and the inadequacy of current stress testing models. In light of these findings, financial supervisors, and the ESRB in particular, have a role to play in developing legally binding and harmonised global disclosure standards that lead to publicly available, high-quality, comparable, and reliable data. At the macroeconomic level, a coordinated assessment of the banking system exposure to climate risk

should also require the development of standardised climate and scenario and stress testing methodologies that both banks and supervisors can use to accurately assess vulnerabilities at the firm and system-level. Additionally, there might be place for supervisors, to consider implementing a carbon-adjusted countercyclical capital buffer to increase banks' resilience to climate-related risks if the banking system is considered to be excessively exposed to physical or transitional risks. However, such instrument should be cautiously developed having due regard for the current limitations of supervisors to comprehensively assess such exposure.

Central banks can also consider developing green monetary policy instruments to mitigate the economic shocks from climate change without prejudice to their primary mandates. Possible green policy tools include Green Quantitative Easing, a Green Asset Collateral framework. Green Quantitative Easing involves adjusting quantitative easing policies to reduce the carbon bias of central banks' portfolios and increase their exposure to green assets, while a Green Asset Collateral framework would involve incorporating climate-related criteria into the assessment of eligible collateral, such as green credit rating standards. Additionally, central banks also have a soft power, using their influence to encourage the financial sector to incorporate climate-related risks into their decision-making processes.

In conclusion, climate change and the transition to a sustainable economy bring challenges for the banking system, and banks are indeed incentivised to use their pivotal role as financial intermediaries in the economy to phase out from carbon-intensive assets in their portfolios. In addition, it is true that these factors pose significant financial risks to the banking system, which regulators, supervisors and central banks must consider when pursuing their tasks. However, it is important for them to act within the boundaries of their mandates and not adopt policies that could not only jeopardise the stability of the financial system, but also result in uncontrolled inflationary and negative economic scenarios. A risk-based approach that considers the long-term time horizons of climate change is there recommended, which ultimately carries a positive contribution for the transition itself.

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