

A hand holding a white paper airplane against a bright sun in a mountainous landscape. The sun is low on the horizon, creating a lens flare effect. The background shows dark, silhouetted mountains under a clear blue sky. The foreground is filled with golden, out-of-focus grass. The overall mood is hopeful and aspirational.

# Emissions Impossible:

Quantifying financial risks associated  
with the net zero transition

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# Executive summary

Financial institutions are increasingly expected to quantify their exposures to risks related to climate change. Such risks include climate transition risk: that is, the potential negative impacts on an organisation, or asset values, associated with the transition to a lower-carbon economy. Financial institutions identify, measure and monitor transition risk – both at the level of their individual clients/exposures and their overall portfolio – using a variety of data and tools. There remains little consensus, however, as to the most suitable metrics through which to do so.

Emerging metrics differ in the degree to which they provide information on climate transition risk. Many of the climate-related metrics are based on greenhouse gas (GHG) emissions, which may not be a comprehensive indicator of a firm's exposure to transition risk. This is because measures of emissions suffer from systematic reporting biases, tend to be backward-looking, and may not accurately capture how a firm's profitability is likely to be affected by an increase in the cost of emissions (including that brought about by the imposition of a carbon tax). We find little empirical correlation between firms' emissions intensity and one measure of climate transition risk. While emissions-based metrics may not be a comprehensive measure of transition risk, they do have the advantage of being relatively objective and straightforward for external stakeholders to verify.

Other types of metrics, such as climate transition value at risk or outputs of a financial institution's internal climate scenario analysis, can provide a more risk-sensitive (granular and forward-looking) representation of transition risk. These benefits come, however, at the cost of greater complexity: this is partly because such metrics require a degree of judgement in assessing the detail of how different firms and sectors will be affected by the net zero transition. They are therefore less externally verifiable and objective.

Quantifying transition risks to financial institutions is inherently complex. Multiple metrics may be needed to provide a comprehensive view of a financial institution's exposure to transition risk. Financial institutions will continue to refer to multiple sources of quantitative and qualitative information about their clients and counterparties to inform their assessment and monitoring of climate transition risk.

As with other aspects of financial risk, more complex and risk-sensitive metrics may be better suited to financial institutions' internal measurement and management of transition risk. Metrics that are more verifiable and objective have the benefit of enabling comparison across firms; they may, therefore, be better suited to use in financial institutions' disclosures. That said, it may be useful for financial institutions and authorities to communicate the information contained in the metrics they use, including the degree to which they provide a robust representation of transition risk.

As work on climate risk management expectations and disclosure standards continues, financial institutions and authorities should remain mindful of the relative strengths of different metrics, and use metrics for purposes to which they are best suited. Were financial authorities to assess the safety and soundness of financial institutions based solely on their operational or financed emissions, this might give a misleading representation of transition risks. This could also disincentivise financial institutions from engaging in transition financing activities that are currently high emitting, yet critical in supporting economy-wide transition.

## About the IIF

The Institute of International Finance (IIF) is the global association of the financial industry, with about 400 members from over 60 countries, including commercial and investment banks, asset managers, insurance companies, professional services firms, exchanges, sovereign wealth funds, hedge funds, central banks and development banks. The IIF's mission is to support the financial industry in the prudent management of risks, to develop sound industry practices, and to advocate for regulatory, financial and economic policies that are in the broad interests of its members, and foster global financial stability and sustainable economic growth.

For more information about the IIF, please visit: [www.iif.com](http://www.iif.com).

## About WTW

WTW provides data-driven, insight-led solutions in the areas of people, risk and capital. Leveraging the global view and local expertise of our colleagues serving 140 countries and markets, we help businesses sharpen their strategy, enhance organisational resilience, motivate their workforce and maximise performance.

WTW helps its clients identify climate-related risks and turn them into opportunities. In particular, its Climate Quantified™ data and analytical tools provide cutting-edge measurement of physical, transition and liability risks across a range of financial institutions and markets.

For more information about WTW and its capabilities relating to climate risks, please visit the [Climate and Resilience Hub](#).

**Transparency disclaimer:** The IIF and WTW have collaborated to produce this analytical paper, which is not intended to promote any specific metrics or providers. WTW is a provider of climate-related data and metrics one of which, Climate Transition Value at Risk (CTVaR), is used and profiled in this paper. The paper is not an exhaustive overview of all available metrics, nor is it an endorsement of CTVaR or any other metric. Other firms, including other IIF members, provide alternative metrics.

# Introduction

The risks that climate change poses to the financial system are subject to increasing scrutiny from market participants, financial authorities and civil society. There is widespread recognition that financial institutions and authorities need to develop data and tools with which to measure and manage climate-related risks.<sup>1</sup> Such risks include climate transition risk: that is, the potential negative impact on organisations or asset values associated with the transition to a lower-carbon economy.<sup>2</sup> Transition risks can arise due to changes in policy or regulation, technology and consumer preferences, as well as potential legal risk.<sup>3</sup> Despite the development of multiple frameworks to assess, categorise and disclose financial institutions' exposures to climate transition risk, there remains little formal consensus as to the most suitable and relevant data and metrics through which to do so.

This paper examines some of the metrics which have emerged to quantify climate transition risks to financial institutions. It evaluates metrics according to their informational content and attributes, including their degree of risk sensitivity, as well as the degree to which they are objective and verifiable. It also considers the suitability of different metrics in capturing transition risk for different purposes. For example, individual financial institutions might find that some types of metrics are most suited to their internal risk management, while financial authorities might require other types of metrics for use in their analysis and oversight of risks.

This paper only examines quantitative metrics related to the assessment of climate transition risk. Qualitative information also plays an extremely important role in the assessment of climate-related risks, both by financial institutions and their supervisors, but is beyond the scope of the paper.

The metrics considered in this paper are also generally sector neutral; that is, they may be relevant to any financial institution regardless of the nature of its business. However, certain metrics may be more relevant to certain business models. Climate transition risk metrics are often applied to the assets owned or managed by financial institutions – for example, loans issued by a bank, or assets under management by an asset manager – or those of their broader clients. This is not always the case, however. For example, climate transition risks might apply to the liabilities of an insurance firm, to the extent

that the transition might affect prospects for the entities it underwrites. In the text that follows, metrics are referred to as measuring 'exposure' to transition risk, with the understanding that such 'exposure' could relate to both the assets and/or liabilities of a financial institution.

This paper is also related, but not a direct contribution, to the emerging academic literature on the relationship between climate-related metrics used by non-financial firms – including GHG emissions and the nature and strength of their climate commitments – and the risks posed to their financial sector counterparts. There is a growing body of literature that seeks to identify whether the climate-related characteristics of non-financial firms have bearing on the credit and market risk they pose to the financial sector (see European Central Bank (ECB) (2021)<sup>4</sup>, Bank for International Settlements (BIS) (2022),<sup>5</sup> National Bureau of Economic Research (NBER) (2021)<sup>6</sup>). For example, ECB (2021) finds that firms that make a forward-looking climate commitment and disclose emissions experience a statistically significant reduction in measures of their credit risk. Although not a direct contribution to this literature,<sup>7</sup> the findings of this paper are consistent with those of the literature that find that metrics that contain forward-looking information on financial institutions' counterparties' future activities and intentions – rather than only their current or past emissions – are more likely to provide information on their transition risk. GHG emissions-based metrics may provide some – albeit not a comprehensive – indication of transition risk characteristics, which may explain their explanatory power in regression analysis using historical data.

The paper proceeds as follows: **Section 2** discusses the conceptual origins of climate transition risk, and the need for robust metrics with which financial institutions can measure it. It also reviews financial authorities' recent efforts to enhance the assessment and disclosure of transition risks by financial institutions. **Section 3** sets out a framework to categorise climate-related metrics according to their informational content, as well as broader attributes that might be desired by their users. **Section 4** considers some emerging climate-related metrics and situates them within this framework. **Section 5** concludes and discusses the implications of this analysis for financial institutions and policymakers, including financial authorities.

<sup>1</sup> See, for example, Financial Stability Board (FSB) (July 2021), [The availability of data with which to monitor and assess climate-related risks to financial stability](#), thereafter referred to as FSB (2021).

<sup>2</sup> See Task Force on Climate-related Financial Disclosures (TCFD), [Glossary and Abbreviations](#).

<sup>3</sup> Drivers of transition risk set out in the [Recommendations of the TCFD](#) (June 2017).

<sup>4</sup> ECB (December 2021), [The low-carbon transition, climate commitments and firm credit risk](#).

<sup>5</sup> BIS (March 2023), [Greenhouse gas emissions and bank lending](#).

<sup>6</sup> NBER (February 2021), [Global Pricing of Carbon-Transition Risk](#).

<sup>7</sup> This paper describes the informational content and attributes of some emerging metrics which have been proposed as measures of transition risk. It does not provide a statistical evaluation of the degree to which certain metrics have been a driver of credit or market risk.

# Motivation and context

Financial institutions are increasingly expected to quantify their exposure to climate-related risk. As climate risk assessment and disclosure practices are evolving, the suite of metrics used to quantify risks and opportunities has expanded and become more technically sophisticated. There is a growing expectation that financial institutions demonstrate the progress they are making in measuring climate risks.

There is also an increased focus on understanding not only the materiality of financial institutions' exposure to climate risk, but also their 'transition planning' – that is, how they plan to align their business strategy with net zero emissions. The recent advent of transition planning by financial institutions has introduced a new layer of data and information needs, as firms seek to formulate forward-looking views – under alternative transition scenarios – on factors such as their counterparties' GHG emissions trajectory, adaptive capacity and potential future competitiveness.

Against this backdrop, climate-related metrics may serve different purposes for different financial actors. For example:

- For financial institutions, climate-related metrics are one key input to risk assessment and management as well as engagement with their counterparties and clients. While quantitative metrics are important inputs to decision-making, financial institutions consider a range of inputs, including qualitative information, and use expert judgement for the purposes of risk assessment and client decisions. Box 1 explores how financial institutions are assessing their vulnerability to transition risk. Financial institutions in many jurisdictions are now also required to disclose an array of climate-related metrics for use by investors, and to share information with their supervisors for the purposes of risk monitoring. Climate-related metrics can also support financial institutions' strategic decision-making and target setting – for example, those relating to the decarbonisation of their portfolios or financing of transition-related investments.
- Supervisors increasingly expect financial institutions to manage climate-related risks, including transition risks, with reference to quantitative metrics.<sup>8</sup>

Financial authorities in some jurisdictions require granular climate-related disclosures (for example, the European Banking Authority's (EBA) Pillar 3 standards)<sup>9</sup> or suggest certain disclosures (for example, the Swiss Federal Council has recommended as best practice a dashboard of indicators called the Swiss Climate Scores).<sup>10</sup> Prudential supervisors also refer to metrics as part of supervisory engagement and climate scenario analysis, for which there has been a significant amount of experimentation and variation in the numerous supervisory exercises in recent years.<sup>11</sup>

- Market participants, including investors, retail clients and credit rating agencies, as well as civil society, increasingly expect disclosures concerning a financial institution's climate strategy and how it is identifying, assessing and managing climate-related risk. These stakeholders often benefit from quantitative metrics through which they can compare financial firms over time, against their peers, and relative to their climate commitments. Some financial and non-financial firms have been making voluntary climate-related disclosures for several years, but market-based frameworks (such as the TCFD framework)<sup>12</sup> have generally evolved into regulatory requirements more recently. Later this year, the International Sustainability Standards Board (ISSB) is due to finalise global baseline standards for climate-related disclosures.<sup>13</sup>

Financial authorities have, however, recognised that there are significant challenges associated with developing high-quality, decision-useful climate-related metrics.<sup>14</sup> At a conceptual level, there are issues in determining the most informative metrics for a particular use case or user group. There are also practical challenges in obtaining and compiling metrics, particularly those that rely on data that are unavailable or hard to source (for example, those pertaining to smaller companies, private companies, and those in emerging or developing markets). Such challenges are particularly acute in the case of financial institutions which need to obtain such data from their clients and counterparties, including those spanning multiple sectors of the economy. It is therefore often necessary for financial institutions to proxy missing data or compile them from multiple sources.

<sup>8</sup> As highlighted by the Basel Committee on Banking Supervision's (BCBS) [Principles for Climate Risk Management](#) (June 2022) and the International Association of Insurance Supervisors (IAIS) [Application Paper on the Supervision of Climate-related Risks](#) (May 2021) (hereafter referred to as IAIS (2021)).

<sup>9</sup> EBA (January 2022), [Final draft implementing technical standards on prudential disclosures on ESG risks](#).

<sup>10</sup> Swiss Federal Council (June 2022), [Swiss Climate Scores](#).

<sup>11</sup> See, for example, FSB-NGFS (November 2022), [Climate Scenario Analysis by Jurisdictions: Initial findings and lessons](#) (section 2.4), and IIF (July 2021), [Navigating Climate Headwinds: Reference Approaches for Scenario-based Climate Risk Measurement by Banks and Supervisors](#) (hereafter referred to as IIF (2021)).

<sup>12</sup> See TCFD.

<sup>13</sup> ISSB, [Climate-related Disclosures work plan](#) can be found [here](#).

<sup>14</sup> See, for example, FSB (October 2022), [Supervisory and Regulatory Approaches to Climate-related Risks: Final report](#), thereafter referred to as FSB (2022), NGFS (July 2022), [Final report on bridging data gaps](#) and Coalition of Finance Ministers for Climate Action (COFMA) (November 2022), [Supporting Private Sector Net Zero Targets](#).

The urgency associated with the net zero transition continues to motivate both private and public actors to pursue efforts to enhance the suite of climate risk, and transition-related, metrics. However, despite the shared recognition of the foundational importance of data and metrics for effective market functioning, and the potential relevance to supervisory and regulatory oversight, there is not a consensus view on which metrics may be more or less relevant from a risk, disclosure, engagement or monitoring perspective. To date, numerous alternative classifications of metrics have been advanced by different groups, including those led by market participants (for example, TCFD, UK Climate Financial Risk Forum (UK CFRF)), regulatory standards and exercises (for example, draft ISSB proposals, EBA Pillar 3 reporting template for banks, jurisdictional climate scenario analysis exercises), as well as broader financial authorities' and bodies' overviews (for example, the FSB and NGFS).

Existing classifications of metrics vary significantly, as do recommendations concerning the relevance of metrics to different applications. The TCFD framework includes seven cross-industry categories of climate-related metrics, which are intended to provide decision-useful information for investors: (1) GHG Emissions; (2) Transition Risks; (3) Physical Risks; (4) Climate-related Opportunities; (5) Capital Deployment; (6) Internal Carbon Prices; and (7) Remuneration.<sup>15</sup> These categories were the basis for the ISSB's proposal for metrics to be disclosed as part of global sustainability reporting standards.<sup>16</sup>

Separately, the FSB has classified quantitative information collected by its central bank and supervisor members into 'financial metrics' (including exposures, impact on balance sheet and profit and loss, forward-looking metrics, quantitative scenario/stress test results) and 'carbon-related metrics' (including those relating to GHG emissions, internal carbon prices, as well as environmental, social, and governance (ESG) metrics, scores and ratings). The UK Climate Financial Risk Forum (CFRF) has suggested metrics be organised into five buckets: those for measuring transition risk, physical risk, portfolio decarbonisation, mobilisation of transition finance and cross-cutting metrics that capture financial firms' engagement.<sup>17</sup> Specifically in relation to transition financing, the Japanese Financial Services Agency (JFSA) has recently launched a public and private working group to assess which complementary metrics and disclosures could be useful in addition to emissions-based metrics, recognising that an emphasis on financed emissions alone may disincentivise financial institutions to scale up transition finance.<sup>18</sup>

Further research and engagement between financial institutions, authorities and other stakeholders would help foster a common understanding about the relevance of certain metrics for different uses, and the role that various metrics and tools can play in the analysis of climate transition risk.

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<sup>15</sup> TCFD (June 2017) and TCFD (October 2021).

<sup>16</sup> IFRS (March 2022), IFRS Sustainability Disclosure Standard: [Draft] IFRS S2 Climate-related Disclosures.

<sup>17</sup> See CFRF (2021), Climate data and metrics.

<sup>18</sup> JFSA (February 2023), [Creating an Enabling Environment to Scale-up Transition Financing to Accelerate Decarbonization of Hard-to-Abate Sectors](#), thereafter referred to as JFSA (2023).

## Box 1: Financial institutions' approaches to assessing vulnerability to transition risk

Drivers of transition risk – including those related to changes in policy, technology, and market and consumer preferences – interact with other risks managed by financial institutions, including credit, market, legal and reputational risks.<sup>19</sup>

The challenges associated with measuring climate transition risk are currently greater than for other sources of risk. The forward-looking nature of transition risk means that its assessment generally relies on scenario analysis involving estimation using a number of assumptions and parameters. There are also very high levels of uncertainty associated with different transition pathways, their implications for economies, as well as companies' responses to these. Together, this poses a range of challenges in transition risk measurement.

Efforts are underway across the financial industry to strengthen approaches to incorporating information about potential transition risk (and physical risk) characteristics to come to a holistic view of financial risk (credit, market, etc) that accounts for climate-related risk drivers. Many financial institutions are undertaking climate scenario analysis to assess the potential for transition risk drivers to give rise to financial risks under a plausible range of medium to long-term scenarios.<sup>20</sup> Given the range of uncertainty over the nature of the economy-wide transition, an array of scenarios is being leveraged for the purposes of transition risk assessment (including those produced by the Network for Greening the Financial System (NGFS), the Intergovernmental Panel on Climate Change (IPCC), the International Energy Agency (IEA), and others). Practices vary across the industry, but some financial institutions use in-house modelling approaches, some use third-party tools and metrics, and many use a combination of both.

In order to develop a well-informed view of the scope and dynamics of transition risk, financial institutions may need to undertake multiple levels of data gathering, measurement and analysis. This may include consideration of the transition risk faced by individual clients or investees, as well as transition risk at the level of a portfolio or totality of a financial institution. These varying views may require different data inputs and rely on different tools.

Data available to assess transition risk remain limited both in terms of their quality and availability – these issues are exacerbated when looking at certain types of portfolios (such as sovereign bonds). Some IIF-member banking institutions have expressed that there are greater challenges in terms of the quality and availability of data with respect to transition risks than physical risks (see Figure A.1).<sup>21</sup>

Financial institutions are considering a range of sources of information, including a company's disclosures and client data (see Figure A.2 in relation to a sample of banking institutions), to assist them in assessing transition risks. Increasingly, many financial institutions hope to be able to draw on clients' and counterparties' transition plans for additional forward-looking information as inputs to transition risk analysis and monitoring.

<sup>19</sup> See [BCBS 2021](#) and [IAIS 2021](#) with respect to banking institutions and insurance institutions, respectively.

<sup>20</sup> For a full discussion of industry and supervisory approaches to climate scenario analysis, please refer to IIF 2021: [Navigating Climate Headwinds](#), IIF (January 2022), [Integrity through Alignment: A 2022 Roadmap for Global Standards and Market-led Approaches in Sustainable Finance](#), and IIF (July 2022): [Climate and Capital: Views from the Institute of International Finance](#).

<sup>21</sup> In response to an IIF 2022 survey of 15 large global banking institutions.



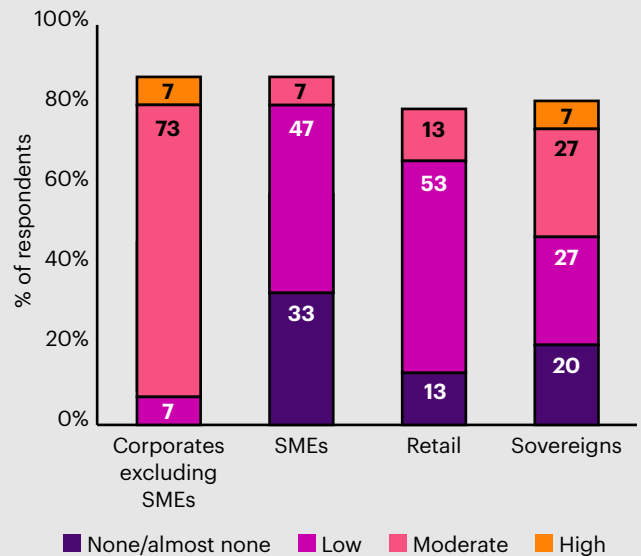
## Box 1: Financial institutions' approaches to assessing vulnerability to transition risk

Some financial institutions refer to third-party metrics as additional inputs to the analysis process. Different tools from third-party providers – such as transition risk metrics, scores or ratings – are emerging for different types of financial institutions. Such tools typically seek to synthesise data through proprietary modelling techniques to provide a view on potential vulnerability to transition risk.

The extent to which financial institutions refer to third-party metrics as an input to transition risk assessment varies by sector, business model and other factors (including firms' levels of in-house capacity). Some financial institutions use third-party metrics as an input to their analysis processes (for example, portfolio benchmarking by an asset management firm), alongside other data and information. Approaches taken by third-party providers in this field are evolving rapidly; however, there are concerns regarding the degree of consistency across such metrics (reflecting broader issues pertaining to the degree of alignment of ESG ratings).<sup>22</sup>

Figure A.1: **Availability of quality data for transition risk assessment**

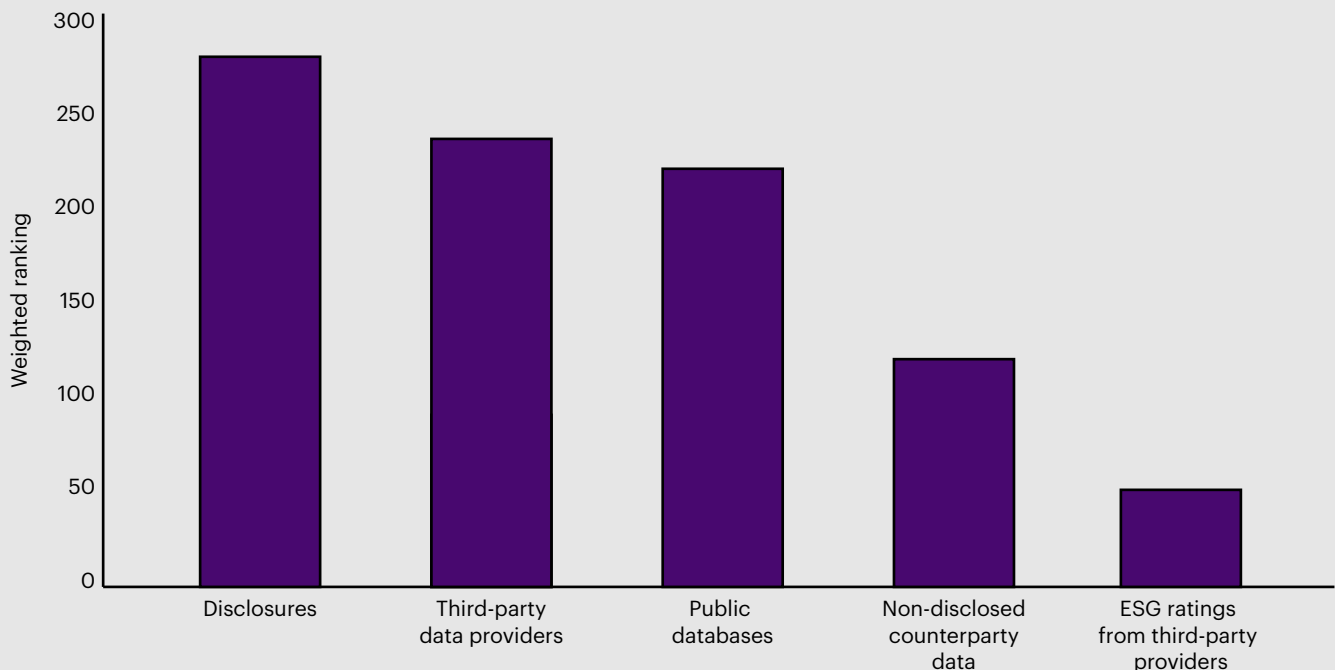
**With respect to transition risk, how would you rate the current availability of quality data across different portfolios and climate risk types?**



Source: IIF H1 2022 Survey of 15 Large Banking Institutions.

Figure A.2: **Relative importance of alternative data sources for a sample of large banking institutions**

**Which data sources are particularly informative for climate-related risk assessment and measurement?**



Source: IIF H1 2022 Survey of 15 Large Banking Institutions. Respondents ranked different data sources; the chart shows a weighted ranking from across the sample.

<sup>22</sup> See the [IIF response](#) to the International Organization of Securities Commissions' (IOSCO) Consultation on ESG ratings and data products providers (September 2021).

# An organising framework for climate-related metrics

This section proposes an organising framework for climate-related metrics. It begins by drawing a distinction between transition risk and other types of climate-related information that are contained in some commonly used metrics. It then goes on to discuss other attributes of climate-related metrics that might be desirable from the perspective of various users, including financial institutions, other market participants and financial authorities.

Whatever their informational content and attributes, metrics differ in the level at which they can be applied. Some metrics can be applied at the level of individual firms (both real economy and financial), including where such institutions are the counterparties or clients of financial firms. Other metrics can be applied to a portfolio comprised of multiple assets or exposures, including those of a financial institution.

## Transition risk versus other types of climate-related information

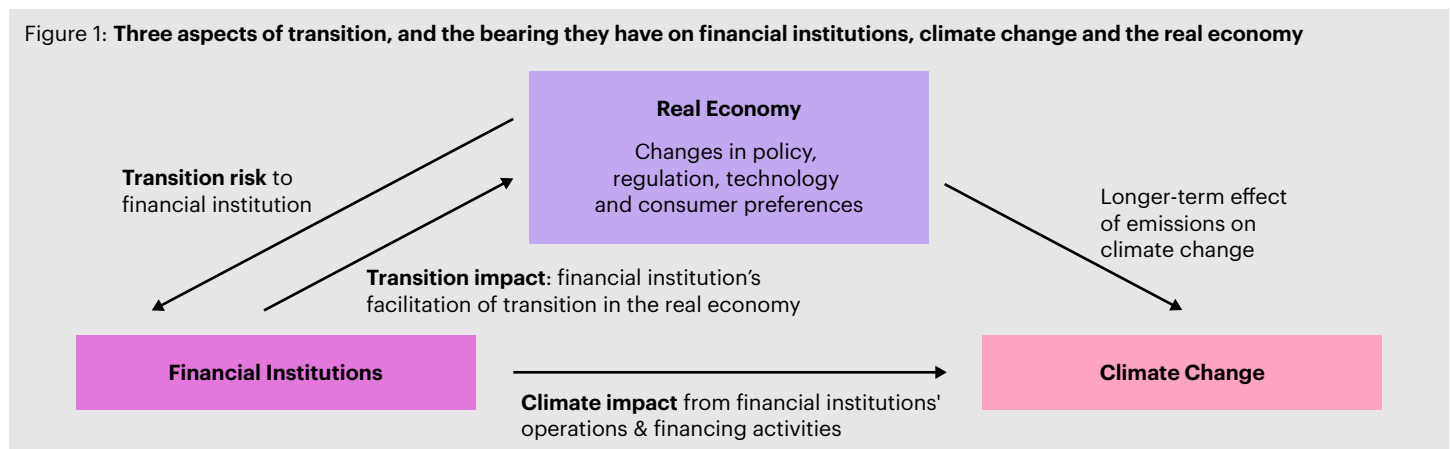
Transition risk is the climate-related financial risk that the transition to a lower-carbon economy poses to a company<sup>23</sup> – that is, the potential negative impact on the profitability of a business or value of an asset from changes in policy, regulation, technology and consumer preferences. Many companies in the real economy may face transition risks, which could, in turn, pose risk to financial institutions.<sup>24</sup> The transition risk to which financial institutions are exposed will also depend on the transition scenario that unfolds in the economy: that is, the timing and pace at which emissions reduce. Importantly, this will also influence the rate at which transition risk can potentially crystallise for financial institutions.

Transition risk is distinct from two other types of information of relevance to financial institutions in relation to climate change:

- **Climate impact:** that is, *the impact a financial institution has on the climate* as measured by its emissions, or the share of emissions of firms it finances, invests in or insures.
- **Transition impact:** that is, the degree to which a financial institution's activities *facilitate the transition to lower emissions in the real economy*. For example, a firm that is engaged in the mining of minerals that play an important role in climate transition, such as lithium that is used in batteries for electric vehicles, may be enabling transition in the wider economy – as might the financial institution that provides their funding.<sup>25</sup> In the medium to long term, facilitating an orderly transition to net zero will help to reduce GHG emissions, thereby reducing both physical and transition risks to the economy and global financial system.

The relationship between climate transition risk, climate impact and transition impact – as well as the bearing they have on financial institutions, climate change and the real economy – is illustrated in **Figure 1**.

Figure 1: Three aspects of transition, and the bearing they have on financial institutions, climate change and the real economy



<sup>23</sup> See, for example, BCBS (2021) (page vi), IAIS (May 2021) (page 8), or FSB (2022) (page 18).

<sup>24</sup> As global standard-setting authorities have recognised, transition risk is not a new source of risk to financial institutions in itself, but instead is a driver of the classical risk types – for example, credit, market, operational, liquidity and reputational risks in the case of banking institutions (see BCBS 2021).

<sup>25</sup> In addition, a financial institution that facilitates transition in the real economy may also ameliorate climate change – at least to the extent that these enabling activities contribute to a broader or longer-term reduction in emissions.

These three types of climate-related information are sometimes conflated. In particular, information on climate and transition impact is sometimes found in metrics that purport to capture information on climate transition risk. For example, there are several instances of emissions-based metrics being proposed or indicated as proxy indicators of climate transition risk.<sup>26</sup> On the face of it, this seems intuitive: after all, any increase in the cost of emissions – for example, that which is brought about by the introduction of a carbon tax – is likely to result in carbon-intensive firms facing higher costs that can reduce their profitability. Similarly, the introduction of climate-related regulation may potentially reduce demand for higher-carbon products compared to lower-carbon alternatives. To the extent that this reduces a firm's profitability, it may be natural to equate higher emissions by a firm with higher climate transition risk.<sup>27</sup> Indeed, many financial institutions use the emissions intensity of a company or activity as an input into their assessment of its transition risk.

However, emissions-based metrics do not provide a comprehensive indication of a company's overall exposure to transition risk. This is for several reasons:

- First, the reporting of emissions is subject to systematic biases and gaps. For example, a software company serving firms in the oil and gas industry might report only very limited emissions, but to the extent that demand for its services is likely to reduce under climate transition, it might be exposed to substantial climate transition risk.<sup>28</sup> Even 'scope 3' emissions – which seek to reflect emissions arising from the entirety of firms' value chains – struggle to capture emissions arising from the activities of firms that use a product or service, and are subject to various data gaps.<sup>29</sup> This limits the availability of information on firms' emissions – and the subsequent effects of a carbon tax on their profitability – across different sectors.

- Second, current and historical emissions – whatever their scope – are backward-looking and give only very limited insight into future changes in firms' business models. Future changes in firms' emissions can be a crucial determinant of the transition risk to which they are exposed. For example, a manufacturing firm that is currently heavily reliant on energy from fossil fuels might be planning to switch to using renewable energy.
- Third, and importantly, even if the above measurement issues were resolved, an increase in the cost of emissions may not necessarily be associated with an increase in the transition risk to which a company is exposed. This is partly because some firms might experience a large increase in the cost of emissions, say as a result of the imposition of a carbon tax, but nonetheless still see continued (or increasing) demand for their products (price inelasticity of demand), or otherwise be able to 'pass through' increased costs without impacting profitability.

For example, higher emitting firms in less competitive industries with few ready alternatives to their products might face relatively small reductions in their profit margins as a result of the transition. Consumers are likely, for example, to continue to use long-haul air travel to some degree, even in the face of a substantial tax levied on the associated emissions, due to the lack of low-emissions alternatives to long-haul air travel (at least in the short to medium term).<sup>30</sup> Furthermore, some of this additional cost associated with transition is likely to be borne by end consumers, as these are passed on in the form of higher airfares (particularly on less competitive routes).<sup>31</sup> Conversely, regulation in some economies might mean that demand for short-haul air travel declines significantly in coming years, whatever its cost structure, as travellers take the train instead of flying.

<sup>26</sup> For example, concentration of credit exposure to carbon-related assets (TCFD), GHG-financed emissions (EBA), alignment metrics (EBA), emissions intensity (U.S. Securities and Exchange Commission (SEC) (March 2022), [Proposed Rules to Enhance and Standardize Climate-Related Disclosures for Investors](#), page 180).

<sup>27</sup> Companies may also face financial risks due to their failure to meet emissions targets or commitments, and the consequences this has for either their reputation and/or legal risk.

<sup>28</sup> See Noss (September 2022), [Seeing through the smog: Towards a more robust measure of climate transition risk](#), hereafter referred to as Noss (2022).

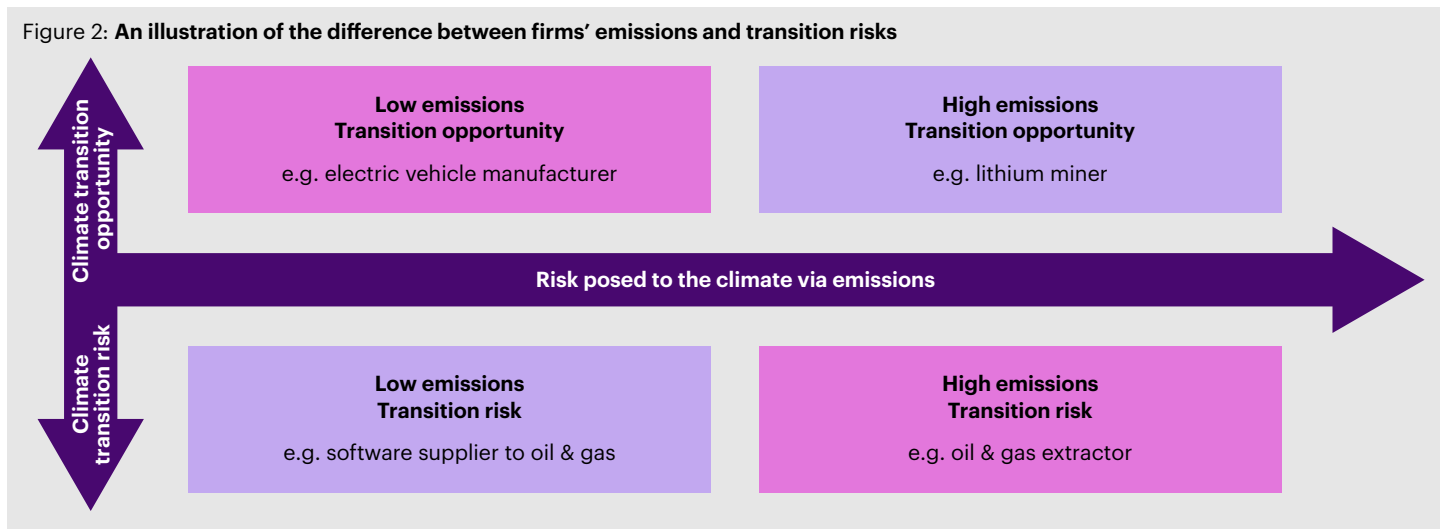
<sup>29</sup> Scope 1 and 2 emissions capture emissions that are attributable to a company's direct operations and activities, including their use of electricity. Scope 3 emissions capture emissions across firms' broader value chains.

<sup>30</sup> See Brons et al (2001), [Price elasticities of demand for passenger air travel: a meta-analysis](#), Tinbergen Institute Discussion Papers.

<sup>31</sup> Ibid.

**Figure 2** shows the sectors given in the examples above, according to whether they have high/low emissions (that is, having a high/low negative impact on the climate)

versus whether they present a source of climate transition risk, or, instead, a profitable investment opportunity.

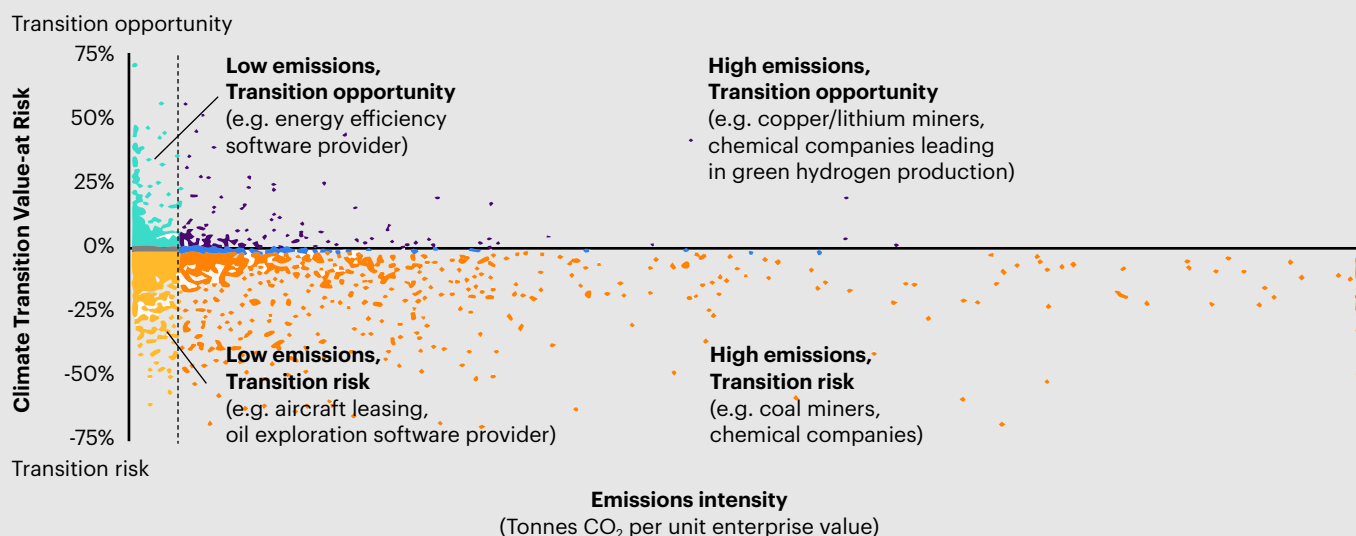


There is also little empirical correlation between measures of a firm's emissions intensity and direct measures of its climate transition risk. **Figure 3** compares the emissions intensity and climate transition risk of firms in the STOXX World Equity Index.<sup>32</sup> As in Figure 2, firms are divided into quadrants depending on whether they have high/low emissions intensity, and whether they are a source of transition risk or opportunity (that is, whether they are estimated to decrease or increase in value as a result of transition). In general, however, there is little or no

correlation between firms' emissions intensity and their transition risk. There are a sizeable number of firms that are high emissions intensity, but which are likely to see an increase in value due to transition (top-right quadrant); likewise, there are also firms that are lower emissions intensity but nonetheless at risk from transition (bottom left quadrant). The empirical relationship between emissions-based metrics and transition risk is further explored in **Box 2**.

<sup>32</sup> Climate transition risk is measured using WTW's Climate Value at Risk (CTVaR) metric. CTVaR estimates the future change in the value of an asset or firm – or debt and equity issued by a firm – associated with a given future climate transition scenario. Estimates given here related to a climate scenario in which global temperature increases remain below two degrees Celsius; see [Annex 1](#) for more details.

Figure 3: **The empirical relationship between operational emissions intensity and climate transition risk**<sup>1,2</sup>



Source: STOXX and WTW. Positive CTVaR value reflects transition opportunity, negative CTVaR value reflects transition risk.

<sup>1</sup> Firms in the STOXX World Equity Index. The dotted line indicates the average emissions intensity of firms in this index.

<sup>2</sup> Emissions intensity is tonnes of CO<sub>2</sub> scope 1 and 2 emissions per unit enterprise value.

Emissions-based metrics also do not provide a direct measure of the degree to which a financial institution is facilitating longer-term transition in the wider economy. For example, firms involved in mining lithium or cobalt for batteries might give rise to high emissions in the near term. But, because the materials they extract are enabling reductions in emissions elsewhere in the economy – e.g. via the manufacture of batteries for electric vehicles – a financial institution’s funding of such activities might both represent a profitable investment opportunity (rather than transition risk) and facilitate transition in the real economy.<sup>33</sup>

This lack of alignment between these three aspects of the transition underlines the importance of clarifying precisely what information different climate-related metrics capture. In particular, taking emissions-based metrics as direct measures of transition risk could have unintended consequences – both for individual firms’ risk management and for the broader climate transition. For example, a financial institution that sought to manage its exposure to climate transition risk by relying on emissions-based metrics might stand to reduce its exposure to high emitting industries even when some such investments could be profitable during the transition. In addition, such a financial institution might also risk slowing transition in the real economy, or making it less orderly – at least to the extent that certain activities which are high emitting can play a valuable role in enabling lower emissions elsewhere, or are in hard-to-abate sectors which will be necessary during the transition.

### Desirable attributes of climate-related metrics

Whatever their informational content, climate-related metrics – including those based on emissions – can differ in the degree to which they are:<sup>34</sup>

- **Granular:** that is, whether they differentiate between exposures that are economically similar, but that differ in transition risk characteristics. For example, metrics applicable at the level of individual firms – including those within the same industry – are relatively granular.
- **Forward-looking:** that is, whether they differentiate between exposures on the basis of their projected future risks, rather than a firm’s current or past activities.

Granular and forward-looking metrics that measure an aspect of risk could be described as ‘risk-sensitive’. Risk sensitivity is desirable to inform decision-making as it provides a finer and more precise view of the risks presented by certain activities and exposures. However, it is important to recognise the current early state of models and scenario analysis which underlie forward-looking metrics. There are a large variety of approaches being taken by third-party providers and financial institutions themselves in this area, and practices are still evolving.

<sup>33</sup> This challenge has been recognized by some official sector authorities such as the JFSA (2023).

<sup>34</sup> These attributes can be applied to other broader types of risk metric; their application here, however, is confined to climate-related metrics.

A third desirable attribute of transition risk metrics is the degree to which they are verifiable and objective: that is, (relatively) straightforward for third parties, such as investors or financial supervisors or authorities, to calculate and/or verify independently. The degree to which a metric is verifiable and objective is likely to be influenced by multiple factors, for example:

- The transparency of its construction – that is, whether details of the methodology used to construct the metric are available to external stakeholders. For example, the use of certain protocols or measurement standards can increase the transparency of a metric’s construction.
- The level of reliance on subjective judgement in its calculation. For example, metrics of climate transition risk typically require a degree of judgement in their calculation. This is necessary in order to determine how, for example, decarbonisation across a sector is likely to affect the profitability of firms within it. Other metrics, such as GHG emissions, are calculated based on publicly available (and, in some cases, internationally agreed) protocols for their reporting, which specify details of their construction and can be applied more objectively (that said, judgement is still required, particularly with respect to data gaps).<sup>35</sup>
- The number and nature of data sources used in their calculation. In general, metrics calculated using fewer data types – particularly where these are publicly available – are more readily replicated by third parties.

Such verifiability and objectivity are desirable attributes of climate-related metrics – particularly those used in financial firms’ disclosures. This is because they allow external stakeholders – whether they are other firms, investors or financial authorities – to verify them independently. They also help reduce the actual or perceived misrepresentation of a financial institution’s climate-related risk (a practice sometimes referred to as ‘greenwashing’). Verifiable and objective metrics also have the advantage of being easier for stakeholders to compare across different financial institutions. This can help provide a level playing field on which to compare climate-related risks across different firms.

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<sup>35</sup> Efforts are underway to standardise emissions reporting protocols, for example through the [GHG Protocol](#). Nevertheless, a degree of approximation is often still required – either by a (financial or non-financial) company in estimating their own emissions, or by a financial institution in estimating the emissions of counterparties that do not report such data.

# Examining climate-related metrics proposed for assessment of transition risk

This section uses the framework described in the previous section to evaluate the informational content and attributes of some categories of climate-related metrics that are becoming prominent within the financial services industry.

Metrics included in the evaluation are drawn from some prominent disclosure frameworks at both global and jurisdictional levels, official sector publications, and some market-based frameworks and analyses (see Section 2). The scope of the evaluation does not include financial risk metrics, such as those of credit risk (for example, probabilities of default and loss given default), although many financial institutions are also re-evaluating these in light of climate-related risks.<sup>36</sup> Nonetheless, some of the metrics examined here can be used to assess transition risk to the assets or activities of a financial institution's counterparty or client, from which it is then possible to derive the impact on credit risk metrics, or on the value of a firm's debt and equity (for example, by using a structural credit risk model).<sup>37</sup>

The evaluation has been informed by desk-based research, engagement with a sample of financial institutions and the empirical analysis in the previous section. It is not necessarily representative of the views of all major financial institutions.

Table 1 evaluates categories of metrics based on the framework described in Section 3; that is:

- a. Whether the metrics can be applied to individual real-economy companies, as the clients, counterparties or investees of financial institutions, and/or whether they can be applied at a portfolio-wide level (including at the level of the whole financial institution);
- b. The extent to which metrics can provide information for the assessment of transition risk for a real-economy company and/or financial institution's portfolio (depending on the metric); and
- c. The attributes of metrics – whether they are granular, forward-looking, and/or verifiable and objective.

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<sup>36</sup> Many financial institutions are developing models and approaches for assessing the impact of climate-related risk drivers, including transition risk drivers, on financial risk metrics. For example, see discussion in [GARP \(2022\)](#), [UK CFRF \(2021\)](#) and [ECB \(2022\)](#).

<sup>37</sup> See Merton, R. (May 1974), *On the Pricing of Corporate Debt: the Risk Structure of Interest Rates*, *The Journal of Finance* (29(2)) and UN Environment Programme – Finance Initiative (2020), *Beyond the Horizon: New Tools and Frameworks for transition risk assessments from UNEP FI's TCFD Banking Program*.

Table 1: **Information captured by, and attributes of, some proposed climate-related metrics**

Category of Metrics	At what level can the metric be applied?		Degree to which the metric provides information about transition risk	Attributes: is this metric...?		
	Firm or exposure	Portfolio level		Granular <sup>(1)</sup>	Forward-looking	Verifiable and Objective
<b>(Scope 1-3) GHG emissions</b>	✓	✓	Very low	✓	No	Partially <sup>(2)</sup>
<b>(Scope 1-3) GHG emissions intensity</b>	✓	✓	Low	✓	No	Partially <sup>(2)</sup>
<b>Portfolio alignment measures</b> (e.g. deviation from target or benchmark, implied warming)	✓ <sup>(3)</sup>	✓	Low	Potentially <sup>(3)</sup>	✓	No <sup>(4)</sup>
<b>Climate Transition Risk Metrics or Scores</b> (incl. CTVaR)	✓	✓	Medium/High (with differences across providers and models)	✓	✓	No <sup>(5)</sup>
<b>Proportion of financial institution exposure to carbon-intensive sectors</b>	No	✓	Low	✓	No	✓

(1) For the purposes of this evaluation, the granularity of portfolio-level metrics refers to the ability to differentiate between (otherwise similar) financial institutions on the basis of their exposure to transition risks.

(2) GHG emissions and emissions intensity metrics are conceptually verifiable and objective, and efforts are underway to standardise their reporting; however, a degree of judgement and approximation is still often required in their calculation.

(3) Some – but not all – portfolio alignment metrics can be calculated at the level of individual firms.

(4) Portfolio alignment metrics can be more objective – for example, whether or not an organisation has a GHG emissions reduction target, or the maturity of its alignment objectives. Most are more quantitative or based on climate transition scenarios, which can make them more subjective and less verifiable.

(5) Climate Transition Risk Metrics or Scores tend to be based on a larger number of data sources and require a degree of judgement in their calculation. This makes them less verifiable and objective. For details see text that follows.

Further notes to the table can be found in Annex 2.



## Key observations from this evaluation

**Although prominent in several frameworks, emissions-based metrics are not comprehensive measures of the transition risk to which financial institutions are exposed.**

There are two types of GHG emissions metric: that is, those based on:

- Absolute emissions, which indicate the total amount of GHG gases emitted by a firm (or its broader value chain) over a given period.
- Emissions intensity metrics, which measure emissions relative to a given unit of firm output.

GHG emissions-based metrics feature significantly in both market-based and official sector frameworks for climate risk assessment and disclosure advanced to date, with some stakeholders suggesting that such metrics can be considered proxy indicators of the climate transition risk facing financial institutions.<sup>38</sup> There are direct GHG emissions-based metrics – absolute or emissions intensity metrics – and other GHG emissions-based metrics which are derived from emissions data or characteristics, including portfolio alignment metrics and proportion of financial institution exposure to high (or low) emitting industries.

As outlined in the previous section, GHG emissions-based metrics suffer from multiple shortcomings as a measure of transition risk. This has implications both for individual financial institutions' assessments of their transition risks (see Box 1), and also for financial authorities' assessments of the totality of transition risk facing multiple financial institutions. While no single metric provides a complete picture of transition risk, emissions-based metrics appear to be particularly imprecise in this regard.

That said, emissions-based metrics may provide some – albeit indirect – measure of the transition risk to which individual financial institutions are exposed. If enough investors believe metrics pertaining to emissions contain information on transition risk, they may reflect this in the cost of funding they extend to financial institutions. Under these circumstances, GHG emissions-based metrics could become a de facto transition risk metric.<sup>39</sup>

## Emissions intensity metrics are more useful to financial institutions than metrics based on absolute emissions

To the extent that emissions-based metrics provide an – albeit not comprehensive – indication of transition risk, emissions intensity metrics are generally preferred by firms over those based on absolute emissions. This is because emissions intensity metrics provide a better reflection of the reliance of a company on emissions, and, therefore, may provide some indication of the degree to which an increase in the cost of such emissions – say, due to the imposition of a carbon tax – may affect their profitability.

In contrast, absolute emissions do not control for the scale of a company's activities, and are affected by factors unrelated to their transition risk (such as changes in their market share).

**Climate Transition Risk Metrics or Scores – including Climate Transition Value at Risk – are more risk-sensitive metrics of transition risk, but their composition varies across providers and they are less verifiable and objective.**

As discussed in Box 1, a range of specific metrics and tools are now being produced by third-party providers, academics and other groups, which are intended to summarise the climate transition risk characteristics of a counterparty, client or exposure in a more sophisticated manner than those based on emissions. For example, see WTW's CTVaR metric<sup>40</sup>, MSCI's Climate VaR<sup>41</sup>, Sustainalytics Low Carbon Transition Ratings<sup>42</sup>, and the sectoral transition risk heatmapping tool<sup>43</sup> developed by the United Nations Environment Programme Finance Initiative (UNEP FI) in conjunction with a global group of banking institutions. These tools are often designed for use by financial institutions in their internal risk management and/or investment decision-making processes. In general, these metrics aim to account for a broader range of factors associated with transition – such as changes in consumer sentiment, regulation and technology – and their effects on firms' profitability during the transition through reference to certain climate transition scenarios.

These metrics are generally more granular and forward-looking, which increases their risk sensitivity, albeit at a cost of lower verifiability and objectivity. They tend to be based on a larger number of data sources (including, in some cases, emissions data). Their calculation requires judgement: for example, they are predicated on underlying assumptions as to how a given transition scenario will impact different economic sectors. For this reason, a significant degree of heterogeneity has been recorded between alternative climate transition risk scores for some firms and sectors.<sup>44</sup>

<sup>38</sup> For example, concentration of credit exposure to carbon-related assets (TCFD), GHG financed emissions (EBA), alignment metrics (EBA), emissions intensity (U.S. Securities and Exchange Commission (SEC) (March 2022), *Proposed Rules to Enhance and Standardize Climate-Related Disclosures for Investors*, page 180).

<sup>39</sup> See Lazard, *Climate Center presentation* (2021).

<sup>40</sup> See Annex 1.

<sup>41</sup> See MSCI (2020), *Climate Value at Risk: Powering better investment Decision Making*.

<sup>42</sup> See Sustainalytics, *Low Carbon Transition Ratings*.

<sup>43</sup> UN Environmental Programme Finance Initiative (2020), *Beyond the Horizon: New Tools and Frameworks for transition risk assessments from UNEP FI's TCFD Banking Program*.

<sup>44</sup> Bingler, Senni, Monnin (2020), *Climate Financial Risks: Assessing Convergence, Exploring Diversity*.

Financial institutions use climate transition risk metrics and scores to different degrees. Some financial institutions find it valuable to refer to climate transition risk metrics as an input to their internal decision-making, while others prefer to rely more on in-house climate scenario analysis, drawing on a range of other data in order to have greater control over the transition assumptions and a better insight into the modelling. The lack of objectivity and verifiability of climate transition risk metrics, including the outputs of internal climate scenario analysis, can also be a drawback from the perspective of public disclosure.

**Some climate-related metrics proposed for assessing transition risk at the level of financial institutions are relatively verifiable and objective, but do not directly measure transition risk.**

The proportion of a financial institution's exposure to 'carbon-related assets', or specific highly carbon-intensive sectors, has been proposed as a summary metric for a financial institution's own transition risk. The TCFD and ISSB propose a broad definition of 'carbon-related assets', while some other frameworks or approaches focus on specific sectors such as energy.<sup>45</sup> Although this category of metric does not require specific information on a financial institution's GHG emissions (it instead relates to balance sheet data), it is still an emissions-related metric in that it is predicated on an assumed link between carbon intensity and transition risk.

These metrics therefore suffer from the same weaknesses as other emissions-based metrics in that they are not a comprehensive measure of transition risk. However, metrics that relate to emissions characteristics of a sector are generally simpler and require fewer assumptions to calculate them on the part of the financial institution.

One emerging summary metric in the European Union (EU) is the Green Asset Ratio (GAR), which is calculated as the ratio of a financial institution's EU taxonomy-aligned exposures to total exposures.<sup>46</sup> The EU Taxonomy Regulation<sup>47</sup> categorises economic activities based on their overall level of sustainability, defined by an activity's contribution to at least one of the EU's environmental objectives (evaluated relative to predetermined and static thresholds), in addition to a specification that the activity does no significant harm to any of the other objectives. The EU taxonomy itself is not intended to measure sources of potential financial risk; rather, taxonomy-related

metrics generally aim to capture financial institutions' impact on the climate. Nevertheless, to the extent that EU taxonomy-aligned exposures may be perceived as less exposed to transition risk within the EU, the GAR may be perceived as an (indirect) risk metric. However, care should be taken not to misinterpret metrics such as the GAR given its underlying link to the definitions in the EU taxonomy, its lack of forward-looking elements and its highly aggregated design.<sup>48</sup> Moreover, studies to date, including by the NGFS<sup>49</sup> and the EBA<sup>50</sup>, suggest there is little evidence of risk differentials based on an exposure's climate or ESG characteristics.

There is also an increasing focus on portfolio alignment metrics, particularly in the context of climate-related commitments and transition planning. Such metrics broadly aim to measure the alignment of a financial institution's business activities with the goals of the Paris Agreement and associated net zero objectives. Some portfolio alignment metrics use current and projected emissions data in order to assess the alignment of companies with specific climate benchmarks; others (such as maturity scale metrics) incorporate other information on the credibility of a company's transition plan.

Although they seek to provide more forward-looking information, portfolio alignment metrics are still based on emissions data and are not generally designed to measure transition risk. As the empirical analysis in Box 2 illustrates, the relationship between a company's alignment status is not directly correlated with its transition risk. That said, financial institutions might still refer to information about a company's alignment with net zero emissions as part of a holistic assessment of their transition risk (for example, by reference to transition plans as these are developed by companies in the coming years).

Separately, portfolio alignment metrics might provide some information on potential reputational or legal risks. For example, if a real-economy company or financial institution does not take steps in line with its publicly stated climate-related targets or commitments, it may face repercussions from its investors, customers or civil society. However, significantly more information is generally required than just a portfolio alignment metric in order to assess reputational and liability risks.

<sup>45</sup> For more information, see [Annex 2](#).

<sup>46</sup> The EBA requires information on the GAR to be published as part of [Pillar 3 disclosure](#).

<sup>47</sup> For more information about the EU taxonomy for sustainable finance, see [European Commission \(2023\), EU taxonomy for sustainable activities](#).

<sup>48</sup> The determination of activities which are taxonomy-aligned intrinsically includes an assessment of the growth prospects for those activities in the context of the EU's broader net zero transition pathway. Given the significance of the EU taxonomy as the basis for EU regulations, it is possible that taxonomy-aligned activities will receive greater policy attention and public funding in the coming years. While these factors could indicate that certain taxonomy-aligned activities in the EU may pose lower transition risk to a financial institution (all else equal), several issues limit this interpretation: for example, the taxonomy itself does not currently reflect transition pathways for sectors.

<sup>49</sup> NGFS (May 2022) [Capturing risk differentials from climate-related risks: A Progress Report](#).

<sup>50</sup> EBA (May 2022), [Discussion Paper on the role of environmental risks in the prudential framework](#).

<sup>51</sup> For example, assigning companies to categories like aligned, aligning, committed to aligning, not aligned, as discussed in [GFANZ \(2022\)](#).

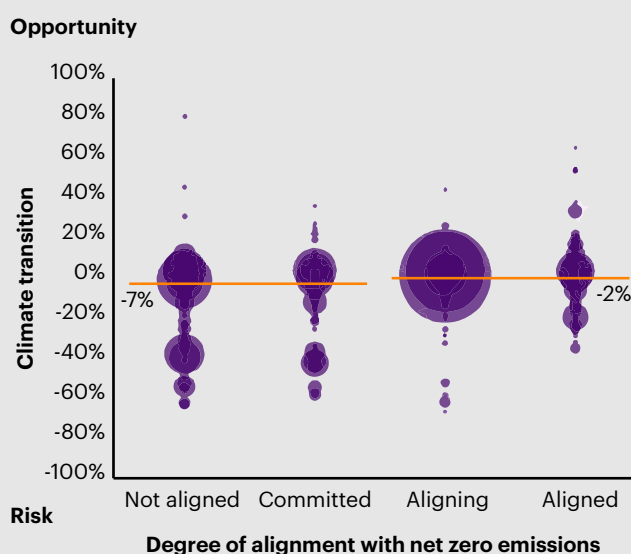
## Box 2: How well do emissions-based metrics perform as measures of transition risk?

This box compares one direct transition risk metric with emissions-based climate metrics. It begins by exploring the relationship between the climate transition risks and net zero alignment of firms in the real economy, before considering a case study of the metals and mining sector. Throughout, climate transition risk is measured using the Climate Transition Value at Risk (CTVaR) metric developed by WTW. CTVaR is a risk-sensitive measure of transition risk and opportunity, the details of which are outlined in Annex 1.

### Exploring the relationship between net zero alignment and transition risk

There is an expanding array of frameworks that endeavour to assess a company's alignment with net zero: that is, the degree to which they are – or are committed to – reducing their emissions. Figure B.1 compares firms in the STOXX World Equity Index according to their degree of net zero alignment<sup>52</sup> (horizontal axis) and climate transition risk (vertical axis). The size of each bubble is proportional to a firm's market capitalisation. The horizontal orange lines indicate the average transition risk/opportunity to firms across the less and more aligned category, weighted by their market capitalisation.

Figure B1: Firms' alignment to net zero emissions compared to their transition risk/opportunity (as given by CTVaR)



Sources: CA+100, NZIF, SBTi, STOXX, TPI and WTW calculations.

At the aggregate level, there is some consistency between the two metrics. Firms that are more transition-aligned (in the aligned or aligning categories) are, on average, less exposed to transition risk – that is, they have less negative climate transition value at risk value (-2%) than firms which are less aligned with the transition (-7%).

That said, the relationship between the two metrics is complex and there is far from perfect correlation between them. Whilst the bulk of firms in the 'not aligned' and 'committed' categories are estimated to be at risk from transition, a substantial minority are estimated to stand to profit from it, as reflected by their positive CTVaR value. Similarly, there is a substantial minority of firms that are categorised as 'aligned' or 'aligning' with the transition to lower emissions, but that are estimated to be at risk from transition, shown by a negative CTVaR value.

These discrepancies between the two metrics might reflect the shortcomings of emissions-related metrics as a measure of transition risk to firms. There are firms that are relatively emissions-intensive which are 'not aligned' or only 'committed' to net zero alignment, but which may still increase in profitability as a result of the transition. This includes firms that may experience greater demand for their products/services during the transition (for example, those involved in the extraction of transition-critical minerals and commodities), and/or those that may pass through any increase in their costs of production, for example due to the imposition of a carbon tax, on to their customers, thereby protecting their profitability. Conversely, other firms may be negatively impacted by the transition, but report emissions that fall short of the entirety of those created by their value chains (for example, software supplied to the oil and gas industry). Such firms may appear to be more aligned to the transition, yet still be exposed to substantial transition risk.

<sup>52</sup> While there are many frameworks that endeavour to assess companies' net zero transition plans, the analysis in Figure B1 is based on an assessment of alignment using the Net Zero Investment Framework (NZIF), developed by the Institutional Investors Group on Climate Change (IIGCC), which provides a set of criteria against which investors may assess the alignment of companies with a net zero emissions pathway. Firms can then be classified as (i) aligned to a net zero pathway, (ii) aligning to a net zero pathway, (iii) committed to aligning to net zero, or (iv) not aligned. For further details, see the IIGCC's (December 2021) [Net Zero Investment Framework: IIGCC's Supplementary Guidance on Target Setting](#).

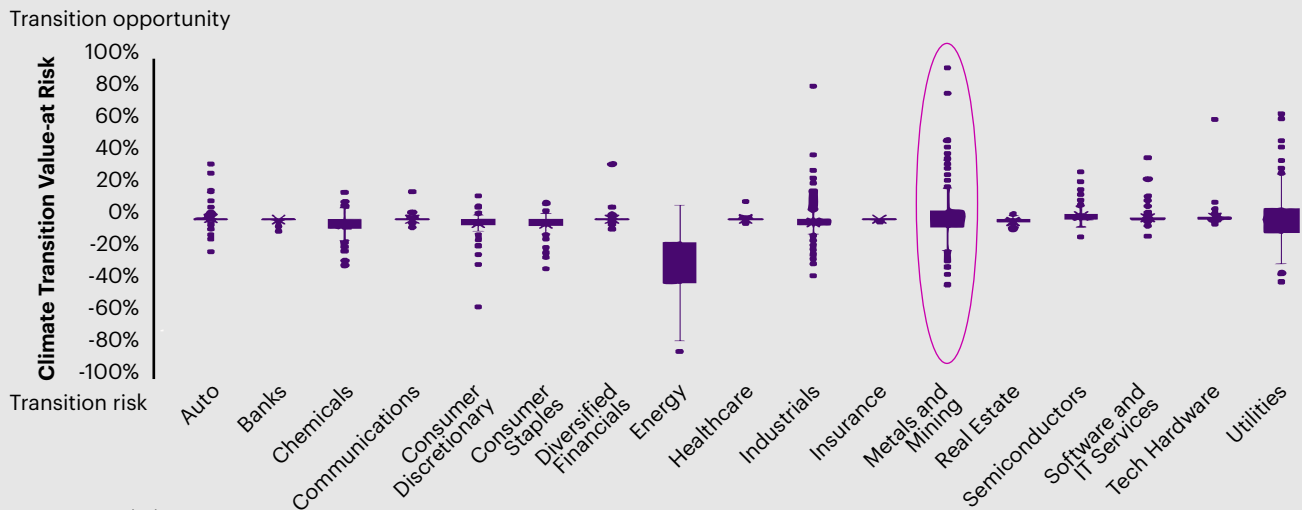
## Box 2: How well do emissions-based metrics perform as measures of transition risk?

### Deep Dive: Focus on Transition in the Metals and Mining Sector

The transition risk to firms in the metals and mining sector varies considerably, and more so than that among firms in many other sectors. This is illustrated by Figure B.2, which shows the distribution of estimated changes in a firm's enterprise value as measured by CTVaR across different sectors due

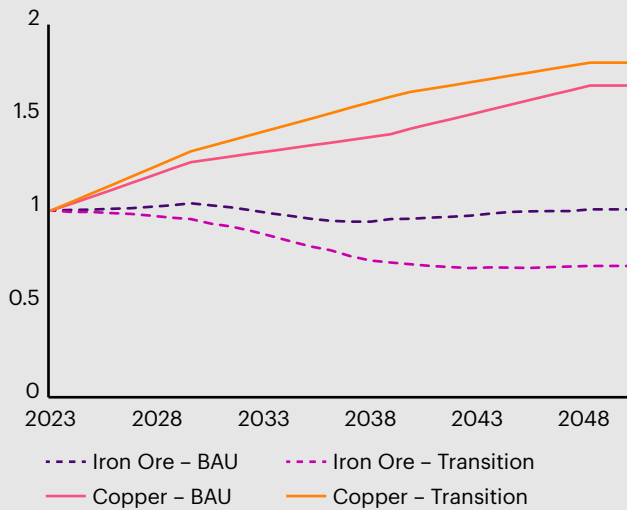
to the transition to net zero emissions.<sup>53, 54</sup> The high variation in transition risk among firms in the metals and mining sector can be explained due to differences in the estimated future profitability of the extraction of different commodities during transition, as well as differences in firms' industrial processes and the ambition of their net zero targets.

Figure B2: **Climate Transition Value-at-Risk by Sector**



Source: WTW calculations.

Figure B3: **Commodity demand by scenario (2023 production = 1)**



Source: WTW calculations.

Within the mining industry, iron ore miners are an example of a sector that – in aggregate – might be expected to reduce in value during transition (see Figure B.3). This is partly due to a likely reduction in demand for steel (which is produced from iron ore) due to an increase in the lifetime of steel infrastructure and machinery, as well as an increase in the availability of scrap steel. Together, these factors are likely to reduce demand for iron ore, resulting in a reduction of the profitability for firms in that sector.

On the other hand, the transition may be a source of increased profitability for other parts of the mining industry. This is due to the possible increase in demand for commodities needed in the production of low-carbon technologies. Demand for copper, for example, may be expected to grow during the transition, due to the enlargement of electricity networks, renewables and other electric technologies necessary to decarbonise energy systems – all of which use copper as a raw material.

<sup>53</sup> CTVaR is calculated under a transition scenario in which global temperature increases remain below two degrees Celsius; this is consistent with the Intergovernmental Panel on Climate Change's (IPCC) SSP1-2.6: Sustainable development scenario.

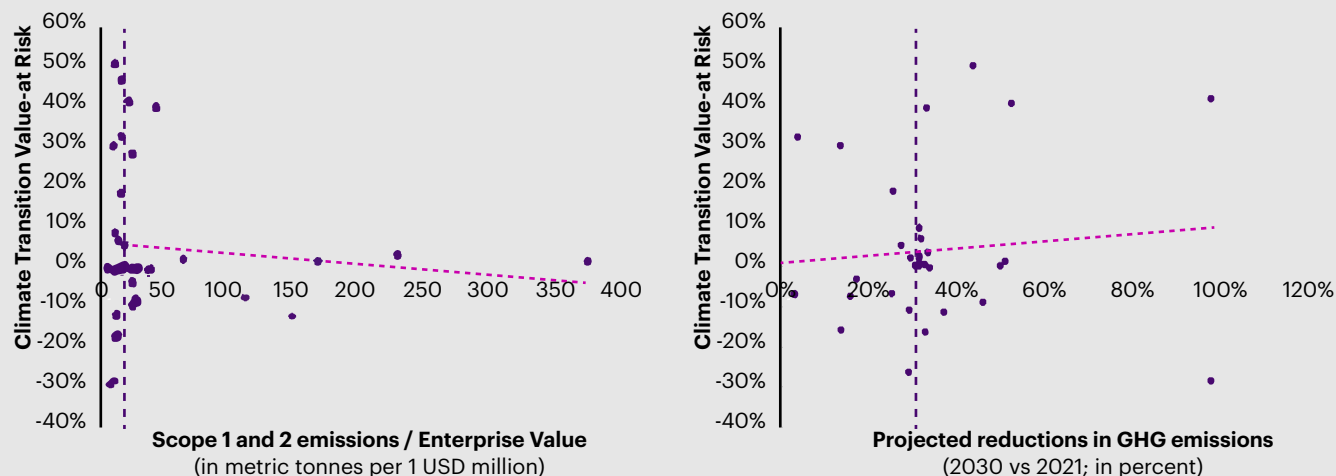
<sup>54</sup> A value of 25% would mean that WTW's CTVaR methodology would value a company at 25% higher than its current market value. Conversely, a value of -25% below implies a decline of the company's valuation by a quarter. See Annex 1 for more details on the CTVaR methodology.

## Box 2: How well do emissions-based metrics perform as measures of transition risk?

The metals and mining sector provides an example of the limitations of emissions-based metrics in providing information about the degree of transition risk (or opportunity). Figure B.4 (left panel) shows only a weak relationship between mining firms' emissions intensity and the degree of transition risk to which they are

exposed.<sup>55</sup> Some firms with an emissions intensity lower than the median for the sector (scatter points to the left of the dotted vertical line) are estimated to profit while others are projected to become less profitable as a result of transition (in other words, they have a mix of positive and negative CTVaR values).

Figure B4: **Correlation between emissions intensity and transition risk for selected firms in the metals and mining sector**



Source: Company reports and WTW calculations.

These data also indicate a lack of a strong correlation between the strength of a company's climate commitments and their climate transition risk in the metals and mining sector. The right-hand panel of Figure B.4 compares firms' transition risk (vertical axis) with their projected reductions in emissions between now and 2030. There is little to no correlation between the ambition of a firm's emissions reduction and the degree of transition risk. That said, the majority of firms whose projected reduction in operational emissions exceeds the median reduction in emissions (shown as the vertical dotted line) face negligible transition risk or even benefit from the transition. Importantly, however, this analysis does not take into account the degree of credibility of firms' transition plans.

Overall, this analysis suggests that real-economy companies' alignment with a net zero emissions pathway is not currently a strong indicator as to whether they are likely to profit – or are at risk – from the transition. There does, however, appear to be some indicative evidence that firms with more ambitious emissions reduction targets may be exposed to less transition risk.

Taking account of this information in conjunction with other data and tools, including climate scenario analysis, as well as other information about a counterparty's transition strategy and objectives (including their credibility), could enable a fuller picture of transition risk for a financial institution. For this reason, the broader information about strategy and intentions that could be contained within a corporate's transition plan could provide valuable forward-looking information for financial institutions as they assess and monitor transition risks.

<sup>55</sup> The sample corresponds to firms in the metals and mining sector with available data on scope 1 and 2 emissions (for 2021 and 2030 forecast by Bloomberg) and WTW's CTVaR.

# Conclusion

This paper provides an organizing framework through which to categorise the information contained in some climate-related metrics that are gaining traction within the financial sector. This includes the degree to which they capture a firm's exposure to climate transition risk, as well as the degree to which they are risk-sensitive (that is, granular and forward-looking), objective and verifiable.

The analysis points to the limitations of GHG emissions-based metrics as direct measures of transition risk. Emissions-based metrics have the advantage of, at least conceptually, being relatively more verifiable and objective. But they provide only an indirect measure of the exposure of financial institutions to transition risk. They also do not capture the degree to which real-economy firms (including those that are relatively high emitting) may facilitate transition elsewhere in the economy (that is, their transition impact).

Other metrics – such as climate transition value at risk, and other climate transition metrics including the outputs of internal climate scenario analysis – are more risk-sensitive: that is, they can provide a more forward-looking and granular estimate of transition risks to which financial firms are exposed. They do, however, come at the cost of greater complexity and less objectivity/verifiability, because they tend to be based on a larger number of data sources and require a greater degree of judgement in their calculation.

Ongoing work by both financial institutions and authorities has illustrated that quantifying transition risk to financial institutions is inherently complex. Multiple metrics may be needed to provide a comprehensive view of financial institutions' exposure to transition risk. Financial institutions could usefully continue to use multiple sources of quantitative and qualitative information concerning their clients and counterparties to inform their assessment and monitoring of such risks. As with other types of financial risk, more complex and risk-sensitive metrics may be better suited to measuring and managing risk to individual financial institutions – even if this comes at the cost of greater complexity. Metrics that are more verifiable and objective have the benefit of enabling comparison across firms, both by financial authorities and investors; they may therefore be better suited for use in financial disclosures.

It is important that users of climate metrics – including both financial firms and authorities – remain mindful of the relative strengths of different metrics and use them for purposes to which they are suited. Were financial authorities to assess the safety and soundness of financial institutions based solely on their financed emissions, this might give a misleading representation of transition risks. This could also disincentivise financial institutions from engaging in certain activities which are critical to the economy-wide transition.

# Annex 1: WTW's Climate Transition Value-at-Risk (CTVaR) Metric

WTW's Climate Transition Value-at-Risk (CTVaR) – which estimates the effect of climate transition on the value of assets and businesses – is an example of a risk-sensitive climate transition risk metric.

CTVaR estimates how the value of an asset or firm is likely to change due to the transition to net zero emissions versus current market expectations (in other words, a -20% CTVaR value indicates that the net present value of a firm's future cash flows is likely to reduce by 20% under a given transition scenario). It does so by considering how changes in consumer preferences, regulation and technology are likely to affect markets under different climate transition scenarios and in turn firms' cash flows and profitability.

The CTVaR metric looks beyond a firm's or asset's emissions and focuses instead on broader drivers of valuations due to climate transition. It acts as a tool with which to assess transition risk and also identify profitable investment opportunities that might arise as a result of transition, including those associated with firms that are currently relatively high emitting, but whose activities support transition in the wider economy. The metric can be used to estimate transition risk or opportunity at the level of sectors and firms, as well as firms' individual business lines, and debt/equity liabilities.

Further details on the methodology underpinning CTVaR are available [here](#).

# Annex 2: Notes to Table 1

Category of Metrics	Examples of where used, proposed or discussed (non-exhaustive list)
<b>(Scope 1-3) Emissions or Emissions intensity</b>	<ul style="list-style-type: none"> <li>• ECB</li> <li>• FSB</li> <li>• Draft ISSB Standards (S2)</li> <li>• SEC proposed disclosure rule</li> <li>• Swiss Confederation <a href="#">Swiss Climate Scores</a></li> <li>• TCFD<sup>56</sup></li> </ul>
<b>Portfolio Alignment measures</b>	<ul style="list-style-type: none"> <li>• EBA</li> <li>• <a href="#">Swiss Climate Scores</a>: includes 'Share of companies in portfolio with verified commitments to NZ and credible interim targets' and 'Global Warming Alignment' as two of six dashboard metrics</li> <li>• TCFD and <a href="#">TCFD Portfolio Alignment Team (TCFD PAT)</a>: recommends financial institutions describe the extent to which their lending and other financial intermediary business activities, where relevant, are aligned with a well below 2°C scenario</li> <li>• UK CFRF</li> </ul>
<b>Climate Transition Risk Metrics or Scores</b>	<ul style="list-style-type: none"> <li>• ECB: Report on good practices for climate stress testing discusses scenario-based measures of transition risks</li> <li>• FSB mentions climate value at risk as information collected by authorities to assess tail risks in a forward-looking manner</li> <li>• UK CFRF raises CTVaR for use in assessing transition risks</li> </ul>
<b>Proportion of financial institution exposure to carbon-intensive sectors</b>	<ul style="list-style-type: none"> <li>• EBA: Template 4 includes exposure to top 20 carbon-intensive firms</li> <li>• FSB</li> <li>• <a href="#">Draft ISSB Standards (S2)</a>: proposes that commercial banks and insurers disclose 'Gross exposure to carbon-related industries, by industry' and 'Percentage of gross exposure for each carbon-related industry' for the following eight industries, which are related to the TCFD non-financial groups: (a) Oil, Gas and Consumable Fuels, (b) Chemicals, Construction Materials, Metals and Mining, and Paper and Forest Products, (c) Air Freight and Logistics, Airlines, Marine, and Road and Rail, (d) Automobiles, (e) Home building , (f) Beverages and Food Products, (g) Electric Utilities, Gas Utilities and Multi Utilities, and (h) Real Estate Management and Development</li> <li>• <a href="#">Swiss Climate Scores</a> includes 'Share of companies in portfolio with activities in coal and other fossil fuels' as one of the six dashboard metrics</li> <li>• TCFD: recommends banks provide the amount and percentage of 'carbon-related assets' (both in absolute terms and relative to total assets), where 'carbon-related assets' refers to assets or organisations with relatively high direct or indirect GHG emissions. In 2021, the TCFD suggested that banks define carbon-related assets as those tied to the following four non-financial groups: Energy, Transportation, Materials and Buildings, and Agriculture, Food and Forest Products</li> <li>• UK CFRF</li> </ul>

<sup>56</sup> Several financial authorities use the TCFD framework as the basis for jurisdictional disclosure expectations or requirements (as discussed in [IIF 2021](#)) and some have already indicated that they would be willing to require financial firms in their jurisdiction(s) to comply with the forthcoming ISSB standards. Those authorities include but not limited to: [UK-Prudential Regulation Authority \(PRA\)](#), [Australia Treasury](#), [JFSA](#), [HK-Securities and Futures Commission \(SFC\)](#).



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