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## Abstract

This paper studies the effectiveness of risk management, one of the two channels identified by the Network for Greening the Financial System (NGFS, 2024) as those through which the financial system contributes to physical risk adaptation in the European Union (EU). We assess the efficacy of Level 3 prudential regulations in encouraging banks to include physical risk adaptation in their risk management and client engagement strategies. Our analysis adopts a broad perspective, encompassing not only prudential risk management but also, and in our view more importantly, prudential transparency regulation, given the positive leverage that stakeholders can exert to incentivise adaptation efforts. Our findings suggest that banks should consistently integrate physical risk adaptation into their stress tests, transition plans and Pillar III disclosures. Transition plans must address physical hazards, exposure and vulnerability and must set adaptation targets. Adaptation measures should be treated as risk mitigants reflected in losses given default (LGDs), with the severity and consistency of those losses being reflected in transition plans and stress tests.

Key words: EU, physical risks, adaptation, regulation

JEL CODES: K23, O52, Q54, Q58

## Non-technical summary

Europe is the fastest warming continent. A number of physical risks, such as excess heat, flooding, drought and wildfires, have become more prevalent over the past decade. Consequently, climate change adaptation has become of paramount importance, given that it is aimed at reducing both exposure and vulnerability to physical hazards. Climate change adaptation is one of the six environmental objectives of the EU and is a legal obligation for Member States. In 2024, the NGFS highlighted the role of banks in managing climate risk and providing adaptation financing. The research question asked in this paper is therefore whether climate change adaptation is sufficiently embedded in the risk management guidance and Pillar III disclosure rules for banks.

The literature review in this paper suggests that natural disasters result in a reduced supply of bank credit, that bank lending to non-financial corporates is negatively correlated with their flood risk exposure and that the financing of climate change adaptation lags behind that of climate change mitigation.

A holistic approach to physical climate risk is required in banks' climate stress testing, transition plans and Pillar III disclosures. Consistency can be ensured by using scenario analysis modelling approaches that are common throughout the EU for each physical hazard to be taken into consideration. Transition plans should, in fact, be seen as "mitigation and adaptation plans" and should include targets for adaptation to physical risk as well as estimates for the impact of physical risks on LGD. Finally, the current disclosure rules are designed for the principle of proportionality to be applied based on bank size. Given the local nature of bank vulnerability to physical risk, this paper suggests that proportionality should be assessed based on vulnerability rather than on size.

# 1 Introduction

Some of the costliest manifestations of climate change are damage caused by natural disasters and extreme weather phenomena (Fahr et al. (2024), p. 26). Europe is the fastest warming continent (WMO (2024), p.39). Recent data suggest that average annual economic losses from natural disasters for the period 2020-23 were around €44.5 billion (based on 2023 prices).<sup>1</sup> This figure includes, among others, losses from river and coastal floods, as well as from extreme heat and cold (WMO, 2024). Unprecedented precipitation and surface water flooding are projected to increase across all regions of Europe (IPCC, 2023), while the wildfire potential has risen significantly (WMO, 2024).

Acknowledging the economic impact of physical risks,<sup>2</sup> the EU Platform on Sustainable Finance (PSF) recognises the necessity for adaptation and for international bodies to focus on resilience to physical risks through adaptation measures (PSF, 2025).<sup>3</sup> Estimates of adaptation investment needs vary widely across the EU,<sup>4</sup> ranging from €158 billion to €518 billion per year until 2027 (EP, 2022). Physical climate risk affects a sovereign country's ability to borrow, given that countries with greater exposure to natural disasters have been assigned comparatively lower ratings since the Paris Agreement (Cappiello et al., 2025).

Financial systems are significantly exposed to high physical climate risks, particularly in a scenario of high and rising temperature anomalies (ECB, 2024). The European Central Bank (ECB) has quantified the potential losses for 2050 from portfolio exposures to river floods in Germany and France at approximately €200 billion.<sup>5</sup> Nevertheless, adaptation finance usually lags behind mitigation funding (EIB (2021), p.13; Fankhauser (2016),p. 12; PSF (2025), p. 20), despite the growing shift towards dual-benefit finance pursuing both mitigation and adaptation objectives (Climate Policy Initiative, 2025).

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<sup>1</sup> Based on recorded estimates from the Catastrophe Database (CATDAT) provided by RiskLayer and on Eurostat structural indicators. See the article entitled "[Annual economic losses caused by weather- and climate-related extreme events in the EU Member States](#)", published on the European Environment Agency website on 13 October 2025.

<sup>2</sup> NGFS (2020), p. 10 defines physical risk as the economic costs and financial losses from the increasing severity and frequency of extreme climate change-related weather phenomena and from gradual shifts in the climate. Slightly more restrictive, Article 4(52f) of the [Capital Requirements Regulation](#) defines physical risk, as part of the environmental risk, as the risk of any negative financial impact on a bank stemming from the current or prospective impact of the physical effects of environmental factors on that bank's counterparties or invested assets.

<sup>3</sup> FSB (2025), p. 14, Conclusion: "Work on vulnerabilities assessments focuses on issues of growing concern in financial markets, such as extreme weather events and the role played by insurance protection gaps and adaptation measures.". The seventh assessment report by the IPCC will also focus on adaptation progress, limits, options to accelerate, and funding.

<sup>4</sup> This estimate was made in the context of the EU budget and includes certain mitigation and biodiversity support measures. OECD (2024) includes an estimate for a number of European countries.

<sup>5</sup> Portfolio exposures cover loans, debt securities and equity portfolios. Financial institutions include deposit-taking corporations, non-money market fund investment funds, insurance corporations and pension funds.

Adaptation measures tend to be backward-looking in their design, rather than seeking to anticipate future hazard, exposure and vulnerability patterns (Wannewitz et al., 2024).

NGFS (2024) recognises the importance of adaptation for the financial sector and identifies two channels for addressing this issue: (i) a financial risk management toolkit for physical climate risks, given that climate change adaptation focuses on reducing exposure and vulnerability to such risks; and (ii) an investment business case when adaptation financing is a mainstream consideration in financing certain economic activities.<sup>6</sup> This approach is also consistent with the Organisation for Economic Co-operation and Development (OECD) definition of adaptation investment (OECD, 2024), although the latter also encompasses mitigation.<sup>7</sup> There is no consensus on the scope of the definition of climate risk adaptation. For Ongena et al. (2025), climate adaptation encompasses a country's vulnerability to climate hazards – its susceptibility to adverse impacts, capturing both transition and physical risks – and its capacity to mobilise both private and public investment for adaptation with a view to economic, governance and social readiness.

In principle, this paper adopts the NGFS approach, with a focus on the EU prudential regulatory framework for physical risks and, in particular, on its Level 3 prudential regulations and guidance. We therefore analyse their effectiveness in incentivising banks' adaptation to the physical risks of climate change. Our analysis adopts a broad perspective and encompasses not only prudential risk management but also, and in our view more importantly, prudential transparency regulation, given the extent to which stakeholders can influence banks' management of physical risks and incentivise adaptation (Schmieder et al., 2024). We conclude that although adaptation is a legal obligation in the EU, its content is usually blurred by being coupled with climate change mitigation in EU Levels 1-3 legislation and prudential guidelines. Banks' stress testing, transition plans and Pillar III disclosures do not, as yet, make consistent allowance for physical climate risks and adaptation.

The remainder of this paper is divided into three sections. Section 2 presents a review of the relevant literature. Section 3 examines the EU prudential regulatory sustainability framework for physical risk management and transparency (Pillar III), as well as its effectiveness, as derived from the supporting literature review, as regards banks, physical risks and climate change adaptation.

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<sup>6</sup> Such as: infrastructure, e.g. railways in high-temperature environments, and commercial and residential buildings in high-temperature or high-precipitation areas. The largest share of adaptation financing is derived from public, national or international sources, given that adaptation is generally for the public good or is a means to social ends, as indicated in UNEP (2024). This type of investment is outside the scope of our paper.

<sup>7</sup> Adaptation investments should meet the following three criteria (OECD, 2024): (i) resilience benefits, i.e. the investment should increase resilience to climate change by directly reducing physical climate risks or by supporting adaptation by others; (ii) do no significant harm, i.e., the investment does not negatively affect the resilience of other people or ecosystems; and (iii) compatibility with national or local strategies, such as national adaptation plans, nationally determined contributions or national disaster reduction strategies. If such plans do not exist, or do not set objectives in relation to the investment concerned, the presumption is that the investment is compatible.

## 2 Literature review

In general, the academic literature in this area provides limited direct guidance for policy design for climate change adaptation. This is partly explained by the methodological challenges of assessing the impact of physical risks that are local in nature and by the diversity of adaptive responses. Two adaptation channels are distinguished (Carleton et al., 2024): reactive (ex post) and proactive (ex ante, i.e. measures adopted in anticipation of future physical risks). Preventive measures are particularly effective in managing physical risks with a high probability of incidence but where the losses are small. Insurance is, however, particularly effective in managing physical risks with a low probability of occurrence but resulting in large losses. For example, financial adaptation through catastrophe bonds and disaster insurance can reduce welfare losses from cyclones by 21% (Phan and Schwartzmann, 2024).

### 2.1 Economic impact of physical risks

A broad body of empirical literature finds that extreme events can substantially effect economic outcomes (Bilal and Stock, 2025). Together, disaster risk and default risk lead to slow post-disaster recovery and heightened sovereign borrowing costs (Phan and Schwartzman, 2024). Disaster-prone countries incur sizeable welfare losses because their economies grow at an annual rate that is, on average, 1% lower than that of their non-disaster-prone peers (Cantelmo et al., 2022 and 2023). Given that climate change exacerbates the magnitude and frequency of natural disasters, it is increasingly likely that such negative macroeconomic and welfare outcomes will worsen: climate change could lead to a threefold increase in the GDP growth gap, while public debt and welfare losses might both rise by a factor of almost five.

Abalo et al. (2025) estimates climate-related damage for five emerging economies in Africa and analyses a small set of GDP impact channels (damage to agriculture, labour productivity and capital stock).<sup>8</sup> It presents the macroeconomic benefits of sector-level adaptation interventions, taking into account, among others, their upfront costs and the climate impacts avoided. It finds that significant GDP gains are to be made from adaptation.<sup>9</sup> High-income regions see reconstruction activity; less wealthy regions do not and their populations decline in affected regions, as does their post-event adaptation spending (Usman et al., 2024).

If physical hazards under the Representative Concentration Pathway 8.5 scenario in 2050 materialised globally simultaneously, they would result in an aggregate loss in

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<sup>8</sup> Guinea-Bissau, Madagascar, Malawi, Mali and Zimbabwe.

<sup>9</sup> The authors make recommendations for a more comprehensive assessment of climate-induced damage. These recommendations include: strengthening good quality data collection and improving modelling capabilities to capture cascading climate impacts across sectors; integrating climate and non-climate shocks; expanding assessment to a global scale in order to capture cross-border risks and economic spill-overs and extending the time horizon beyond 2050 in order to provide critical insights for designing forward-looking adaptation strategies.

GDP on average of more than 10% in the euro area, with three sectors bearing the brunt: wholesale and retail, real estate and construction (Fahr et al., 2024). The European Commission Joint Research Centre (JRC) makes a clear case for adaptation measures in parallel with climate mitigation in the EU (JRC, 2020).

## 2.2 The impact on banks of physical climate risks and regulation as an adaptation tool

The impact on banks of the transmission and amplification channels for natural disasters includes a high probability of negative wealth effects, the deterioration of borrower and bank balance sheets, and an increase in credit and sovereign risks (Avril et al., 2025). The transmission and amplification of natural disaster effects might be mitigated by applying a restrictive macroprudential framework (i.e. low leverage, high capitalisation). Where market failures distort private adaptation, public policy should intervene by, for instance, improving information (e.g. locally relevant and updated information on damage caused by various natural hazards), providing public goods (e.g. financial stability), correcting negative externalities (e.g. limiting the reduction in credit supply) and addressing incomplete markets (e.g. insurance) (Carleton et al., 2025).

Ongena et al. (2025) examines the relationship between the financial policies implemented by regulators to both enhance the financial system's resilience to climate-related shocks while also facilitating the transition to a greener economy, and the systemic risk to banks. Resilience is proxied by a climate-related policy index (D'Orazio and Thole, 2022).<sup>10</sup> The authors use a sample of 458 international banks from 47 advanced and emerging economies over a period extending from 2000 to 2020. They conclude that overly stringent climate-related financial policies could jeopardise an orderly transition by reducing the ability of businesses to invest in energy-saving and emission-reduction technologies. However, countries that are particularly vulnerable to natural disasters stand to benefit the most from adopting climate-related financial policies.

D'Orazio (2025) uses a sample of 88 banks in developed and emerging economies over the same time period and applies the same climate-related policy index (D'Orazio and Thole, 2022). It concludes that stronger climate-related policies result in a statistically significant reduction in the credit risk associated with physical climate risks. This relationship is non-linear and shows the diminishing marginal effects of climate-related financial policies. The impact on credit risk is greater in low-vulnerability countries. In high-vulnerability countries, climate-related financial policies are not sufficient and additional policies are necessary for adaptation to physical climate risks. For transition risks, the relationship between the stringency of financial climate policies and credit risk does not show any statistical significance.

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<sup>10</sup> This Index captures not only the stringency of green prudential policies, but also credit limits or quotas promoting environmentally friendly sectors, taxonomies and standards for sustainable finance, requirements for climate disclosures by financial and non-financial institutions and policies fostering green bond issuance and related frameworks.

Ample evidence exists that natural disasters result in reduced supply of bank credit. Álvarez-Román et al. (2023) found a significant decrease in credit supply following climate-driven wildfires in affected areas in Spain. Geographically diversified banks cut credit supply more steeply, while small banks lend less but maintain activity. The return on assets is lower, on average, for less significant institutions (LSIs) located in areas that, historically, experience severe flooding events more frequently, partly because flood risks can negatively affect bank profitability owing to a decrease in lending in the euro area (Pagliari, 2021). Faiella and Natoli (2018) reaches similar conclusions for Italian banks that lend to firms located in areas at risk of flooding. Bank lending to non-financial firms is negatively correlated with their flood risk exposure. Based on data for Swedish banks, Cella and Schubert (2026) observes that insurance payouts correlate with high collateral but do not meaningfully temper bank sensitivity to climate shocks, signalling limits to insurance as a bank buffer.

For the same physical risk, De l'Estoile et al. (2025) points to the fact that the potential credit risks for banks in France are higher through the building occupiers channel than through the business owners channel. The authors highlight the distinction between building owners and occupiers in assessing potential losses for banks, given that the physical risks of each of these channels are exerted through different transmission mechanisms.

Physical risk covers the threat to economic activities associated with nature degradation, and euro area bank credit portfolios are vulnerable to future biodiversity loss (Boldrini et al., 2025). Water scarcity is the most significant risk in the EU,<sup>11</sup> while in an extreme, but plausible, drought with a 25-year return period, nearly 15% of economic output would be at risk (Ceglar et al., 2025). As regards the impact of adaptation interventions on bank mortgage portfolio losses, Faiella and Lavecchia (2025) finds that coastal barriers significantly reduce such losses for Italian banks exposed to the risk of coastal flooding in Rimini. The authors highlight the need to improve the quality of the information required to both identify assets exposed to coastal flooding and assess their vulnerability should an event materialise. Their recommendations include a call for precise information on the dwelling plan (ground-floor apartments are more exposed than those on upper floors) and for the reporting of insurance policies against catastrophic risks. Both are relevant for assessing the vulnerability of a bank to a particular risk of flooding. Residential mortgage rates have been increasingly affected by physical climate risk in euro area countries (Fontana et al., 2025).<sup>12</sup> In France, the damage function formula gives more weight to industrial or commercial undertakings than to office activities, thus emphasising horizontal activities located at ground level. Given, however, the current French insurance scheme, potential losses for the banking sectors are small (De l'Estoile et al., 2025).

Investors apply a penalty to commercial real estate exposed to physical climate risk in the euro area and the penalties increased in the period 2007-23 (Foerster et al.,

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<sup>11</sup> In 2021, the European Investment Bank (EIB) pledged a minimum 15% of its climate lending to climate adaptation. See EIB (2023) and EBA (2022), para. 134.

<sup>12</sup> The authors study eight euro area countries: Belgium, Germany, France, Ireland, Spain, France, Italy, the Netherlands and Portugal.

2025). The availability of bank capital and liquidity may also be affected. Pozdyshev et al. (2025) proposes a way of integrating physical risks into credit risk modelling using an extension of the existing Basel capital approach.<sup>13</sup>

Storms lead to significant declines in equity prices, although less so for firms with local institutional ownership that have already priced physical climate risk into their stock valuation before an event. The results are, however, mixed for floods (Bauer et al., 2025). Investors demand higher returns on bonds exposed to physical climate risk (Bats et al., 2024).

The ECB focuses on the physical impact of climate change on the economy and financial sector, investment needs and the insurance protection gap (ECB, 2024b), and regularly monitors how certain physical climate risk indicators<sup>14</sup> affect a firm's ability to pay back a loan or bond (ECB, 2024a). Climate scenarios have incorporated some of these physical risks (NGFS, 2024 and 2025), but further harmonisation of physical risks analysis and standardisation of the assumptions, exposures and scenarios is needed, as is better calibration that incorporates more recent data and a greater number of hazards (Bressan and Nieto, 2025). It should be noted, however, that climate scenarios do not, as yet, take into account adaptation to physical risks.

## 2.3 Private financing of physical climate risk adaptation

Financial literature has largely focused on the impact of public financing of climate adaptation (Runhaar et al., 2017), including the conditions for its effectiveness in limiting physical climate risks (Verschuur et al., 2025). The public sector is the motor for adaptation finance, albeit relatively modest (Mongelli et al., 2024), while private financing of climate adaptation is comparatively understudied and focuses mostly on the financing of households (Poussin et al., 2014).

Cortés Arbués et al. (2025) analyses adaptation investments by businesses across 28 European countries (2018-22) and concludes that private investments in climate change adaptation are increasing annually at a rate of approximately 30.6-37.7% of the GDP, with important differences in adaptation intensity across countries, sectors and hazards. The Netherlands, Greece, and Croatia are well above average in adaptation expenditure, as measured as a percentage of GDP, while Ireland, Luxembourg and Denmark are well below average.<sup>15</sup> There are also differences across sectors. Despite being the largest contributors to GDP in most European countries, manufacturing and wholesale retail trade invest less in adaptation compared with other economic sectors. As regards hazards, in most countries, all sectors invest proportionately the most in adaptation to heatwaves, with southern European countries investing the highest share. Adaptation to flooding is the second largest investment, while adaptation to wildfires and droughts attracts a very small proportion of investments. Public investments in adaptation did not discourage

<sup>13</sup> The internal ratings based (IRB) approach.

<sup>14</sup> Flooding, wildfires, landslides, subsidence, windstorms, water stress, droughts and rainfall variation.

<sup>15</sup> Adaptation expenditure is aggregated over nineteen NACE Rev. 2 economic sectors.

private investments over the period concerned (Verschuur et al., 2025), and there was a positive relationship between the sovereign debt rating index and the growth rate of private adaptation financing (Cortés Arbués et al., 2025).

## 3 The EU regulatory sustainability framework and adaptation financing: safety and soundness

### 3.1 Climate change adaptation: an overarching legal obligation in the European Union

Climate change adaptation is a legal obligation in the EU (ECA (2024), p. 12), but its content is usually blurred by being coupled with climate change mitigation in EU Levels 1-3 legislation, despite acknowledgement of the fact that the two should be differentiated (EP (2022), p. 51). This blurring is explained by the fact that, while the global goal of adaptation under Article 7 of the Paris Agreement was elevated to one of the six legally binding environmental objectives of the EU laid down in Article 9 of the EU Taxonomy (Gortsos and Kyriazis, 2024), the definition of climate change adaptation in Article 2(6) of that Taxonomy is very broad, i.e. “the process of adjustment to actual and expected climate change and its impacts”.

Under the Taxonomy Regulation,<sup>16</sup> an economic activity that pursues climate change adaptation should contribute substantially “to reducing or preventing the adverse impact of the current or expected future climate, or the risks of such adverse impact, whether on that activity itself or on people, nature or assets”.<sup>17</sup> This is an all-encompassing approach to adaptation and includes both mitigation of transition risks and adaptation to physical risks.

In addition, several technical screening criteria<sup>18</sup> provide guidance on how to determine whether the economic activities of 13 sectors – ranging from forestry and manufacturing to arts and education – make a “substantial contribution to climate

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<sup>16</sup> 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 (OJ L 198, 22.6.2020, p. 13).

<sup>17</sup> Recital 25 of Regulation (EU) 2020/852.

<sup>18</sup> Annex II of Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate change adaptation and for determining whether that economic activity causes no significant harm to any of the other environmental objectives (OJ L 442, 9.12.2021, p. 1).

change adaptation”.<sup>19</sup> However, these activities relate primarily to the mitigation of climate transition risks.

The ambitious strategy of the EU is aimed at inducing smarter, faster and more systematic adaptation, fostering, among others, the use of “nature-based solutions” to increase the EU’s resilience to climate change.<sup>20</sup> Specific legal obligations for Member States to adopt measures that have the potential to foster climate change adaptation result from dedicated EU legal acts relating, for example, to water and flood management.<sup>21</sup> Member States must prevent the deterioration of surface waters and groundwater (Article 4 of the Water Framework Directive<sup>22</sup>) and produce river basin management plans (Article 8). Member States must undertake a preliminary flood assessment for each river basin (Article 4 of the Floods Directive<sup>23</sup>), prepare flood hazard maps and flood risk maps (Article 6) and draw up flood risk management plans (Article 7).<sup>24</sup> Although these legal acts were adopted before the EU Taxonomy and do not explicitly refer to climate change adaptation, protecting wetlands contributes to nature-based solutions for climate change adaptation to flood risks, and this should be reflected in a future amendment.

The EU Nature Restoration Law<sup>25</sup> adopted in 2024 recognises that “restoring ecosystems also contributes to the Union’s climate change mitigation and climate change adaptation objectives” (Article 1). It sets legally binding targets for restoring degraded ecosystems (Article 4) (i.e. at least 20% of EU land and sea areas by 2030 and all such areas in need of restoration by 2050), with the submission of national restoration plans to the European Commission by 1 September 2026 (Article 14). The EU adaptation strategy relies heavily on natural solutions, in much the same way as the decarbonisation strategy does on “natural sinks”.<sup>26</sup> As a result, the

<sup>19</sup> In general, and depending on the economic sector, the physical and non-physical contributions, collectively called adaptation solutions, substantially reduce the key physical risks. The physical risks are identified by performing a robust climate risk and vulnerability assessment, that assessment being proportionate to the scale of the activity and its lifespan. The climate projections and impact assessment are in line with best practices and available guidance, IPCC recommendations, etc., and the adaptation solutions “(a) do not adversely affect the adaptation efforts or the level of resilience to physical climate risks of other people, of nature, of cultural heritage, of assets and of other economic activities; (b) favour nature-based solutions or rely on blue or green infrastructure to the extent possible; (c) are consistent with local, sectoral, regional or national adaptation plans and strategies; (d) are monitored and measured against pre-defined indicators and remedial action is considered where those indicators are not met; (e) where the solution implemented is physical and consists in an activity for which technical screening criteria have been specified in Annex II of [Commission Delegated Regulation \(EU\) 2021/2139](#), the solution complies with the do no significant harm technical screening criteria for that activity.”

<sup>20</sup> [Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Forging a climate-resilient Europe - the new EU Strategy on Adaptation to Climate Change](#) (COM/2021/82 final).

<sup>21</sup> See, for example, [European Commission v Hellenic Republic, C-359/24](#) (ECLI:EU:C:2025:403), para. 45, referring to Directives 2000/60/EC on water policy and 2007/60/EC on assessment and management of floods.

<sup>22</sup> [Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy](#) (OJ L 327, 22.12.2000, p. 1).

<sup>23</sup> [Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks](#) (OJ L 288, 6.11.2007, p. 27).

<sup>24</sup> “[Commission reports show faster progress is needed across Europe to protect waters and better manage flood risks](#)”, *press release*, European Commission, 4 February 2025.

<sup>25</sup> [Regulation \(EU\) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation \(EU\) 2022/869](#) (OJ L, 2024/1991, 29.7.2024).

<sup>26</sup> The [Fit for 55](#) package of legislation aims to make all EU sectors fit for a reduction of at least 55% of greenhouse gas emissions by 2030. Several legal acts under the Fit for 55 package have been adopted since 29 June 2022.

taxonomy of economic activities has not been adapted to the EU context, nor are there any plans to do so.

NGFS (2024) uses the definition of climate change adaptation provided by the Intergovernmental Panel on Climate Change (IPCC), i.e. “the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions”.

The IPCC definition borrows elements for building climate resilience (NGFS (2024), p. 7). In line with the EU Climate Law,<sup>27</sup> euro area countries have been implementing national adaptation plans and strategies since 2019 (EEA (2023), p. 33). These plans translate into regional adaptation plans which identify, among others, adaptation measures to which banks can contribute by providing financing where such measures are warranted under national and regional adaptation plans and strategies (UNEPFI (2023), p. 7; UNDRR, 2023).<sup>28</sup>

## 3.2 Is climate change adaptation integrated into ESG risk management?

Adaptation increases the resilience of communities by addressing exposures and vulnerabilities resulting from climate hazards. The question is how banks incorporate climate change adaptation into environmental, social and governance (ESG) risk management (Elderson, 2025), namely into materiality assessments (from which physical risks are largely omitted) (Elderson, 2024), transition plans (Dikau et al., 2022) and scenario analysis. Chart 1 shows EU prudential guidance and regulation on sustainability and on climate risk management and transparency.<sup>29</sup>

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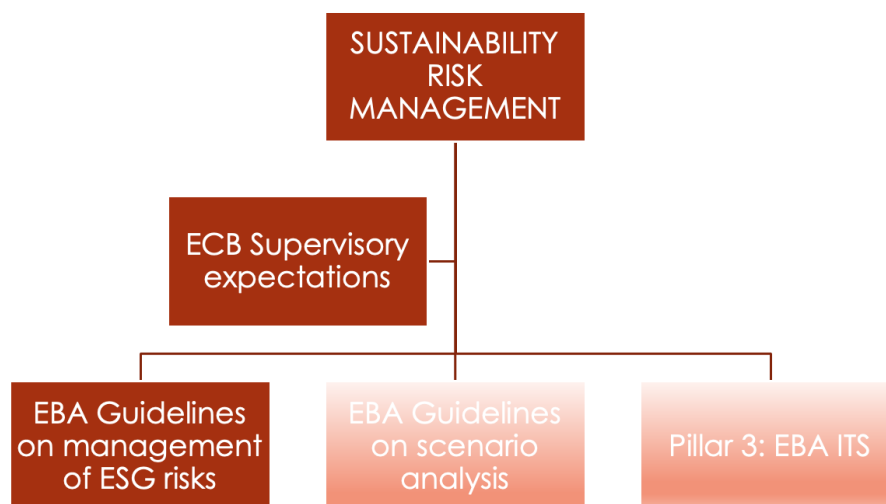
<sup>27</sup> [Regulation \(EU\) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations \(EC\) No 401/2009 and \(EU\) 2018/1999 \(OJ L 243, 9.7.2021, p. 1\).](#)

<sup>28</sup> See the article entitled “[Overview - National Adaptation Plans](#)” published on the website of the United Nations Framework Convention on Climate Change (UNFCCC).

<sup>29</sup> The climate risk scenarios developed by the IPCC and the NGFS include physical risk, while those developed by the IEA do not.

## Chart 1

### Prudential regulation on sustainability risk management and transparency



Source: Authors' analysis

Forward-looking scenario analysis and adaptation are considered by the European Banking Authority (EBA) in its Guidelines on the management of ESG risks (EBA (2025b), paras 94-98) and its Guidelines on environmental scenario analysis (EBA (2025a), para. 72), and form part of the ECB supervisory expectations (ECB (2020), p. 18).

Physical risks are part of the materiality assessment for ESG risks (EBA (2025c), paras 19 and 22) in terms of the geographic dependencies of borrowers' key assets and their levels of vulnerability to environmental hazards. The EBA Guidelines on the management of ESG risks require institutions to “quantify climate-related risks, such as by estimating the [...] magnitude of financial impacts [...]”. Moreover, banks should incorporate material ESG risks and their impacts on financial risk categories into their internal capital adequacy assessment process (ICAAP). Banks must use stress tests as part of their ICAAP and internal liquidity assessment process (ILAAP) frameworks – in accordance with Articles 73 and 86 of the Capital Requirements Directive (CRD)<sup>30</sup> – but also, as part of their Pillar I internal model approaches, as “challenger models” where internal ratings based (IRB) approaches are used. Bank stress tests assess how plausible, although unlikely, negative financial scenarios could affect a bank's profitability, solvency and liquidity.

When referring to data processes, the EBA Guidelines on the management of ESG risks recommend collecting data points on the geographical location of key assets (e.g. production sites) and exposure to environmental hazards (e.g. temperature, wind, water and solid mass-related hazards) at the level of granularity needed for

<sup>30</sup> [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, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC \(OJ L 176, 27.6.2013, p. 338\).](#)

appropriate physical risk analysis. The availability of insurance applies only to large corporate counterparties.<sup>31</sup>

When integrating scenario analysis into their risk management, banks may find it useful “to leverage ESG stress testing or other resilience testing exercises conducted by the supervisors within the financial sector” (EBA (2025b), para. 11; EBA, 2025c). Climate change scenarios are crucial in assessing financial risks triggered by climate risks. Comparable climate scenarios should inform both banks’ stress test exercises and their transition plans. In turn, both should support prudential supervisors in assessing the forward-looking dimension of climate risks, including physical risk, and its possible implications for potential additional capital needs.

Articles 87a(3) and 87a(5) of the CRD<sup>32</sup> provide the legal mandate and define the objectives of the EBA Guidelines on environmental scenario analysis (EBA, 2025c), including the parameters, time horizons and assumptions to be used in each of the scenarios. These Guidelines also specify how climate risks should be considered for the purpose of Pillar I credit risk internal model approaches for banks adopting the IRB approach.<sup>33</sup> The Guidelines highlight the need for both supervisors and banks to fully understand the transmission channels for climate risks (EBA (2025c), paras 15 and 72) and to refer to credible scenarios developed by international bodies,<sup>34</sup> such as the NGFS, the JRC, the International Energy Agency (IEA) and national (government) bodies, without prioritising any of them. The Guidelines also point to the need for sufficient consistency between the scenarios used for physical and for transition risks, even when different modelling approaches are used.<sup>35</sup> In practice, different modelling approaches limit comparability across scenario providers used by different banks. For example, the types of physical risk are different, or simply non-existent, in the scenarios provided by the IEA. The supporting models and the impact assessment methodologies also differ and do so across countries. Consequently, they do not guarantee a level playing field (see the Annex). Furthermore, the EBA also refers to the possibility of a simpler form of testing for bank environmental risk resilience that would use a sensitivity analysis that applied a “what if” hypothesis across short to long-term horizons and that encompassed physical risks. The breadth and depth of the EBA approach would be determined by the materiality of risks identified within a bank’s portfolios and operations, as well as by the size and

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<sup>31</sup> As defined in Article 3(4) of [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 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](#) (OJ L 182, 29.6.2013, p. 19).

<sup>32</sup> [Directive \(EU\) 2024/1619 of the European Parliament and of the Council of 31 May 2024 amending Directive 2013/36/EU as regards supervisory powers, sanctions, third-country branches, and environmental, social and governance risks](#) (OJ L, 2024/1619, 19.6.2024).

<sup>33</sup> Institutions using IRB approaches “...shall include ESG risks drivers, in particular physical and transition risk drivers stemming from climate change” EBA (2025c), para. 88.

<sup>34</sup> As specified in Article 87a(3) of the CRD.

<sup>35</sup> EBA (2025b), para. 81. The Guidelines state, at paragraph 75c, that the institutions should consider both physical and transition risks including “sectoral pathways to net-zero emissions, i.e. how the different sectors transition and adapt to a sustainable economy, including, where relevant, the international outlook, such as the International Energy Agency (IEA), the Science Based Targets initiative (SBTi) or the Net Zero Banking Association (NZBA) sectoral decarbonisation pathways, the regional context, foremost among which the European Green Deal strategy, the Fit for 55 package, and the 2050 climate-neutrality target, and the national policies and climate strategy”.

sophistication of that bank, thereby acknowledging that small institutions could be exposed to major physical risks (EBA (2025b), para. 67). The Guidelines state that adaptation policies should be included in climate risk scenarios, but do not specify how (EBA (2025b), para. 75). Although adaptation financing is a physical risk mitigant, it is not treated as such in standard (IPCC and NGFS) climate scenario modelling (NGFS, 2024 and 2025). In setting their climate scenarios, banks should, however, assess their counterparties' adaptation policies (EBA (2025b), para. 72). For physical risks, banks should factor in the corporate profitability transmission channel that may be impacted by ex ante adaptation costs arising from adverse climate-related disruptions, as well as higher leverage for ex post adaptation if corporate assets and households sustained damage (EBA (2025b), Figure 2 and Annex). Financial climate models that provide both sectoral probabilities of default (PDs) and LGDs have technically opened up this possibility (Mandel et al., 2025).

While the EBA Guidelines on environmental scenario analysis still refer to acute and chronic physical risks (EBA (2025c); EBA (2025), para. 78; Myklebust, T., 2022), the Basel Committee on Banking Supervision (BCBS) recommends aggregate reporting of physical risks without distinguishing between the two (BCBS (2025), p. 6, Template CRFR2 on physical risk and Table CRFRB on qualitative information). The EBA abandoned this distinction in its draft implementing technical standards as not being useful in terms of the disclosure of ESG risks (see Section 3.4 below) (EBA (2025), para. 26). The European supervisory authorities<sup>36</sup> joint consultation on integrating ESG risks into supervisory stress tests (ESA, 2026) contemplates a scenario of compound physical risks (e.g. droughts, heatwaves, wildfires and floods/storms), as in the new NGFS short-term scenarios (NGFS, 2025).

The EBA Guidelines on environmental scenario analysis complement both the Guidelines on the management of ESG risks and the Guidelines on stress testing by institutions. They seek to address, within the context of the business model analysis, which is part of the Supervisory Review and Evaluation Process (SREP), the features specific to environmental risks which have potential implications for both capital and liquidity requirements in the short term and for resilience in the longer term.<sup>37</sup>

Transition plans are a risk management tool for banks introduced under Article 76(2) of the CRD<sup>38</sup> (Binder, J-H. (2025); EBA (2025b), p. 7).<sup>39</sup> Under the Capital Requirements Regulation (CRR),<sup>40</sup> the transition plans drawn up by banks are not

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<sup>36</sup> The EBA, the European Securities and Markets Authority (ESMA) and the European Insurance and Occupational Pensions Authority (EIOPA).

<sup>37</sup> EBA (2025c) refers to climate-related and environmental risks in the context of the business model analysis (BMA) and ESG stress testing. Furthermore, the Guidelines specify how competent authorities should take ESG risks into account in the SREP.

<sup>38</sup> [Directive \(EU\) 2024/1619 of the European Parliament and of the Council of 31 May 2024 amending Directive 2013/36/EU as regards supervisory powers, sanctions, third-country branches, and environmental, social and governance risks](#) (OJ L, 2024/1619, 19.6.2024).

<sup>39</sup> The transposition of CRD VI in all Member States will apply from 11 January 2026. From that date onwards, banks will be required to submit their transition plans to the supervisors, who will assess their robustness during the SREP; see EBA (2025a).

<sup>40</sup> [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 and amending Regulation \(EU\) No 648/2012](#) (OJ L 176, 27.6.2013, p. 1).

for publication (Nieto and Papathanassiou, 2023). Despite their name, transition plans (EBA (2025b), para. 95; EBA (2025c), paras 48 and 51) ensure that banks monitor and address ESG risks, including transition and physical risks, over the short and medium term, as well as over a long-term horizon of at least 10 years, for which scenarios associated with higher levels of physical risks are applied (EBA (2025b), para. 9). Transition plans should be fully integrated into the ICAAP and into the risk management framework.<sup>41</sup>

The scope of the plans is comprehensive given that a combination of methodologies – based, for example, on exposure, portfolio, sector, portfolio alignment and scenario – is used to identify and measure ESG risks. The identification of sectors and exposures also facilitates consideration in a transition plan of hazard severity and of adaptation measures. In our view, banks need to take exposure, hazard and vulnerability into account in their transition plans and to conduct a materiality assessment of physical risks. Pillar III disclosure requirements (see Section 3.3 below) focus solely on sectoral exposures by geographic region.

Transition plans need to be grounded in science-based and up-to-date scenarios originating from national, EU or international organisations (e.g. the IPCC). The EBA Guidelines for the management of ESG risks (EBA, 2025b) and Guidelines for environmental scenario analysis (EBA, 2025c) should therefore have seized the opportunity to create a level playing field across banks and EU countries by ensuring full alignment across the EU of the scenarios and modelling approaches used for transition plans, climate stress testing and climate resilience analysis (EBA, 2022).<sup>42</sup>

The Guidelines on the management of ESG risks (EBA (2025b), paras 9, 19, 24, 33-34 and 36-37) could inform EU bank transition plans and physical risk adaptation strategies by, for example, requiring banks to monitor their levels of physical risk exposure over several time horizons and use scenario analysis to determine how different physical risks might affect their business continuity. Furthermore, the materiality assessment of climate and environmental risks could be expanded to include the physical risk exposure of geographic areas and real estate, even in the absence of a mandatory list of exposures for physical risk. At the exposure level, consideration could be given to ex post and ex ante investments in adaptation (insurance and the capacity of the counterparty to ensure resilience to physical risks through ex ante investments, e.g. retaining walls) and to concentration risk by allowing for the vulnerability of geographical areas to physical risk (e.g. measuring exposures and collateral in high flood-risk, water-stressed and wildfire-risk areas). We would suggest that future revisions of the Guidelines on the management of ESG risks provide a list of physical risks (hazards), along the lines of those monitored by the ECB, for which banks should assess their exposure over the return periods for those risks, while at the same time giving banks the flexibility to adjust the physical risks they take into account depending on the nature of their portfolios and

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<sup>41</sup> CaixaBank (2023), p. 39 discusses physical risk as a driver for various types of risks.

<sup>42</sup> For the sake of consistency across supervisory authorities and to preserve a level playing field across financial sectors, the EBA, ESMA and EIOPA issued joint guidelines for ESG stress testing (ESA, 2026). These Guidelines leave open the possibility of using different scenario providers.

their borrowers' vulnerability. Ideally, banks should also allow for their borrowers' adaptation measures (ECB (2024a)).

With the physical risks affecting counterparties continuing to grow, there is an increasing need to take this into account at all stages in granting and processing credit. In point of fact, some banks already include physical risks and environmental parameters in their PD assessments or in their credit scoring models (ECB (2020), Expectations 8.1 and 8.6). Finally, empirical evidence shows that European banks shift credit supply to firms that will benefit from regulatory changes that favour adaptation.

### 3.3 Is Pillar III disclosure of physical risks an effective stakeholder discipline tool?

The growing exposure to physical risks, such as floods and wildfires, that have a very strong regional component and occur frequently (ECB (2024), p. 52 and 56; ECB, 2024a) must also be reflected in the public Pillar III disclosures in order to inform private investors and stakeholders (Gözlügöl and Ringe (2022), p. 45).

Based on the data held in the ESG Hub established by the EBA,<sup>43</sup> mean bank exposures to physical risk is relatively low, amounting to 23.2% in 2024. There are, however, discrepancies across Member States, and banks in some countries may be more vulnerable than in others. For example, banks in Austria and Bulgaria show exposures sensitive to physical risks of over 90%. It should be noted, however, that the EBA data are not currently broken down by physical risk and country.<sup>44</sup>

At the time of writing, the EBA is in the process of revising the Pillar III disclosure templates (EBA, 2025) that establish detailed uniform formats for reporting ESG-related risks pursuant to Article 449a of CRR III.<sup>45</sup> It has currently issued a no-action letter that will apply until the end of 2026. The existing regulation has so far applied solely to large banks whose shares have been traded in EU regulated markets since 2022 (large listed banks). The revision of the implementing technical standards is motivated not only by the amendments introduced under CRR III (Article 449a) that extend the scope of application of the requirements to all institutions in a "proportionate manner", but also by the ad hoc ESG data collections of recent years, together with the insights gained from the various ECB-European banking supervision climate scenario exercises conducted. Moreover, in undertaking the revision, the EBA is mindful of the current discussions on the Omnibus package, the objective of which is to streamline and align various ESG reporting standards to reduce the burden for small and medium-sized enterprises.

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<sup>43</sup> ESG data submitted under [Commission Implementing Regulation \(EU\) 2022/2453 of 30 November 2022 amending the implementing technical standards laid down in Implementing Regulation \(EU\) 2021/637 as regards the disclosure of environmental, social and governance risks](#) (OJ L 324, 19.12.2022, p. 1).

<sup>44</sup> See the [EBA ESG Dashboard](#).

<sup>45</sup> [Regulation \(EU\) 2024/1623 of the European Parliament and of the Council of 31 May 2024 amending Regulation \(EU\) No 575/2013 as regards requirements for credit risk, credit valuation adjustment risk, operational risk, market risk and the output floor](#) (OJ L, 2024/1623, 19.6.2024).

As regards physical risks, the introduction of the principle of proportionality under Article 449a of the CRR means that the EU disclosure requirements for gross exposures to climate-relevant sectors subject to physical climate hazards will vary between banks, depending on the size and complexity of the institution concerned, from 31 December 2026.<sup>46</sup>

Large (listed and unlisted) banks (Article 433a of the CRR) must disclose hazards related to temperature (e.g. wildfires, heat stress), wind (e.g. cyclones, storms, hurricanes), water (e.g. sea-level rises, droughts, floods) and solid mass (e.g. coastal erosion, soil degradation, landslides) semi-annually (Template 5 of Commission Implementing Regulation (EU) 2024/3172).<sup>47</sup> The EBA has abandoned the distinction between chronic and acute physical risks.<sup>48</sup> The geographic granularity of gross exposures is defined by the Nomenclature of Territorial Units for Statistics, Level 3 (NUTS 3),<sup>49</sup> and large listed banks are required to report their ten largest exposures to such hazards.

Other listed institutions (not large banks) (Article 433c of the CRR) and large subsidiaries (Articles 13(1) and 449a of the CRR) must disclose their gross exposures annually, but without distinguishing among the different physical hazards. Their disclosures are therefore less granular (NUTS 2).<sup>50</sup> Moreover, such institutions need only disclose their five largest exposures.

Small and non-complex institutions (SNCIs) (Article 433b of the CRR) and other unlisted institutions (Article 433c of the CRR) are not obliged to disclose qualitative or quantitative information on physical risks exposure and need only provide simplified essential ESG information.

Two key observations should be made as regards the recent EBA approach for disclosing physical climate risk. First, it does not extend the physical risks reporting obligation to SNCIs and other unlisted institutions, many of which are less geographically diversified than larger institutions. As Álvarez-Román et al. (2023) and Faiella and Natoli (2018) conclude, these institutions experience decreases in credit supply following climate-driven events, but continue to be involved in affected areas. In regulating the disclosures of non-systemically relevant credit institutions, the principle of proportionality has prevailed over the objective of providing market participants and other stakeholders with a more accurate view of the potential negative economic impact of climate hazards arising from the restriction of credit in

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<sup>46</sup> The classification of economic sectors uses the NACE 2.1 revision as a reference. Given their high dependence of physical assets, Sectors I (accommodation and food service activities) and K (telecommunication, computer programming, consulting, computing infrastructure and other information services) have been added to the existing list (A,B,C,D,E,F,G,H,M) of climate relevant sectors.

<sup>47</sup> EBA (2025), EBA (2025a) and the EBA no-action letter of 5 August 2025.

<sup>48</sup> See the EU Taxonomy [Classification of climate-related hazards](#).

<sup>49</sup> For example, in Spain, NUTS 3 corresponds to the provinces, islands and geographical regions. For further information, see the [NUTS](#) page published on the Eurostat website.

<sup>50</sup> For example, in Spain, NUTS 2 corresponds to the “comunidades autónomas” (autonomous communities).

the aftermath of a physical climate event and, ultimately, of the impact on the profitability, if not the viability, of the banks concerned.<sup>51</sup>

Second, exposure is just one of the components of physical climate risk. Vulnerability is equally important, and the EBA Guidelines on ESG risk management refer to the levels of vulnerability to environmental hazards as being relevant for the materiality assessment of physical risks (EBA (2025b), para. 19). Information on adaptation measures could provide stakeholders with a more accurate view of the economic and financial impact of climate-related physical risks. While not seeking to add to disclosure requirements, it should be ensured that the proportionality principle is guided by vulnerability rather than size.

In addition to the above, large listed banks subject to Article 8 of the EU Taxonomy are required to disclose their aggregate green asset ratio (GAR).<sup>52</sup> This is aimed at gauging the extent to which a bank's portfolio is sustainable, and a breakdown must be provided by: (i) environmental objective, including climate change adaptation; and (ii) type of counterparty (manufacturing types, mining, agriculture, etc.).<sup>53</sup> The disclosure of GAR began in 2024 and covered the stock of loans, debt securities and equity instruments and the flow for new lending.<sup>54</sup>

While the definition of GAR has remained unchanged, its computation was simplified on 4 July 2025 under the amendments to Commission Delegated Regulation (EU)

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<sup>51</sup> While supportive of the simplification objective of the Omnibus Directive, the ECB observed that ESG reporting provides more information on the wider ESG risks beyond Pillar III climate data and that ESG risks "are not necessarily proportionate to an institution's size". See the [Opinion of the European Central Bank of 8 May 2025 on proposals for amendments to corporate sustainability reporting and due diligence requirements \(CON/2025/10\)](#), section 3.1.6.

<sup>52</sup> The GAR ratio for climate change adaptation is calculated as the proportion of loans and advances/debt securities/equity instruments financing taxonomy-aligned economic activities for the objective of climate change adaptation as compared with total loans and advances/debt securities/equity instruments of non-financial undertakings and all other covered on-balance sheet assets. The European Banking Federation (EBF, 2024) noted, in 2024, that there is an asymmetry and the GAR would seem to be lower for banks that predominantly provide green finance to SMEs and to clients in third countries owing, for example, to the fact that SMEs are included in the denominator but not in the numerator.

<sup>53</sup> [Commission Delegated Regulation \(EU\) 2021/2178 of 6 July 2021 supplementing Regulation \(EU\) 2020/852 of the European Parliament and of the Council by specifying the content and presentation of information to be disclosed by undertakings subject to Articles 19a or 29a of Directive 2013/34/EU concerning environmentally sustainable economic activities, and specifying the methodology to comply with that disclosure obligation \(OJ L 443, 10.12.2021, p. 9\), Annex V, Section 1.2.1, as amended by Commission Delegated Regulation 2022/1214 of 9 March 2022 amending Delegated Regulation \(EU\) 2021/2139 as regards economic activities in certain energy sectors and Delegated Regulation \(EU\) 2021/2178 as regards specific public disclosures for those economic activities \(OJ L 188, 15.7.2022, p. 1\) and Commission Delegated Regulation 2023/2486 of 27 June 2023 supplementing Regulation \(EU\) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to the sustainable use and protection of water and marine resources, to the transition to a circular economy, to pollution prevention and control, or to the protection and restoration of biodiversity and ecosystems and for determining whether that economic activity causes no significant harm to any of the other environmental objectives and amending Commission Delegated Regulation \(EU\) 2021/2178 as regards specific public disclosures for those economic activities \(OJ L, 2023/2486, 21.11.2023\).](#)

<sup>54</sup> For examples of GAR disclosures using various methodologies, see ABN AMRO (2023), p. 294; BNP Paribas (2023); Deutsche Bank (2023), p. 43.

2021/2178 adopted under the Omnibus I proposal.<sup>55</sup> The disclosure obligations for large listed banks<sup>56</sup> and all other banks falling within the scope of the CRR ESG requirements will be suspended until 31 December 2026 (EBA (2025), paras 6 and 16).

The EBA proposes continuing alignment with the disclosure requirements of Commission Delegated Regulation 2021/2178 (EBA (2025), para. 26), with the templates in that Regulation being substituted for the existing ones<sup>57</sup> and being included, as appropriate, in Pillar III disclosures,<sup>58</sup> which distinguish climate change adaptation by sector (NACE 4).

The reference to disclosure obligations under Commission Delegated Regulation 2021/2178 is beneficial for banks because it avoids duplication and streamlines the disclosure rules. Given the complexity of GAR calculations and the often-unreliable borrower data, GAR is of limited use currently as a stakeholder disciplinary tool. Furthermore, the absence of an EU Taxonomy on adaptation complicates differentiation of taxonomy eligible and non-eligible economic activities for the purpose of adaptation.

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<sup>55</sup> [Commission Delegated Regulation \(EU\) 2026/73 of 4 July 2025 amending Delegated Regulation \(EU\) 2021/2178 as regards the simplification of the content and presentation of information to be disclosed concerning environmentally sustainable activities and Delegated Regulations \(EU\) 2021/2139 and \(EU\) 2023/2486 as regards simplification of certain technical screening criteria for determining whether economic activities cause no significant harm to environmental objectives \(OJ L, 2026/73, 8.1.2026\)](#) is subject to scrutiny by the European Parliament and Council and came into effect on its publication in the Official Journal of the EU.

<sup>56</sup> [Templates 6-10 related to the GAR and the Taxonomy Regulation under Commission Implementing Regulation \(EU\) 2024/3172 of 29 November 2024 laying down implementing technical standards for the application of Regulation \(EU\) No 575/2013 of the European Parliament and of the Council with regard to public disclosures by institutions of the information referred to in Part Eight, Titles II and III, of that Regulation, and repealing Commission Implementing Regulation \(EU\) 2021/637 \(OJ L, 2024/3172, 31.12.2024\)](#).

<sup>57</sup> [Replacing Templates 7 and 8 of Commission Implementing Regulation \(EU\) 2024/3172 by the relevant templates in Commission Delegated Regulation 2021/2178 of 6 July 2021 supplementing Regulation \(EU\) 2020/852 of the European Parliament and of the Council by specifying the content and presentation of information to be disclosed by undertakings subject to Articles 19a or 29a of Directive 2013/34/EU concerning environmentally sustainable economic activities, and specifying the methodology to comply with that disclosure obligation \(OJ L 443, 10.12.2021, p. 9\)](#).

<sup>58</sup> [Templates 1 \("Assets for the calculation of GAR"\) and 4 \("GAR KPI flow"\) given in Annex VI to Commission Delegated Regulation 2021/2178](#).

## 4 Conclusion

Climate change adaptation is a legal obligation in the EU, but its content is usually blurred by being coupled with climate change mitigation in EU Levels 1-3 legislation.

Physical climate risks require a holistic approach in banks' stress testing, transition plans and Pillar III disclosures. Stress tests assess the impact of physical risks as a trigger for financial risks. Physical risks should be representative of the geographic areas in which banks operate, and compounded physical risks (e.g. dry and wet, as well as mixed events) should, ideally, also be assessed. To facilitate bank monitoring of physical risk exposures, the EBA Guidelines should provide a list of physical risks that reflects the physical risk indicators monitored by the ECB (ECB 2024a), while giving banks the flexibility to focus on those risks that are relevant to the vulnerability of their exposures and collateral to each of the hazards concerned. Going forward, modelling approaches to assess the impact of physical risks should be harmonised, and financial climate models should ideally account for adaptation and capture physical risk heterogeneity, as well as different national and regional institutional capacities.

Transition plans need to set targets for adaptation to physical risk that reflect the hazards, exposures and vulnerabilities concerned. Adaptation measures need to be viewed as physical risk mitigants and should, ideally, also be disclosed, from the point of view of vulnerability, allowing for the principle of proportionality and need for simplification (e.g. reporting on hazards with return periods above certain thresholds).

Future revisions of the EBA Guidelines on the management of ESG risks (EBA, 2025b) and the Guidelines on ESG scenario analysis (EBA 2025c) should seize the opportunity to create a level playing field across banks and EU countries and ensure full alignment across the EU of the modelling approaches and scenarios used for climate scenario analysis and their consistency across transition plans, climate stress testing and climate resilience analysis.

Our analysis includes an assessment of Pillar III as a tool for stakeholder discipline over banks' management of physical risks and their adaptation tools. The disclosure rules envisaged in Level 3 legislation will introduce greater proportionality into banks' disclosure. That said, we have two key observations to make as regards the recent approach to the disclosure of physical climate risk.

First, this approach does not extend the obligation to report physical risks to SNCIs and other unlisted institutions, many of which are less geographically diversified than larger institutions and limit their lending while continuing to supply credit in the aftermath of physical hazards. This may have important consequences for their profitability and solvency, as shown in the literature review based on data for Spain, Italy and the euro area.

Second, exposure is just one of the components of physical climate risk; vulnerability is as important. If adaptation measures have been adopted by a borrower, this is also relevant information that needs to be disclosed.

A greater focus on adaptation in the EU Taxonomy would greatly support the expansion of financial instruments targeted at adaptation financing for physical risks. This, in turn, would be supportive of favourable risk treatment for non-financial firms that tap the financial markets to invest in adaptation to physical climate risks.

## Annex

### Main differences between selected scenario providers

Physical risks scenario providers/ Characteristics	Network for Greening the Financial System (NGFS) long-term	NGFS short-term	Joint Research Centre – European Commission
Approach	World/Top down (damage applied to aggregated GDP)  Regional damage function/Non sector specific	World/Bottom up (damage applied to each continent)  Hazard and sector specific damage function/continent (5)	EU/Top down  Hazard and sector specific damage function  > 1000 territorial units
Hazards	Chronic (no sea level rise) vs acute (cyclones, droughts, floods, heatwaves)  Coarse geographical resolution and relatively lower return periods	Compound chronic and acute (wet – storms, hurricanes, floods) and dry (heatwaves, droughts, fires) events using a story line to describe the compound effects  Higher geographic resolution and return periods	Combined hazards  Floods (coastal and river)  Wildfires  Earthquakes  Landslides  Windstorms  Heatwaves  Human mortality from heat/cold

Source: Authors' analysis.

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