

Network for Greening the Financial System
Technical document

Final report on bridging data gaps

July 2022



Foreword



Ravi Menon
Chair of the NGFS



Patrick Amis
Co-Chair of the Workstream on
bridging the data gaps



Fabio Natalucci
Co-Chair of the Workstream on
bridging the data gaps

Addressing climate change and building a sustainable financial system requires a solid climate information architecture based on high-quality, reliable and comparable climate data. In its latest assessment report published in April 2022, the Intergovernmental Panel on Climate Change (IPCC) underscored the critical role of climate data to effectively align the financial sector with science-based decarbonization and adaptation objectives. In particular, availability of decision-useful, comparable data is paramount to align capital flows to a low-carbon trajectory compatible with the Paris Agreement net-zero goal and efficiently manage climate-related risks. Reliable data are also crucial to prevent greenwashing practices, establish reliable and effective net-zero strategies, and ensure investor protection.

The Network for Greening the Financial System (NGFS) started a workstream on Bridging Data Gaps in July 2020, pioneering a constructive dialogue with financial stakeholders on important climate data issues. A Progress Report (May 2021) underlined how persistent climate data gaps hindered the achievement of climate objectives and identified three building blocks to bridge them under the triptych “disclosures / taxonomies and alignment approaches / metrics.”

This Final Report achieves two important objectives. First, it makes actionable recommendations, building on initiatives, regulations, and policies that have emerged over the past months under the COP26 umbrella. However, it also makes clear that further steps are urgently needed to improve the quality, availability, and comparability of climate-related data through increased reporting requirements, sector-based methodologies, technological innovation, and intensified cooperation among financial regulators, financial institutions, and non-financial sector stakeholders. All these recommendations are closely linked with the “directory,” (see *infra* on the definition of “directory”) which will help their successful implementation going forward.

Second, the Final Report advances a robust climate information architecture by laying out the rationale, organization, content, and the description of the “directory”. The directory is a practical solution to help bridge data gaps as it helps financial sector stakeholders identify important and relevant climate-related data sources to meet their needs and facilitate access to these data. It also facilitates the identification of potential data gaps (where raw data items needed to construct a metric are not available) and creates incentives to bridge such gaps. As a living catalogue of available climate-related data sources for financial sector stakeholders, the directory is a public good. Besides, in fostering the establishment of comparable and consistent climate data, the directory can support the implementation of the International Sustainability Standards Board (ISSB) global standards. Hence, the NGFS hopes it will be used widely by financial sector stakeholders and the public globally, as a widespread adoption will in turn allow users to feedback to NGFS on the latest data sources and sustain the relevance of the directory. We urge all interested participants to take advantage of this new tool and leverage it to effectively green the financial system.

We genuinely appreciate the dedication of all workstream members who have contributed to the Final Report and the design and setup of the directory, as well as the valuable engagement of financial market participants and other stakeholders whom we have consulted in the past two years.

Table of Contents

Executive summary	4
1. Introduction	11
2. Despite the progress in terms of building blocks, challenges remain	12
2.1 New urgency and a pressing need for better availability, comparability and reliability of climate-related data	12
2.2 Recent policy developments and initiatives highlight the challenges for achieving greater availability, comparability, and reliability of climate-related data	21
3. The directory	24
3.1 Description of the final directory	24
3.2 Evidence-based conclusions on the main gaps and key challenges in climate-related data	30
3.3 Lessons learned from the directory and how it could be used to address some of the climate-related data challenges	34
3.4 The NGFS practical solution to help to bridge the gaps	39
4. Addressing persisting gaps in data availability and consistency, while ensuring greater reliability and capacity building – Our policy recommendations	40
5. Looking forward	46
Acknowledgments	47
List of acronyms	48
List of boxes and Figures	50
Annex: Directory extension and harmonisation	51

Executive summary

In May 2021, the Network for Greening for the Financial System (NGFS) published its *Progress report on bridging data gaps*. This report laid the groundwork for a comprehensive assessment of climate-related data needs, availability and gaps, and identified three building blocks needed to ensure the availability of reliable and comparable climate-related data: (i) a rapid convergence towards a common and consistent set of global disclosure standards; (ii) efforts towards a minimally accepted global taxonomy/shared principles for sustainable finance classifications; (iii) the development and transparent use of well-defined and decision-useful metrics, certification labels and methodological standards.

Gaps in climate-related data encompass several dimensions:¹ availability (e.g., coverage, granularity, accessibility), reliability (e.g., quality, auditability, transparency) and comparability. Indeed, in some instances relevant data are not available. In other instances the data exist but lack the appropriate granularity, cannot be verified or are of poor quality. Finally, in some cases available data sources cannot be compared or are not consistent. However, uncertainties related to evolving climate-related data needs make it difficult to draw definitive conclusions on the data gaps.

Despite notable progress made over the past year and a half on the climate information architecture encompassing these three building blocks, the need for further progress on the climate-related data front is pressing, and there continue to be significant challenges. **Against this backdrop, this final report provides specific NGFS policy recommendations for improving the availability, quality, and comparability of climate-related data, thus further advancing progress on the three building blocks.**

Since the publication of its *Progress report*, the NGFS has worked on finalizing its directory² in order to provide a comprehensive assessment of climate-related

decision-useful data needs and availability, drawing evidence-based conclusions about the main data gaps and key challenges to closing those gaps. The gaps identified in this report from the analysis of the directory are based on our observations.³ The aim of the directory is to be a living catalogue of available climate-related data sources for financial-sector stakeholders to use. Hence, further updates of the directory could help to close some of the gaps by incorporating existing data sources, while many of them will most likely need to be addressed by policymakers. **In identifying the main climate-related data gaps, this report provides concrete policy recommendations that policymakers and other stakeholders can adopt to urgently address climate-related data challenges, and highlights in particular areas where the directory can prove useful in meeting these challenges.**

Despite the progress in terms of building blocks, challenges remain

New urgency and a pressing need for better availability, comparability and reliability of climate-related data

In the wake of the COP26, a number of initiatives have focused on climate-related data. Analytical tools and related methodologies (e.g., measuring and reporting greenhouse gas (GHG) emissions) have been developed, increasing data quality and availability. These initiatives include the development of broad and cross-sectoral climate-related indicators (e.g., the International Monetary Fund (IMF)'s Climate Change Indicators Dashboard, closely linked with the New Data Gaps Initiative, or the Global Resilience Index Initiative⁴) and sectoral indicators (e.g., the Global Methane Pledge, the Beyond Gas and Coal Alliance, the Global Coal to Clean Power). On the specific topic of key performance indicators and methodologies, the European System of Central Banks is coordinating efforts to develop methodologies and benchmark indicators to estimate

1 For more information, please see the *Progress report on bridging data gaps*, NGFS, May 2021

2 The terminology "repository" formerly used in the *Progress report on bridging data gaps* has been replaced by "directory" in the Final report to clarify that no actual climate data are directly accessible through the directory. In particular, the repository can be thought of and used as a directory of available climate-related metrics and data sources based on specific stakeholders' use cases (see *infra*).

3 This does not necessarily mean that they are all actual gaps, but rather that information was not available at the time of writing this report.

4 For more information, see *Global Resilience Index Initiative - Greening Finance and Investment*.

the carbon footprint of financial institutions' portfolios and their exposure to physical risks.⁵ In addition, financial institutions have started to implement climate-related data commitments, the most notable initiatives from a data perspective being The Glasgow Financial Alliance for Net-Zero and the One Planet Data Hub Initiative. Finally, data availability has also been a focus of some policy/regulatory moves since the *Progress report*, including the G20's October 2021 Sustainable Finance Roadmap and the European Single Access Point (ESAP) in the European Union (EU).

Data availability challenges are compounded by data reliability issues. Recent developments with regard to ratings and data providers have helped to bring to the fore the need to tackle availability and reliability in parallel. In its July 2021 report on *The availability of data with which to monitor and assess climate-related risks to financial stability*, the Financial Stability Board (FSB) notes that "differences in the construction of environmental, social and governance (ESG) ratings across providers prevent them from supplying consistent and comparable information on transition risks across firms and jurisdictions".⁶ Data reliability is one of the main advances highlighted in the EU's July 2021 revised sustainable finance strategy,⁷ which aims to improve the reliability and comparability of ESG ratings and assess certain aspects of ESG research. In this regard, the International Organization of Securities Commissions (IOSCO) published a report in November 2021 providing a series of recommendations on ratings and data products providers.⁸

Policy and regulatory initiatives focused on the harmonisation of sustainable finance classifications/taxonomies and the development of global disclosure standards since the publication of the *Progress report* have been centred on three areas:

- the design of sustainable finance classifications and taxonomies (e.g. deployment of the EU Taxonomy and related developments, the *Malaysian Climate Change and Principles based Taxonomy*, *ASEAN Taxonomy for Sustainable Finance*, the *South African Green Finance Taxonomy*);
- corporate and investor disclosures (e.g. the EU Corporate

Sustainability Reporting Directive (CSRD) and Sustainable Finance Disclosure Regulation (SFDR), Japan's *revision of the Corporate Governance Code*, China's *revised climate disclosure rule*, the United States (US) Securities and Exchange Commission (SEC)'s *climate disclosure rule*, etc).

- the standardisation of sustainability information (e.g. the International Financial Reporting Standards (IFRS) *Prototype for Climate-related Disclosures Requirements*, the *formation of the International Sustainability Standards Board (ISSB)*, the *ISSB Exposure Draft on Climate-related Disclosures*, the European Financial Reporting Advisory Group (EFRAG)'s *Sustainability Reporting Standards*, the Taskforce on Nature-related Financial Disclosures (TNFD) *beta version of its risk management and opportunity disclosure framework*).

Recent policy developments and initiatives highlight the challenges for achieving greater availability, comparability, and reliability of climate-related data

High-quality, comparable and consistent data are a necessary foundation for achieving convergence towards a common and consistent set of global disclosure standards and a minimally accepted global taxonomy/shared principles for sustainable finance classifications. However, despite recent progress, a number of challenges remain, adding to the sense of urgency. Such challenges include: the interoperability of classifications and reporting frameworks, rising concerns about greenwashing risks across the world, the need to take into account issues specific to emerging markets and developing economies (EMDEs), scarce data availability for private companies and small and medium-sized enterprises (SMEs), and the limited disclosure of forward-looking information.

The directory

The NGFS Workstream on bridging the data gaps was tasked with systematically mapping climate-related data gaps and proposing policy recommendations and solutions aimed at bridging such gaps. For this

5 See: *ECB presents action plan to include climate change considerations in its monetary policy strategy* (europa.eu)

6 *The Availability of Data with Which to Monitor and Assess Climate-Related Risks to Financial Stability*, Financial Stability Board, Basel, July 2021, p. 23.

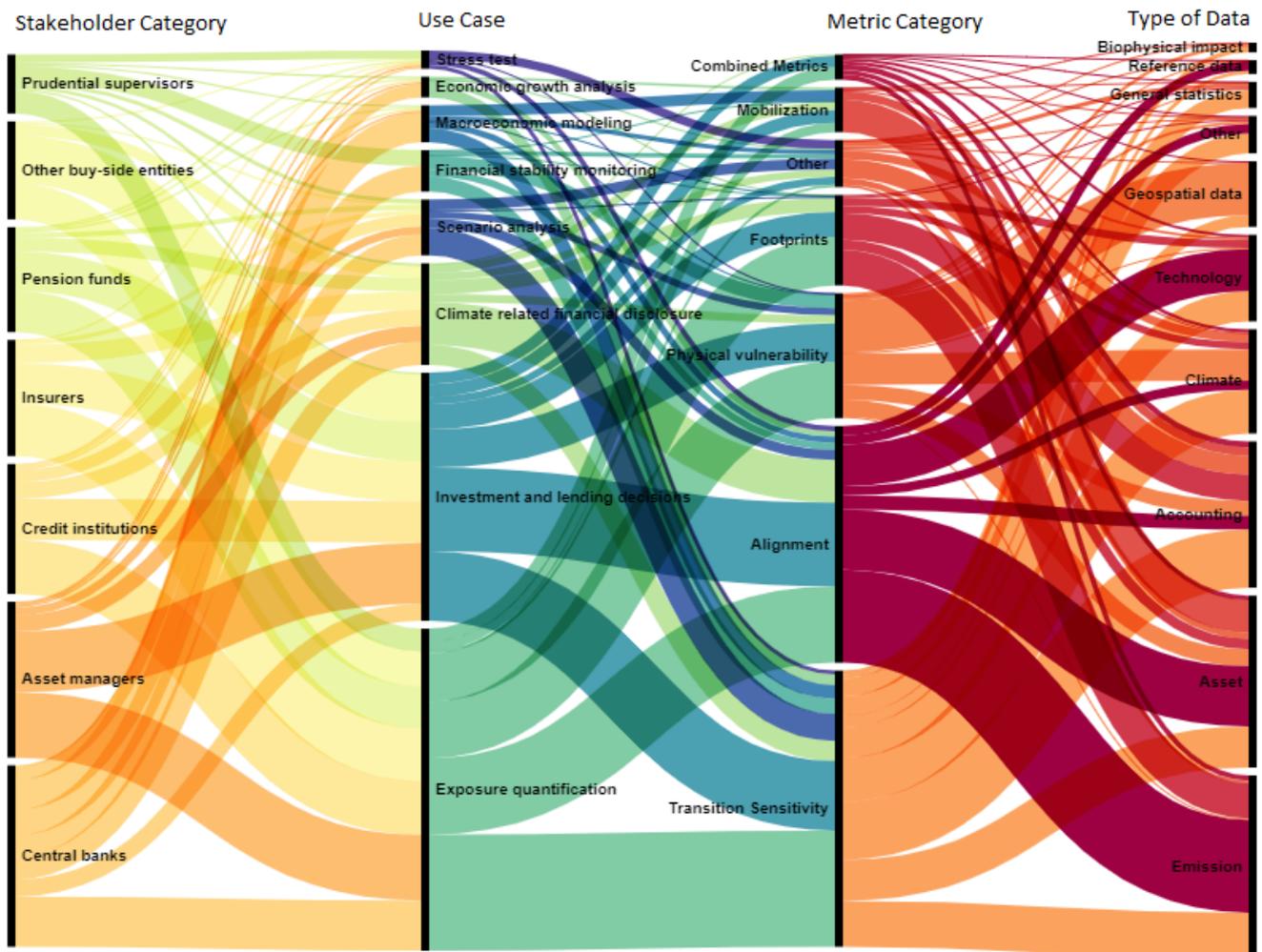
7 See *Strategy for financing the transition to a sustainable economy*, European Commission website.

8 "Environmental, Social and Governance (ESG) Ratings and Data Products Providers", FR09/21, International Organization of Securities Commissions, Madrid, November 2021.

purpose, and applying a user-centric approach, the NGFS has developed a classification into seven main stakeholder categories⁹ and into eight main use cases¹⁰ that define the application of climate-related data for these key stakeholders. On the basis of this, detailed results for use

cases, metrics, and raw data items have been recorded in the NGFS directory. The directory has a three-layered structure, under which use cases, metrics and raw data items are recorded and described in connection with each other (see Figure 1).

Figure 1 Interconnectedness of stakeholders, use cases, metrics and raw data items types in the directory



9 The *Progress report on bridging data gaps*, NGFS, May 2021, offers a first classification into six main stakeholders categories, namely: Central banks, Prudential supervisors, Credit institutions, Insurers, Pension funds, and Other buy-side entities. The final report adds Asset managers as a seventh category.

10 The *Progress report on bridging data gaps*, NGFS, May 2021, offers a first classification into six main use cases, namely: Exposure quantification, Investment and lending decisions, Macroeconomic modelling, Financial stability monitoring, Climate-related disclosures, Scenario analysis and stress testing. The final report adds Stress test (distinct from the Scenario analysis stress testing) and Economic growth analysis (distinct from Macroeconomic modelling).

Taking stock of the available data, the final directory references 329 unique metric/methodology combinations, 1 262 raw data items and 748 links to data sources based on the needs of financial sector-stakeholder use cases.¹¹ **The content of the final version can be used to draw evidence-based conclusions on the main climate-related data gaps and highlight key challenges to close such gaps.**

Main gaps and key challenges in climate-related data
In linking climate-related data needs to sources, the directory allows us to identify gaps: if raw data items cannot be linked to a source, they can be considered as gaps in the directory. In the final directory, there are 514 raw data items lines (of out of total of 1 262) for which no link to a data source could be reported. This does not necessarily mean that there are actually 514 gaps, but rather that information was not observable for these raw data items at the time of writing this report. Indeed, further extensions of the directory might show that some of these gaps can be closed with existing data sources. Similarly, the NGFS has observed that the data sources referenced in the directory could still suffer from gaps across the three following dimensions: availability, reliability and comparability. Furthermore, given the breadth of data needs and sources, uncertainties remain and conclusions are tentative. Ongoing extensions, improvements, and updates of the directory are needed going forward to make sure that this public tool remains relevant given the breath-taking speed of advancements in the field of climate change.

Based on the findings of this report, the largest gaps are for biophysical impact¹², emissions and geospatial data types, limiting the usability of the “Physical vulnerability” and “Transition sensitivity” metric types, which are the leading metric types that benefit from these three raw data items. Investment and lending decisions and exposure quantification are the use case categories most affected by these gaps.

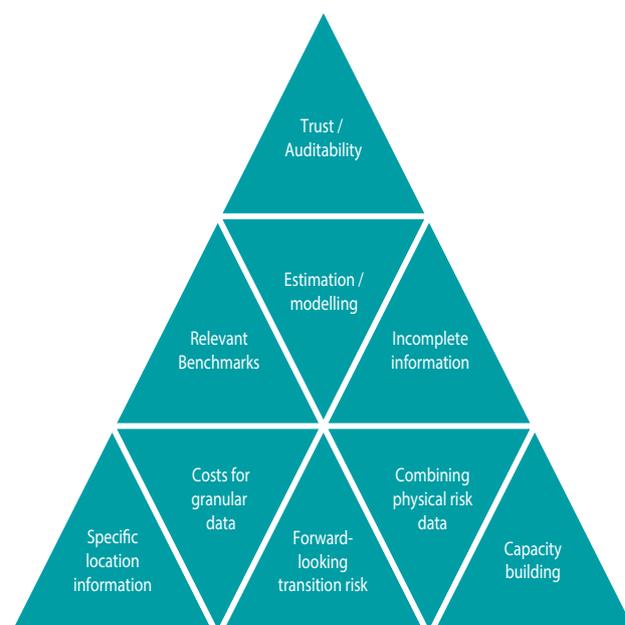
The directory points to a number of key challenges to closing climate data gaps (see Figure 2):

- Auditability is needed to build trust and enhance the quality of data. In addition, the information currently available in the directory makes it difficult for a financial or nonfinancial entity to conduct a proper assessment of its climate-related

exposures, especially given the lack of relevant benchmarks, limiting the ability to compare against peers.

- Analysis of the directory shows that climate-related data often rely on estimations and modelling. As these methods often require detailed or specific technical expertise and/or are the proprietary knowledge of private vendors, there is a need for stakeholders to build the capacity to understand the advantages and disadvantages of the methods of different providers.
- The directory points to granularity issues (geographical data at entity and asset levels in particular lack specific location information) and, where granular data are available, it is often at a cost, which limits accessibility.
- Analysis of the directory showed that forward-looking data¹³ are limited for transition risk, while “physical risk” metrics rely on a combination of forward-looking, biophysical and geospatial data. Forward-looking metrics still remain a challenge given that data items on biophysical impact and geospatial information are often unavailable (see *supra*).
- Understanding science-based metrics requires capacity building.
- Finally, the information on climate-related data in the directory is, at times, incomplete, and could benefit from further extensions, harmonisation and cleaning efforts (see the Annex).

Figure 2 **Key challenges for climate-related data**



11 But, as such, does not offer direct access to actual data.

12 Biophysical data type would consider both abiotic (e.g., floods, droughts, storms, etc.) and biotic data (e.g., biodiversity, forest depletion, etc.).

13 The term forward-looking data refers to data/information that offer a prospective appreciation. These data include targets, commitments, emissions pathways and projections. In many cases, these data can consist in modelled data or estimates.

Lessons learned from the directory and how it could be used to address some of the climate-related data challenges

The directory can be thought of, and used, as a catalogue of available climate-related metrics and data sources based on specific stakeholder use cases. Indeed, once a specific use case has been identified, the directory can be used to choose from multiple metrics and methodologies suitable for a given purpose across the six metric types. Once a specific metric or methodology has been selected, the directory displays all the raw data items that are needed to construct it. The directory can then direct users to the raw data items for which the sources are known/available.

The directory can help financial-sector stakeholders to identify important and relevant climate-related data sources to meet their needs, facilitate access to data, and thus **improve the broader dissemination of existing climate-related data**. Similarly, by linking the climate-related data needs to available sources, **the directory can improve broader knowledge of missing climate-related data items**, by pointing to potential data gaps that have not been identified so far and creating incentives to bridge such gaps.

The NGFS directory as a public good

The directory was released for public consultation¹⁴ in order to (i) seek feedback on the format and functionalities of the directory web interface (a prototype at that stage), (ii) obtain feedback on the contents of the directory (in terms of climate-related data sources and gaps identified) and (iii) gather suggestions on the future of the directory. The potential role of the directory as a public good was highlighted by several respondents to the NGFS public consultation, who found the tool to be a “vital resource for coordinating data and tool development for climate-aligned finance”.

The NGFS sees the directory as a public good, a living tool aimed at fostering better dissemination of climate-related data and offering a practical solution to bridge climate-related data gaps.

Taking onboard the feedbacks from the public consultation, the NGFS is currently working to develop a new website and to identify a possible long-term solution for housing and updating the directory.

The update of the directory could be managed centrally or be a collaborative effort (users could reference new metrics, raw data items and sources, and provide expert feedback on both items already referenced and newly added items). With respect to the future hosting of the directory, the choice will be guided by the principle that the directory should be a public good and be broadly and easily accessible by financial-sector stakeholders and the general public in both advanced and emerging market economies.

Addressing persisting gaps in data availability and consistency, while ensuring greater reliability and capacity building – Our policy recommendations

Despite steps taken by policymakers and financial-sector stakeholders, analysis of the directory showed that some challenges hinder the ultimate objective of bridging the climate-related data gaps. Therefore, the need for further progress on the climate-related data front remains pressing. **Against this backdrop, this final report provides specific NGFS policy recommendations for improving the quality, availability, and comparability of climate-related data. These recommendations will also help foster progress on the three building blocks** (see Figure 10: Our further recommendations to advance the building blocks and address the data gaps). **In the light of this, the directory could play an important role in advancing this policy agenda, as highlighted below** (see Figure 11: How the directory can play a role in achieving the building blocks).

¹⁴ For more information, see Box 6 and *The NGFS launches a consultation on its repository of climate-related data needs and available sources*, Banque de France, Paris, 26 April 2022.

Recommendation 1: Foster convergence towards a common and consistent set of global disclosure standards

To further advance this goal, including the IFRS effort through the creation of the ISSB, there is a need to substantially increase the availability of decision-useful granular data on emissions, and to improve the reliability of reported climate-related data, by:

- i. Intensifying dialogue between standard setters, regulators and supervisors, the financial industry and non-financial entities, and other stakeholders (i.e., environment and energy agencies, academics, climate scientists, etc) to identify existing limitations in quality of reporting.
- ii. Fostering discussion at global level, including through the ISSB, to develop more granular, sector-based methodologies for climate-related disclosures.
- iii. Increasing reporting requirements for non-financial corporates.
- iv. Building trust in reported climate-related data.

The directory can play a role in achieving/fostering this goal by:

- Improving the availability of data.
- Documenting persisting gaps to fulfil the needs of financial-sector use cases.
- Fostering the establishment of comparable and consistent data.

Recommendation 2: Increase efforts towards mutually shared and operationalised principles for taxonomies and sustainable finance classifications

There is a need to harmonise taxonomies and sustainable finance classifications across the globe and to foster interoperability. The availability of comparable and consistent data can help to achieve this objective. To further advance this goal, it is essential to:

- i. Intensify cooperation and coordination on existing taxonomies and sustainable-finance alignment approaches.
- ii. Foster the development of use cases in collaboration with the private sector.
- iii. Enhance the usability of statistical classifications in the deployment of sustainable-finance alignment approaches, in order to improve data collection.
- iv. Increase linkage between sustainable-finance alignment approaches (e.g., taxonomies and other classifications) and disclosure and/or data-related measures, in order to enhance data availability and pave the way for interoperable and more globally consistent classifications.

Recommendation 3: Developing well-defined and decision-useful metrics, and methodological standards

To further advance this goal, there is the need to substantially increase the harmonisation of forward-looking metrics, by:

- i. Collecting more granular data, notably by improving the availability of asset level geographical data.
- ii. Assessing the quality of forward-looking metrics in order to increase reliability and fostering public-private cooperation to harmonise methodologies for designing forward-looking metrics.
- iii. Fostering partnerships with non-financial institutions, and more particularly with those designing energy-climate scenarios at global and regional levels (e.g., the International Energy Agency (IEA), the Intergovernmental Panel on Climate Change (IPCC), the World Resources Institute (WRI), etc.).

The directory can play a role in achieving/fostering this goal in:

- Highlighting trends in the use of metrics and methodologies.
- Highlighting new metrics and methodologies.

.../...

Recommendation 4: Better leveraging available data sources, approaches and tools

Many existing data sources, approaches, and tools have already improved data availability. Knowledge sharing and capacity building are key to enhancing their use and development, by:

- i. Intensifying efforts amongst central banks and supervisors to develop publicly available dashboards, repositories and other structures/tools to automatise data collection, centralise data in a single access point, and facilitate access to and use of data.
- ii. Leveraging existing global platforms and standard setters, such as the NGFS, the International Platform on Sustainable Finance (IPSF) and the ISSB to enhance capacity building and knowledge sharing in this area.
- iii. Providing sufficient training to assurance professionals on decisive climate-related data and indicators.
- iv. Making better and wider use of new technologies (such as artificial intelligence, machine learning, satellite data or open-source platforms).

The NGFS directory itself, as a public tool aimed at improving data accessibility and fostering the quality, comparability and consistency of climate-related data, is an important step towards the achievement of this goal.

Looking forward

Climate-related data needs will continue to grow as both the public and private sector address the challenges posed by climate change. Despite recent progress, there is an urgent need for further action on the climate-related data front. This is why the NGFS work programme for 2022-2024 provides for **the Workstream on bridging the data gaps to evolve – after publication of this final report – into an internal data experts’ network.**

1. Introduction

In May 2021, the NGFS published its *Progress report on bridging data gaps*. This report was part of the mandate of the Workstream on bridging the data gaps, set up by the NGFS to systematically identify climate-related data needs and availability and to propose policy recommendations to bridge resulting climate-related data gaps. Informed by interactions with a vast number of stakeholders and building on the NGFS directory (*see infra*), the *Progress report* laid the groundwork for a comprehensive assessment of climate-related data needs, availability, and gaps. It also identified three building blocks needed to ensure the availability of reliable and comparable climate-related data: i. a rapid convergence towards a common and consistent set of global disclosure standards; ii. efforts towards a minimally accepted global taxonomy/shared principles for sustainable finance classifications; iii. the development and transparent use of well-defined and decision-useful metrics, certification labels and methodological standards.

Gaps in climate-related data encompass several dimensions:¹⁵ availability (e.g., coverage, granularity, accessibility), reliability (e.g., quality, auditability, transparency) and comparability. Indeed, in some instances relevant data are not available. In other instances the data exist but lack the appropriate granularity, cannot be verified or are of poor quality. Finally, in some cases available data sources cannot be compared or are not consistent. Furthermore, uncertainties related to evolving climate-related data needs make it difficult to draw definitive conclusions on the data gaps.

Over the past year, progress has been made on the “climate information architecture”¹⁶ encompassing the three building blocks referred to above. For example, in the wake of the COP26, a number of initiatives have been centred on data (e.g., the development of broad and cross-sectoral climate-related indicators, such as the IMF’s Climate Change Indicators Dashboard, or sectoral indicators, such as the Global Methane Pledge). Data availability has also been a focus of several policy/regulatory initiatives since publication of the *Progress report* (e.g., the ESAP). In addition, policymakers and financial sector stakeholders have taken

steps to promote further standardisation and convergence of disclosure requirements and sustainable-finance classifications and taxonomies (e.g., the formation of the ISSB, the TNFD beta framework or the European taxonomy).

Despite the progress, the need for further action on climate-related data continues to be pressing. There are still significant challenges that prevent efficient pricing of climate-related risks, proper risk management, and the scaling up of private finance, adding to the sense of urgency of addressing climate change and associated financial risks. **Against this backdrop, this final report provides specific NGFS policy recommendations for improving the availability, reliability, and comparability of climate-related data. The implementation of these recommendations will help to foster progress on the three building blocks identified above.**

Since the publication of its *Progress report*, the NGFS has worked on finalizing its directory¹⁷ in order to provide a comprehensive assessment of decision-useful climate data needs and availability, drawing evidence-based conclusions about the main data gaps and the key challenges to closing those gaps. Taking stock of available climate-related data, the final directory references 329 unique metric/methodology combinations, 1 262 raw data items and 748 links to data sources based on the needs of financial-sector stakeholders as summarised by the use cases. The gaps identified in this report from the analysis of the directory are based on our observations.¹⁸ The aim of the directory is to be a living catalogue of available climate-related data sources for financial-sector stakeholders to use. Hence, further updates of the directory could help close some gaps by incorporating existing data sources, although many of them will most likely need to be addressed by policymakers. **In identifying the main climate-related data gaps, this report provides concrete policy recommendations that policymakers and other stakeholders can adopt to urgently address climate-related data challenges, and highlights in particular areas where the directory could prove useful in meeting these challenges.**

15 For more information, see the *Progress report on bridging data gaps*, NGFS, May 2021.

16 “*Strengthening the Climate Information Architecture*”, IMF Staff Climate Note 2021/003, International Monetary Fund, Washington, DC, 8 September 2021.

17 The term “repository” formerly used in the *Progress report on bridging the data gaps* has been replaced by “directory” in the Final report to clarify that no actual climate data are directly accessible through the directory. In particular, the repository can be thought of and used as a directory of available climate-related metrics and data sources based on specific stakeholder use cases (*see infra*).

18 This does not necessarily mean that they are all actual gaps, but rather that information was not available at the time of writing this report.

2. Despite the progress in terms of building blocks, challenges remain

2.1 New urgency and a pressing need for better availability, comparability and reliability of climate-related data

The *Progress report on bridging data gaps* (May 2021) has identified three building blocks that are paramount for ensuring the availability, comparability and reliability of

climate-related data, which are at the core of the climate change challenge (see Figure 3: Building blocks to bridge the data gaps).

A year has passed since the *Progress report* was published, and the need for quality, comparable and decision-useful climate-related data continues to be a pressing issue, despite notable progress over the past year and a half.

Figure 3 Building blocks to bridge the data gaps



2.1.1 A surge in public and private initiatives on data availability, quality and reliability

Addressing climate-related risks and opportunities calls for quality, granular, and consistent data across jurisdictions. The availability of global data would help to address financial-stability risks related to climate change.¹⁹ Granular data are needed to capture

variations in climate change exposures and interlinkages across entities, industrial structures and supply chains. Taking into consideration climate-related data needs based on the level of development of capital markets and the data infrastructure of EMDEs²⁰ (e.g., concentration of data depending on the position in the global value chain, different risk considerations) is a central issue for continuation of data-related work within the NGFS and other global fora.

¹⁹ "The Availability of Data with Which to Monitor and Assess Climate-Related Risks to Financial Stability", Reports to the G20, Financial Stability Board, 7 July 2021.

²⁰ The *Progress report on bridging data gaps*, NGFS, May 2021 featured examples of particular data infrastructure challenges on climate in emerging markets and developing economies. Challenges related to data availability and/or accessibility were in particular highlighted in the report, such as the lack of longer-term time series on climate variables such as temperature and precipitation in some countries due to a lack of weather stations to collect observations or to the non-functioning of some stations; or the fact that, in some areas, access to climate and hydrological data collected by meteorological stations can be costly, these data being often sold to fund continued data collection.

In this regard, COP26 has re-emphasised the need for a data-driven approach to sustainable finance policy as a prerequisite for capital flow alignment and climate-related risk analysis. This approach would help to address more effectively gaps between current initiatives and pathways in pursuit of the Paris Agreement temperature goals. Better data would fill the “knowledge gap”²¹ about the impact of economic activities, corporates, and financial institutions on climate change, ecosystems, and biodiversity erosion, and other ESG factors, as well as about business models and financial stability. Numerous data-related issues have been enhanced by the COP26 discussions.²²

In the wake of the COP26, a range of initiatives has focused on climate-related data. Analytical tools and related methodologies (e.g., measuring and reporting greenhouse gas (GHG) emissions) have been developed rapidly, increasing data quality and availability, although challenges remain. These initiatives include:

- **Broad and cross-sectoral climate-related indicators:**
 - *The IMF’s Climate Change Indicators Dashboard*²³, closely linked with the proposed New Data Gaps Initiative (see Box 1: New Data Gaps Initiative – Climate Change), is a statistical tool linking climate considerations and global economic indicators; it revolves around five broad categories, i.e., economic activity indicators (GHG emissions, national inventories and targets, CO₂ emissions, intensities and multipliers), cross-border indicators (both trade-related and direct investment related), financial and risk indicators (including financial, physical and transition risks), government policy indicators (environmental taxes, environmental expenditure, subsidies on fossil fuels), and climate change data (including annual surface change, temperature change, changes in mean sea levels).
 - *The Global Resilience Index Initiative*²⁴, that aims to providing reference data on climate and natural hazard risks to inform populations and economies, particularly in EMDEs. The Global Resilience Index Initiative is an ongoing project to be delivered in time for COP27, scheduled for 2022.

21 Kreibiehl, S., T. Yong Jung, S. Battiston, P. E. Carvajal, C. Clapp, D. Dasgupta, N. Dube, R. Jachnik, K. Morita, N. Samargandi, M. Williams, 2022: Investment and finance. In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

22 See for example:

- Spatial and sectoral inequalities in measuring greenhouse gas emissions, that have had a decisive role in negotiations, notably with discussions around the effectiveness of adaptation (title III of the Glasgow Climate Pact²¹) and mitigation finance (title IV of the Glasgow Climate Pact) and the role of capacity-building for mitigation and adaptation (title V of the Glasgow Climate Pact); and
- The need for supply chain visibility in developing transparent and effective corporate and financial decarbonization strategies. Discussions have for instance centered around the implementation of Article 54 of the Glasgow Climate Pact on the consistency of financial flows with a pathway towards low greenhouse gas emission and resilient development, as well as the initiatives surrounding the COP26 (e.g., Deforestation Pledge, Global Coal to Clean Power Alliance, etc.).

23 See *Climate Change Indicators Dashboard*, International Monetary Fund website.

24 See *Global Resilience Index Initiative – Greening Finance and Investment*.

New Data Gaps Initiative – Climate Change¹

Building on the successful completion on phases 1 and 2 of the Data Gaps Initiative (DGI)², the G20 Finance Ministers and Central Bank Governors (FMCBG), in their April 2021 Communiqué asked the IMF, in close cooperation with the Inter-Agency Group on Economic and Financial Statistics (IAG) and the FSB, to prepare a concept note on a new DGI. The G20 FMCBG, in their July 2021 Communiqué, and the G20, in their October 2021 Leaders Declaration, noted that they looked forward to a detailed workplan on the new DGI. Subsequently, the IMF, in close cooperation with the IAG, the FSB and the G20 economies, developed a workplan consisting of 14 recommendations covering four main statistical and data priorities: (i) climate change; (ii) household distributional information; (iii) Fintech and financial inclusion; and (iv) access to private and administrative data, and data sharing. The workplan for the new DGI is awaiting endorsement by the G20 FMCBG, before a more detailed version is prepared in collaboration between the international organizations and participating economies, through thematic workshops. Seven of the 14 recommendations in the workplan focus on climate change and the policy drivers supporting these recommendations are summarized below.

Recommendation 1: Greenhouse Gas Emission Accounts and National Carbon Footprints

Monitoring the progress towards emission targets and the transition towards a low carbon economy. All G20 economies have updated their National Determined Contributions (NDCs) as outlined under the Paris Agreement. Consequently, there will be a need to track progress towards these targets on a regular and timely basis. To achieve these targets, G20 economies will need to undergo important industrial and structural reforms – in particular within the energy sector. There will be a need to monitor the progress of these reforms and their impact on greenhouse gas (GHG) emissions and carbon footprints.

Recommendation 2: Energy Accounts

Transformation of the energy sector is key to addressing climate change. To achieve NDCs defined under the Paris

Agreement, policymakers will need to employ policies to facilitate the energy transition towards a low carbon economy. The energy accounts can be used to monitor the energy mix (including the share of renewable energy sources) used by economic activities in production, energy transformation and final consumption. As such, they are useful to monitor a wide variety of energy. Due to their consistency with the national accounts, energy accounts allow for the calculation of energy intensities (by economic activities), calculating multipliers, energy footprints, or performing structural decomposition analysis. Energy accounts also underpin the calculation of air emission accounts, regarding emissions due to energy extraction, distribution, storage, and transformation. Combined with information about energy taxes and subsidies, they provide a useful tool for scenario analysis.

Recommendation 3: Carbon Footprint of Foreign Direct Investment

Monitoring the offshoring of emissions through trade, investment, and global value chains (GVCs). Additional information on foreign direct investment (FDI), multinational enterprises (MNEs), and GVCs would help analysts better understand where CO₂ emissions are generated, who owns the enterprises generating them, and where the associated goods and services are consumed. These measures present policymakers, for example in the home economies of foreign-owned firms as well as the host economies, with additional policy options to reduce global carbon emissions.

Recommendation 4: Green Debt and Equity Financing

In view of the economic and financial implications of climate change, green financing is considered as a key instrument to support the transition to a more resilient economy. As evidenced by policy initiatives such as the “European Green Deal”, policymakers and financial authorities around the globe are working towards putting in place policies that incentivize investments in green projects and activities and that can contribute to climate

.../...

1 Francien Berry, Barend De La Beer, Kristy Howell and Margarida Martins (International Monetary Fund) are thanked for their generous contribution to the drafting of this Box.

2 See <https://www.imf.org/en/News/Seminars/Conferences/DGI/g20-dgi-progress-reports-and-other-documents> for additional details on the Data Gaps Initiative.

3 Note: In addition to the work on the data gaps initiative that support climate change, the IMF Climate Change Indicators Dashboard provides a statistical tool that link climate considerations and global economic indicators. The dashboard can be accessed here: <https://climatedata.imf.org/>

change adaptation and mitigation. This recommendation is thus part of the general efforts to promote a more balanced society regarding environmental, social and governance aspects, but with an immediate focus on green finance specifically.

Recommendation 5: Physical and Transition Risk Indicators

Given the potential impacts of climate change hazards (such as floods, drought, and fires) and climate policy changes (e.g., carbon prices and energy costs among others) on populations, national wealth, and firms' profitability and stability, it is important to monitor them. Nonlinearity in the climate change trends necessitate identification and development of forward-looking indicators to support policy development and analysis. Climate scenarios developed (e.g., by the NGFS) would be used to quantify risks. The baseline for an assessment of the future impacts of hazards and policy changes would also provide information on current exposures.

Recommendation 6: Government Climate-Impacting Subsidies

Collecting data in this area will provide policymakers with summary information on the extent government subsidy

regimes are conducive to tackling climate change. The G20 economies will be encouraged to report the total annual value of both climate-sustaining and climate-damaging government subsidies in percent of the Gross Domestic Product (GDP) and in percent of total government expenditure.

Recommendation 7: Mitigation and Adaptation Current and Capital Expenditures

The recommendation is driven by the need to measure the policies used by G20 economies to fight against climate change as well as to build climate resilience through climate adaptation measures. At the EU level, the key policy driver is the "European Green Deal" and its policy target to make Europe climate neutral by 2050 as well as the EU Strategy on Climate Adaptation. In addition, data on non-financial/real-economy investments will complement information on effectiveness of sustainable finance initiatives and related commitments undertaken by the financial institutions around the globe. The recommendation would also link with efforts to track current and capital expenditure on climate change adaptation and mitigation in national budgets and to make available (harmonized granular) information on green government expenditure and green investments.

- **Sectoral indicators:**

- *The Global Methane Pledge*²⁵ and its data-related challenges, which mainly relate to emission levels and abatement potentials.²⁶ The figures underlying the pledge are often based on sparse, and sometimes conflicting data, which leads to a wide divergence in estimated emissions at all levels. Despite the development of regular emissions inventories (that are submitted under the United Nations Framework Convention for Climate Change), the reporting content and frequency requirement mainly depends on the status of each country that is a party (to the United Nations Framework Convention on Climate Change)

in respect of the Convention and Kyoto Protocol, and on their independent approach to measurement, estimation and disclosure. For some, collection techniques and standard emission factors are outdated and, for instance, few reflect methane leakage. Moreover, the "bottom-up" approach in measuring estimates leads to greater uncertainty in terms of the information available (especially in certain carbon-intensive sectors, such as the oil and gas industry, where measurement is based on equipment-specific emission sources derived from facility-level assessments), in addition to differences in the default emissions intensity factors chosen.

25 *Global Methane Pledge*, homepage.

26 For further information, see *Improving methane data – Methane Tracker 2020*, International Energy Agency, Paris, 2020.

- *The Beyond Gas and Coal Alliance*²⁷ and the *Global Coal to Clean Power Alliance*²⁸ have emphasised key data-related challenges in the fossil fuel industry, in addition to the abovementioned methane-related data issues. These challenges derive from the technical complexity of the fossil fuel industry across the value chain (upstream, midstream, downstream), and the process-driven nature of the industry that leads to unstructured data.²⁹ These challenges are also a factor in the renewable energy sector, for instance in terms of forecasting and scheduling, weather predictability, and resource management.
- work towards science-based guidelines that cover all GHG emissions scopes set under the net-zero methodology across all alliances (the so-called “Race to Zero Starting Line” criteria). The Alliance specifies, with regard to Scope 3 emissions (indirect supply chain emissions) that the aim is to encompass commitments by businesses and investors where the emissions “are material to total emissions and where data availability allows them to be reliably measured”³², as well as “all territorial emissions for cities and regions”³³.

In addition, financial institutions have started to implement climate-related data commitments, with three notable initiatives from a data perspective:

- The **October 2021 report on metrics and targets**³⁰ issued by the Task Force on Climate-related Financial Disclosures (TCFD) focuses specifically on cross-industry metric categories, drawing up a series of characteristics for ensuring effective climate-related metrics are clear and understandable, reliable, verifiable, objective and consistent overtime (based on current period data, historical data, and forward-looking data). Data availability is a primary concern throughout the report.
- **The Glasgow Financial Alliance for Net-Zero (GFANZ):**
 - the setting up of the Net Zero Financial Service Providers Alliance³¹ to consider the role of services providers in the assessment of risk and the provision of data and information to influence investment decisions; and
- **The One Planet Data Hub Initiative (OPDH)**, created under the umbrella of the One Planet Summit, aims to present information on commitments and actions by financial institutions on one single open-access platform, to “serve as a global observatory giving legibility to the monitoring of Paris-aligned financial flows.”³⁴

Data availability has also been a focus of certain policy/regulatory initiatives since the Progress report:

- The G20’s October 2021 Sustainable Finance Roadmap³⁵ has adopted a specific focus on data, especially as regards Focus Area 2 (Consistent, comparable, and decision-useful information on sustainability risks, opportunities and impacts), with Actions 6 to 8³⁶, but also Action 17 (with a focus on the digital applications in sustainability reporting, such as the use of structured data, identification and labelling of products and assets, as well as transactions of sustainable assets).
- The dedicated data availability policy of the ESAP regulation³⁷ (see Box 2) in the EU.

27 *Beyond Oil & Gas Alliance*, homepage.

28 “*Global Coal to Clean Power Transition Statement*”, – UN Climate Change Conference (COP26) at the SEC, Glasgow, 2021.

29 Mohammadpoor M. and al. (2020), “*Big Data analytics in oil and gas industry: An emerging trend*”, *Petroleum*, Volume 6, Issue 4, pp. 321-328.

30 See *Guidance on Metrics, Targets, and Transition Plans*, Task Force on Climate-related Financial Disclosures, October 2021.

31 Access at *Committed to Net Zero – Net Zero Financial Service Providers Alliance* (netzeroserviceproviders.com)

32 See *Committed to Net Zero*, Net Zero Financial Service Providers Alliance, homepage.

33 See *The Glasgow Financial Alliance for Net Zero: Our progress and plan towards a net-zero global economy*, Glasgow Financial Alliance for Net Zero, November 2021.

34 To be noted, in relation with the GFANZ and OPDH initiatives, *announcement* of a Climate Data Steering Committee to advise how to capture and create open, centralized climate data to accelerate the transition towards a resilient, net zero global economy.

35 See *G20 Sustainable Finance Roadmap*, 7 October 2021.

36 Action 6: to develop a set of internationally consistent, comparable, and reliable baseline standards for disclosure of sustainability-related information on enterprise value creation; Action 7: to further advance sustainability data strategies and frameworks to improve data quality and accessibility for the financial system; Action 8: to encourage improved data quality, usefulness, and methodological transparency from ESG rating agencies and other sustainability data providers.

37 *Proposal for a Regulation establishing a European single access point providing centralized access to publicly available information of relevance to financial services, capital markets and sustainability*, COM/2021/723 final, 25 November 2021

Box 2

The European Single Access Point

In November 2021, the European Commission adopted a package of measures to ensure that investors have better access to company and trading data, as part of the Capital Markets Union project. The package includes four legislative proposals, including a European Single Access Point Regulation aimed at providing a single point of access to public information about EU companies and EU investment products (for “data-driven finance”). The ESAP is a much-needed initiative given that the data currently published are not always easily accessible, nor easy to find, which increases the cost of access. The access point should increase the visibility of entities such as SMEs and unlisted entities that need to attract financing, and should create new investment opportunities for investors. The ESG data will derive from EU legislative requirements and voluntary filings.

From a market perspective, the ESAP is seen as a tool for centralising the public disclosures required under EU legislation or to be filed voluntarily, including by entities not falling within the scope of EU Regulations, and for submitting information that is not currently required to be reported on a voluntary basis. For sustainable finance purposes, within the context of the July 2021 Renewed Sustainable Finance Strategy, the ESAP will contribute by making information about the sustainability of European entities’ activities easily available and usable. This will also make it possible for public authorities, private stakeholders, and civil society to assess more effectively the sustainability

of European entities and, more generally, progress towards the EU’s policy objectives for sustainable development, including the EU’s climate strategy and targets (Recitals 1, 2 and 13 of the proposed ESAP Regulation). The ESAP is scheduled to become operational by 2024, with a phase-in approach. The intention is that an initially limited number of key EU legislative provisions would be in scope (e.g., a Transparency Directive, Accounting Directive, Prospectus Directive, Corporate Sustainability Reporting Directive and disclosure requirements under the Sustainability-Related Disclosure Regulation and Taxonomy Regulation), and a “look through” approach would be adopted for legislation in scope to determine whether key data points stemming from existing or forthcoming regulations should be integrated, a user-friendly format and digital tagging would be used, and raw data and data sources would be included.

It will be publicly funded, be governed by the European Securities and Markets Authority (ESMA), and ultimately be free for end-users. Small and medium-sized companies will be able to post information voluntarily on the ESAP. While the EU had already made substantial strides forward in digital reporting with the introduction of the Inline extensible business reporting language (XBRL)-based European Single Electronic Format (ESEF), the ESAP is likely to extend the application of the ESEF to non-financial information, based on the sustainability standards being developed by the EFRAG.

Data availability challenges are compounded by data reliability issues. Recent developments on ratings (see Box 3 on the perspective of credit rating agencies) and data providers have contributed to bring to the fore the need to tackle availability and reliability in parallel.

- The FSB’s July 2021 report on *The availability of data with which to monitor and assess Climate-related risks to financial stability*³⁸, and recent work by the FSB Standing Committee on Assessment of Vulnerabilities (SCAV)

(the 2022 report by the Working Group on Climate Risks (WGCR), the setting up of the Climate Data and Vulnerabilities Working Group in 2022) have emphasised the importance of the data reliability issue from a financial stability perspective. For instance, the FSB notes that “differences in the construction of ESG ratings across providers prevent them [providers] from supplying consistent and comparable information on transition risks across firms and jurisdictions”³⁹ (page 23 of the above-mentioned FSB 2021 report).

38 Ibid.

39 *The Availability of Data with Which to Monitor and Assess Climate-Related Risks to Financial Stability*, Financial Stability Board, Basel, 2021, p. 23.

- Data reliability is one of the main advances highlighted in the EU's July 2021 revised sustainable finance strategy⁴⁰ and the United Kingdom's October 2021 Sustainable Finance Roadmap.⁴¹ In the former, the strategy points to the potential integration of "sustainable-finance-related data in the data spaces under the European Data Strategy"⁴² and the need to encourage innovative solutions using digital technologies to support SMEs and retail investors. In addition to initiatives in relation to EU regulatory disclosures and standardisation, it also aims to improve the reliability and comparability of ESG ratings and assess certain aspects of ESG research (as illustrated by ESMA's call for evidence on the market characteristics for the ESG Rating Providers in the EU published early in 2022⁴³ and the European Commission's public consultation on the functioning of the ESG ratings market⁴⁴). In the latter UK document, the increasing reliance on providers of ESG-related services, including ratings, data, and verification, is considered from a transparency and integrity perspective and, based on the roadmap, justifies the potential integration of these providers into the scope of authorisation and regulation by the Financial Conduct Authority, details of which will be provided by the end of 2022. In addition, the Japanese Financial Services Agency (JFSA) plans to develop a code of conduct for ESG ratings and data providers on issues such as the transparency and evaluation of methodologies, as well as governance; this is with the aim of ensuring the independence and objectivity of evaluations in the light of the roles to be played by companies and investors in fostering climate goals. The final output of the JFSA expert panel on ESG evaluation and data providers is expected to be published in summer 2022.
- In relation to this matter, IOSCO published a report in November 2021 providing a series of recommendations on Ratings and Data Products Providers⁴⁵ covering the oversight of ESG ratings and data products providers, support for voluntary, industry-led development of standardised definitions for the terminology used and referred to by these providers, the introduction of mitigation measures for potential conflicts of interest, greater transparency of the use of industry averages, estimations or other methodologies used when actual data are not available or are not publicly disclosed, and the evaluation of methodologies.

Box 3

Perspective of credit rating agencies¹

In the first phase of its work on climate-related data gaps, the NGFS had drawn up a survey aimed at gathering high-level input on the work of relevant stakeholders on data issues (with a focus on identifying data items and their availability).²

In the second stage of the work, the NGFS surveyed three credit rating agencies (Moody's, S&P Global Ratings and Fitch Ratings) to collect their insights into the challenges in terms of the quality, consistency and reliability of climate-related data, and to benefit from their perspective on the *Progress Report* building blocks. .../...

1 For more information, see also: *Capturing risk differentials from climate-related risks – A Progress Report: Lessons learned from the existing analyses and practices of financial institutions, credit rating agencies and supervisors*, NGFS, May 2022.

2 *Progress report on bridging data gaps*, NGFS, May 2021.

40 See *Strategy for financing the transition to a sustainable economy*, European Commission website 6 July 2021.

41 See *Greening Finance: A Roadmap to Sustainable Investing*, Her Majesty's Government, London, October 2021.

42 *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Strategy for Financing the Transition to a Sustainable Economy*, COM(2021) 390 final.

43 *Call for evidence on market characteristics for ESG rating providers in the EU*, European Securities and Markets Authority, Paris, 3 February 2022.

44 *Targeted consultation on the functioning of the ESG ratings market in the European Union and on the consideration of ESG factors in credit ratings*, European Commission website.

45 "Environmental, Social and Governance (ESG) Ratings and Data Products Providers: Final report", FR09/21, International Organization of Securities Commissions, November 2021.

The credit rating agencies (CRAs) surveyed reported limited climate-related data coverage and granularity (especially at firm and asset levels), and indicated that backwards-looking data often require significant gap-filling and/or sector averaging. In their experience, an issuer's climate risk profile is driven by that issuer's specific fundamentals, business model and product portfolio – features not captured by available data. To mitigate these issues, the CRAs indicated that better asset-level data coverage would help. They also reported that the biggest gaps are in forward-looking data, which are essential for consistency of accounting treatments and scenario assumptions.

In addition to data limitations, the CRAs surveyed mentioned challenges related to climate data consistency and comparability. In this regard, they emphasised the need for standardised international disclosures practices. Insufficient disclosures were reported as the main limiting factor in effectively evaluating climate and environmental credit risks and – where there is disclosure – inconsistent disclosure across peers. Indeed, insufficient adoption of still-voluntary recommendations and inconsistencies in disclosure could limit their ability to perform peer analysis, a key element in their credit rating analysis. In

their view, the availability of comprehensive, comparable, and consistent disclosures of climate-related risks and opportunities would result in more consistent, comparable and transparent assessments. They have also highlighted the need for companies to draw stronger connections between financial and non-financial reporting and to provide a more coherent, forward-looking, and comprehensive corporate narrative. Finally, the CRAs indicated that harmonisation of taxonomies and definitions would also be beneficial to this end.

Issues related to the verifiability and auditability of climate-related data were said to be generally resolved through a rigorous back-testing process (through the use of external data), but this process required time to carefully verify data and overlay qualitative judgement in the CRAs' assessment of the usefulness of such data.

Finally, technology was seen as a way of lowering the cost/burden of sustainability reporting and improving the quality of data overall. Technology was said to help ongoing monitoring and traceability, which could play a role alongside disclosure. The CRAs also indicated that they deploy technology to facilitate how they use data, identify key data points and interpret them.

2.1.2. Recent policy developments related to further standardisation and convergence of disclosure requirements and sustainable finance classifications and taxonomies

In the *Progress report*, the first two building blocks identified to catalyse progress towards better data were (i) a rapid convergence towards a common and consistent set of global disclosure standards (see the Box 4: What is the rationale for regulatory disclosures?), and (ii) efforts towards a minimally accepted global taxonomy (and sustainable finance classifications). Since publication of the report, policy and regulatory developments targeting further standardisation and expansion of disclosure requirements and sustainable finance classifications and taxonomies have focused on three areas:

Standardisation of ESG information

- The IFRS *Prototype for Climate-related Disclosures Requirements* (November 2021) was published ahead of announcement of the *formation of the ISSB* (November 2021), leading to the *Exposure Draft on Climate-related Disclosures* (March 2022);
- EFRAG’s work has accelerated in the EU, in parallel with the negotiation of the CSRD¹, leading to the publication of a series of *Sustainability Reporting Standards* on climate and other ESG topics;
- The TNFD has launched its *beta framework* for reporting on nature-related risks (March 2022).

Corporate and investor disclosures

- Most disclosure-related regulations relate to the corporate front: advances in the EU (CSRD); consultation for a *corporate disclosure rule in Switzerland* in the summer of 2022; *New Zealand’s October 2021 rule*; Japan’s June 2021 *revision of the Corporate Governance Code*; China’s *revised climate disclosure rule* of February 2022; the U.S. SEC’ March 2022 *climate disclosure rule*; and Securities and Exchange Board of India (SEBI) May 2021 circular on business responsibility and sustainability reporting by listed entities; Chile is currently planning a *similar rule*, and so is *Singapore*. Some disclosure regulations apply to both financial institutions and listed entities (*i.e.*, EU, Singapore, and New Zealand).
- Investor disclosures would appear to be the next frontier: noteworthy are the developments in the EU (with the publication of a specific delegated act under the SFDR in April 2022),² clarifications for Taxonomy-related disclosures under the EU Taxonomy Regulation,³ but also in the United Kingdom with a consultation on fund disclosure requirements (until January 2022),⁴ in France (*implementing decree under Article 29 of the Energy-Climate Law*) and in Canada (*ongoing consultation* by the Ontario Securities Commission (OSC)). Starting in phases from August 2022, Hong Kong will require fund managers to make appropriate climate-related disclosures.⁵
- Challenges mainly revolve around (i) scope 3 GHG emissions for financial institutions and data availability, (ii) the distinction in legal documentation between financial products and labelling, to avoid greenwashing.
- Disclosures are also deploying on the prudential front, essentially in the EU (Pillar 3 and European Banking Authority (EBA) disclosures published in January 2022⁶) and the U.S (the New York Department of Financial Services (NY DFS) rule,⁷ the U.S Office of the Comptroller of the Currency (OCC)⁸ and Federal Deposit Insurance Corporation (FDIC)⁹ consultation projects). Also worth mentioning is the Brazilian Central Bank’s September 2021 resolution for financial institutions to report on their ESG policy as well as on a series of indicators for risk management.¹⁰

Design of sustainable finance classifications and taxonomies

- Deployment of the EU Taxonomy and related developments (other environmental objectives, proposal for a social taxonomy as well as for an extended taxonomy, including further transition-related aspects) in 2021 and 2022;
- Publication of the Malaysian *Climate Change and Principles based Taxonomy* (April 2021) and of the project for the *ASEAN Taxonomy for Sustainable Finance* (November 2021);
- Publication of the finalized *South African Green Finance Taxonomy* (April 2022);
- Other projects are currently under consultation in: Colombia, Singapore, Canada and Thailand.¹¹

1 On June 21st, 2022, the EU Council and European Parliament reached a provisional political agreement on CSRD. Draft EU standards (sector agnostic) have been published and are open for public consultation until August 2022 – they have been designed by an expert group part of the EFRAG new Sustainability Reporting Pillar, who is continuing the work with technical proposals for sector-specific standards.

2 Commission Delegated Regulation of 6.4.2022 supplementing Regulation (EU) 2019/2088 of the European Parliament and of the Council with regard to regulatory technical standards specifying the details of the content and presentation of the information in relation to the principle of ‘do no significant harm’, specifying the content, methodologies and presentation of information in relation to sustainability indicators and adverse sustainability impacts, and the content and presentation of the information in relation to the promotion of environmental or social characteristics and sustainable investment objectives in precontractual documents, on websites and in periodic reports.

3 See *ESAs issue updated supervisory statement on the application of the sustainable finance disclosure regulation*, European Securities and Markets Association, March 2022.

4 “Sustainability Disclosure Requirements (SDR) and investment labels”, Discussion Paper DP21/4, UK Financial Conduct Authority November 2021.

5 See *Consultation Conclusions on the Management and Disclosure of Climate-related Risks by Fund Managers*, Securities and Futures Commission, August 2021.

6 *EBA publishes binding standards on Pillar 3 disclosures on ESG risks*, European Banking Authority, Paris, 24 January 2022.

7 *Guidance for New York Domestic Insurers on Managing the Financial Risks from Climate Change*, New York Department of Financial Services, New York, 15 November 2021.

8 *OCC Seeks Feedback on Principles for Climate-Related Financial Risk Management for Large Banks*, Office of the Comptroller of the Currency, 16 December 2021.

9 *Statement of Principles for Climate-Related Financial Risk Management for Large Financial Institutions*, Notice of proposed policy statement; request for comments, Federal Deposit Insurance Corporation, March 2022.

10 For further information, see *Brazil: The Central Bank of Brazil publishes new ESG regulations for the National Financial System*, Lexology, 27 September 2021.

11 Refer for further reference to: International Platform on Sustainable Finance, Common Ground Taxonomy, Instruction report, November 2021 (pp. 35-43).

Box 4

What is the rationale for regulatory disclosures?

While increased climate disclosures may heighten demand for data or third-party services (including assistance with the reporting of emissions data), resulting in a potential short-term increase in the prices of those services (especially when those disclosures are mandatory), they are also expected, in the longer term, to spur competition, innovation, and other economies of scale that could, over time, lower the costs associated with such services and data and improve their availability. Broad convergence of disclosure-related best practices based on the aggregate accumulation of institutional knowledge could also further reduce the costs of mandatory disclosures¹ (refer to the cost-benefit analysis conclusions in the SEC's climate disclosure rule proposal of March 2022).

A series of impediments to fully voluntary disclosures for climate-related risks: considerable differences in coverage, specificity, and location; current context of full internalisation of costs and not of benefits (leading to a rational under-disclosure as compared to what would be optimal from an investor's perspective); agency (notably due to short-term profitability vs the long-term climate change horizon) and misrepresentation by management; uncertainty and complexity of climate-related risks and broader ESG topics.

Ensuring reliability, consistency, comparability, as well as the monitoring of management's decisions (including by shareholders). It is also consistent with the shifting of incentives for climate finance, and with the integration of ESG matters into corporate strategy.

¹ Refer for further reference to: International Platform on Sustainable Finance, Common Ground Taxonomy, Instruction report, November 2021 (pp. 35-43).

2.2 Recent policy developments and initiatives highlight challenges in achieving greater availability, comparability, and reliability in climate-related data

Common trends for sustainability disclosures and their contribution to greater data availability, comparability, and reliability have emerged as a result of recent initiatives on four different fronts: scope, content, location, and assurance.

On scope

- To address increased demand for sustainability-related information from capital market participants and policymakers, **regulatory efforts have primarily focused on large non-financial corporates, and more specifically on publicly listed companies – and to a lesser extent on financial institutions (at entity level).** When these developments lead to mandatory disclosures, they tend – in most situations – to adopt a size-based

scope approach (large and/or listed companies). Such an approach appears to be driven by expectations of impact and attempts to reduce reporting burden.

- **Other types of climate-related disclosures – especially those directed at financial supervisors – are still at an early stage.** Disclosures at financial entity level (e.g., by investment and asset management companies, credit institutions, etc.), although covered by the 2017 TCFD recommendations, or at the financial product level, have been developed in the EU (i.e., the SFDR, as amended by the Taxonomy Regulation), in China, and more recently in the U.S. (the SEC proposed rule on enhanced disclosures by investment companies about ESG investment practices⁴⁶). As for disclosures for prudential purposes – and hence available to regulators – only the EU has come forward in this area: the recently published EBA Implementing Technical Standard for Pillar 3 disclosures on ESG risks⁴⁷ contains ten detailed templates for credit institutions to report data related to transition risk, physical risk, green asset ratios and other factors.

⁴⁶ See "SEC Proposes to Enhance Disclosures by Certain Investment Advisers and Investment Companies About ESG Investment Practices", Press release 2022-92, US Securities and Exchange Commission, Washington, 25 May 2022.

⁴⁷ EBA publishes binding standards on Pillar 3 disclosures on ESG risks, European Banking Authority, 24 January 2022.

On content

- **Most regulatory measures have not been associated with the disclosure of specific key performance indicators, often relying on self or private-based standardisation frameworks.** This is why reporting standards, when they exist, not only provide guidance, but also help increase comparability, particularly when specific key performance indicators and calculation methods are explicitly defined. On this specific issue, under the auspices of the European Central Bank (ECB)'s Statistics Committees, indicators on green financial instruments, exposures of financial institutions to climate-related physical risks through their portfolios and the carbon footprint of portfolios of financial institutions are being developed.⁴⁸ Current worldwide trends in the development of taxonomies and classifications, as well as the push towards global disclosure standards (such as the creation of the IFRS ISSB) could also play an important role in fostering the development of comparable and consistent performance indicators. In addition, the link between taxonomies and disclosures is also becoming closer (for example in the EU and Malaysia), further underscoring the need for global convergence.
- **However, the use of different statistical classifications feeding into reporting and disclosures can complicate cross-comparability.** For instance, some statistical identifiers may be missing for preparers, depending on the level of reporting (at sectoral level, but also at plant or product level). This can result in substantial differences in availability and comparability between company-level data (parent company vs subsidiaries) and asset-level data (depending, for instance, on the location of the company and its physical assets), as well as sector-level data.⁴⁹
- **Evolving disclosure focuses are being considered in national, regional, and global frameworks, most notably: transition planning** (as taxonomies are progressively incorporating transition considerations

and the need to decarbonise the most carbon-intensive blocks of economies is becoming more and more pressing) and **forward-looking information** (on climate-related risks and opportunities); **governance-related aspects** (contemplated as a foundation for sound transition planning across the three E, S and G pillars), and **ecosystems and biodiversity** (with notable developments on the regulatory and policy front in the EU, Asia (e.g., China, Singapore, Korea, Bangladesh, Mongolia, Malaysia), as well as with the recent release of the TNFD beta framework⁵⁰).

- **The value-chain and time horizon characteristics⁵¹ of current disclosure requirements and initiatives are two major blind spots.** Fragmentation of data availability across the world and across asset classes and locations, coupled with underdevelopment in assurance requirements in most frameworks, weaken the reach of disclosures related to value chain information.
- **Governance-related data points, often of qualitative nature, are gaining traction in current frameworks and initiatives.** Filling the knowledge gap at corporate management and board levels has become increasingly urgent given the complexity of the energy and ecological transition, including in its social component, as it unfolds. The quality of governance-based key performance indicators is therefore one of the main differences in current approaches witnessed over the past year.

On location

- **Connectivity with financial information is becoming a more pressing objective,** as most regulatory initiatives are aimed at the publication of a dedicated section on ESG matters in management reports (and/or registration statements and/or financial statements), including the provision of a note to the consolidated financial statements. Electronic XBRL tagging of financial statements is required in some jurisdictions.

48 See *ECB presents action plan to include climate change considerations in its monetary policy strategy*, Press release, European Central Bank, Frankfurt am Main, 8 July 2021.

49 For further information, see Ameli, N., Kothari, S. and Grubb, M. (2021), "Misplaced expectations from climate disclosure initiatives", *Nature Climate Change*, Issue 11, pp. 917-924.

50 For more information, see *The TNFD Nature-Related Risk & Opportunity Management and Disclosure Framework Beta v0.1: Executive Summary*, Taskforce on Nature-related Financial Disclosures, March 2022.

51 For instance, most disclosure requirements do not consider medium-to-long term challenges (by limiting disclosures to a year time or, as far as transition plans are concerned, a few years at most), and overlook the time horizon characteristics of interdependencies between physical and transition risks (while the worst effects of climate change in the physical risk sphere are expected in the long term, transition risks are more likely to reach a peak earlier (based on various countries' net-zero commitments and their implementation), with important interdependencies evolving over relevant horizons).

- **Most disclosure requirements revolve around the application of the TCFD recommendations, focusing on climate-related measures from a financial and/or risk perspective.** The concept of dual materiality is gaining traction (for example, it is becoming a pillar of EU, UK, and New Zealand disclosure requirements), and is contemplated for a variety of ongoing disclosure projects. The concept of “dynamic materiality”⁵² is becoming more and more apparent, since it is seen as the global standard, for example in the ISSB (Memorandum of Understanding (MoU) with the Global Reporting Initiative (GRI)⁵³) and the TNFD beta framework.

On assurance

- **Assurance requirements are generally underdeveloped.** Such requirements are an emerging feature of disclosure policies and regulations, and are gradually beginning to be discussed in Japan, the United Kingdom, and New Zealand. Although the objective of the EU Taxonomy is to reach a similar level of assurance in sustainability reporting as in financial reporting, assurance requirements remain limited. Having corporates disclose Scope 3 GHG emissions and/or forward-looking information is seen as challenging, given that such disclosures are often partly or fully based on estimates. Providing assurance for that information would therefore be an additional challenge.

To summarise, **high-quality, comparable and consistent data are necessary to achieve convergence towards a common and consistent set of global disclosure standards and a minimally accepted global taxonomy/shared principles for sustainable finance classifications.**

Despite recent progress, a number of challenges remain, adding to the sense of urgency. These include:

- **Interoperability of classifications and reporting frameworks,** both within advanced economies as well as across advanced and emerging economies.
- **Rising concern about greenwashing risks** across the world, including in relations to transition and net-zero objectives – a concern that reinforces the need to improve the comparability and interoperability of approaches.
- **The need to take into account EMDE-specific issues** (i.e., transition-related concerns, position along GVCs, specificities in economic, industrial, and financial structures, the intertwined financing needs for mitigation and adaptation to climate change).⁵⁴
- **Scarce data availability for private companies and SMEs,** adding to the above-mentioned pitfalls.
- **Still limited disclosure of forward-looking information,** including but not limited to targets, transition plans, Capex/investment plans coherent with transition plans, and position along decarbonisation pathways.

52 According to Calace (2020), the concept of materiality is a continuum along which different issues, impacts, and information may fall and evolve. Therefore, dual materiality (as referred to, for instance, in the EU framework) is an extension of the key accounting concept of materiality of financial information that refers not only to the climate-related impacts on the company that can be material but also to the impacts of a company on the climate (or any other dimension of sustainability). The concept of “dynamic materiality” stems from the observation that issues material to environmental and social objectives may turn out to have financial consequences over time. This concept was first popularized in a paper entitled “Embracing the New Age of Materiality Harnessing the Pace of Change in ESG”, issued by the World Economic Forum in March 2020. Dual materiality and dynamic materiality are interrelated.

53 See *IFRS Foundation and GRI to align capital market and multi-stakeholder standards*, Global Reporting Initiative, Amsterdam, 24 March 2022.

54 For further reference, see Ameli, N. et al. (2021), “Higher cost of finance exacerbates a climate investment trap in developing economies”, *Nature Communications*, Issue 12, Article no 4046, 30 June.

3. The directory

The NGFS Workstream on bridging the data gaps was tasked with systematically mapping climate-related data gaps and proposing policy recommendations and solutions aimed at bridging such gaps. To this end, and alongside the three building blocks identified in the *Progress report*, the NGFS has built a directory.

The directory takes initial stock of available data based on the needs of financial-sector use cases. It provides users with insights into data sources that could be deployed to construct various metrics, and highlights specific climate-related data gaps. Once data gaps have been identified, the directory is used to propose policy recommendations to be acted on by policymakers and other stakeholders, for example in terms of disclosure standards and methodological guidance. As the availability of climate-related data improves over the time, the directory will prove not only to be a useful tool for financial-sector stakeholders to gain insight into the climate-related data universe, but it could also become an effective instrument for monitoring and responding to evolving climate-related data needs.

After a brief description of the directory (Chapter 3.1), the report discusses the main NGFS evidence-based conclusions on the main data gaps and key challenges for climate-related data (Chapter 3.2). Finally, Chapter 3.3 focuses on the key lessons learned from public consultation on the directory.

3.1. Description of the final directory

In its *Progress report*, the NGFS decided to adopt a user-centric approach to determine what the climate-related data needs – and subsequently the gaps – are, given that data gaps are cross-cutting issues that affect a large number of financial-sector stakeholders. To this end, the NGFS developed a classification of seven main stakeholder categories⁵⁵ and eight main use cases⁵⁶ that define the application of climate-related data for these key stakeholders. Based on this classification, the NGFS set up a directory of data needs and availability in which, building on the initiatives carried out by the Workstream in the first⁵⁷ and second phases of its work (see *infra*), detailed results for use cases, metrics⁵⁸ and raw data items were recorded.

The directory has a three-layered structure, in which use cases, metrics and raw data items are recorded and described in connection with each other. The linkages between the layers are set out in the alluvial diagram in Figure 4. From left to right, it shows the seven stakeholder categories, their use cases for climate-related data, the metrics required to support the use cases, and the types of raw data items that feed the metrics.

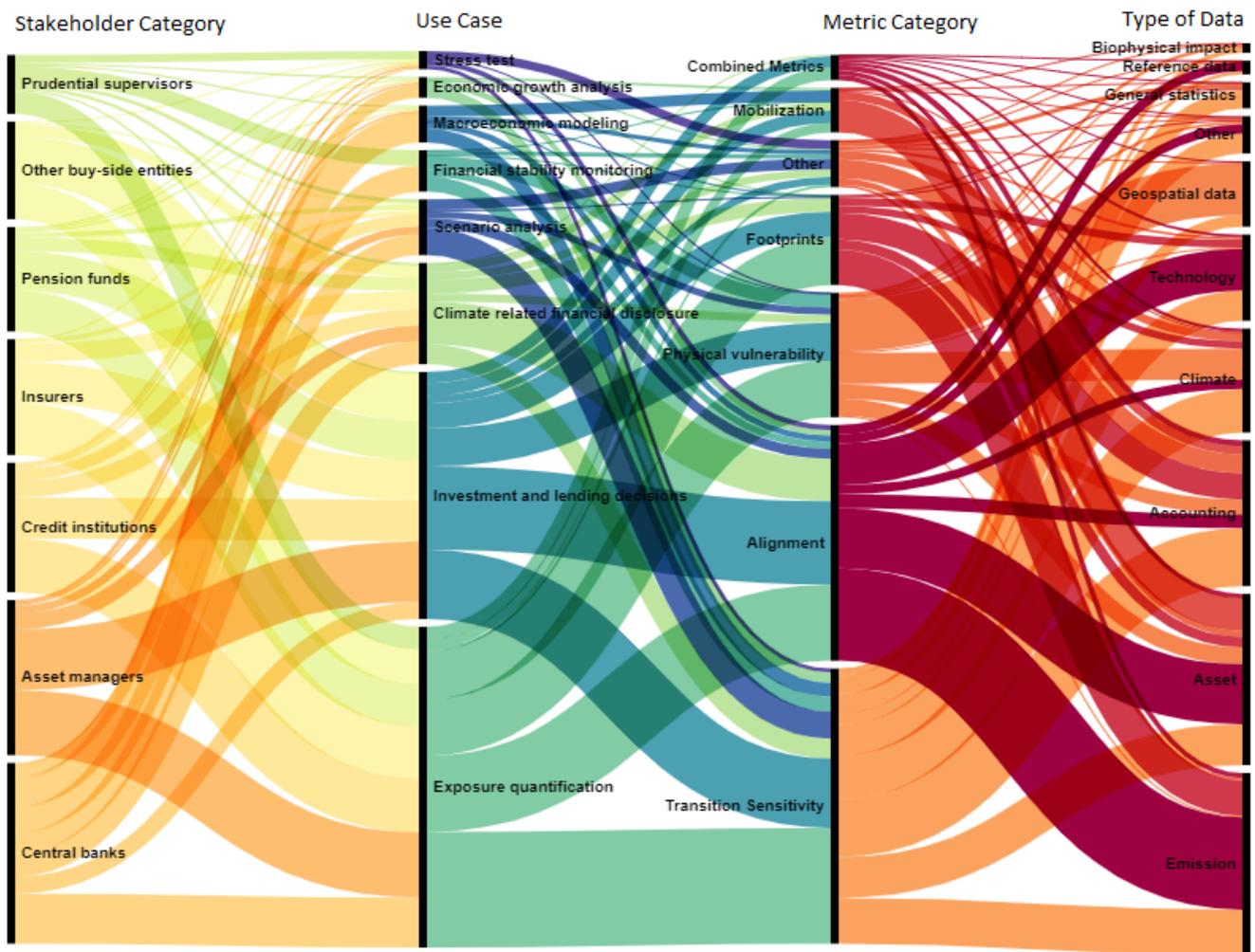
55 The *Progress report on bridging data gaps*, NGFS, May 2021, offers a first classification into six main stakeholders' categories, namely: Central banks, Prudential supervisors, Credit institutions, Insurers, Pension funds, Other buy-side entities. The final report adds Asset managers as a seventh category.

56 The *Progress report on bridging data gaps*, NGFS, May 2021, offers a first classification into six main use cases, namely: Exposure quantification, Investment and lending decisions, Macroeconomic modelling, Financial stability monitoring, Climate-related disclosures, Scenario analysis and stress testing. The final report adds Stress test (distinct from Scenario analysis) and Economic growth analysis (distinct from Macroeconomic modelling).

57 See *Progress report on bridging data gaps*, NGFS, May 2021.

58 The *Progress report on bridging data gaps*, NGFS, May 2021, introduced the classification into six categories of metrics, namely: footprint, transition sensitivity, physical vulnerability, alignment, mobilisation (i.e. scaling-up green finance) and combined metrics.

Figure 4 Interconnectedness of stakeholders, use cases, metrics and raw data items types in the directory



The directory is based on a user-centric approach. The eight use cases are: *exposure quantification*,⁵⁹ *investment and lending decisions*,⁶⁰ *macroeconomic modelling*, *economic growth analysis*, *financial stability monitoring*, *climate-related disclosures*, *scenario analysis* and *stress testing*.⁶¹

After identifying user needs and related use cases – for example, the exposure quantification of transition risk – the directory can be used to identify multiple metrics and methodologies suitable for the purpose. For instance, if the user is interested in analysing exposure to transition risk, there are multiple metrics to choose from in the directory, such as power usage effectiveness, GHG emissions, and carbon intensity. The metrics are divided into six main categories: *footprints*, *transition sensitivity*, *physical vulnerability*, *alignment*, *mobilisation* (i.e., scaling up green finance) and *combined metrics*.⁶²

Finally, the metrics chosen can be linked to the actual raw data items, to the extent possible supplied with a web link to a data source. For instance, the GHG emissions metric is linked to scope 1, 2 and 3 emissions data. Similarly, the power usage effectiveness metric is fed by the energy consumption data item, and the carbon intensity metric is fed by multiple data items, such as Scope 1, 2 and 3 emissions, and the invested amount is linked to a company or to a portfolio.

The directory offers a comprehensive picture of point-in-time climate-related data needs across the seven stakeholder categories and eight use cases (see Figure 5: The point-in-time directory), from which relevant results can be derived (see Box 5: Detailed directory results).

Figure 5 **The point-in-time directory**



59 Sub-categories of the use case: transition risk; physical risk; reputational/liability/operational risk; multiple risks; E(SG) performance; SDG performance; Taxonomy alignment; Paris Agreement alignment.

60 Sub-categories of the use case: transition risk; physical risk; reputational/liability/operational risk; multiple risks; E(SG) performance; SDG performance; Taxonomy alignment; Paris Agreement alignment.

61 Sub-categories of the use case: micro-prudential; macro-prudential; portfolio level.

62 A seventh category (other) contains metrics that fit multiple categories or do not fit into any of the six categories.

Box 5

Detailed directory results

Raw data items

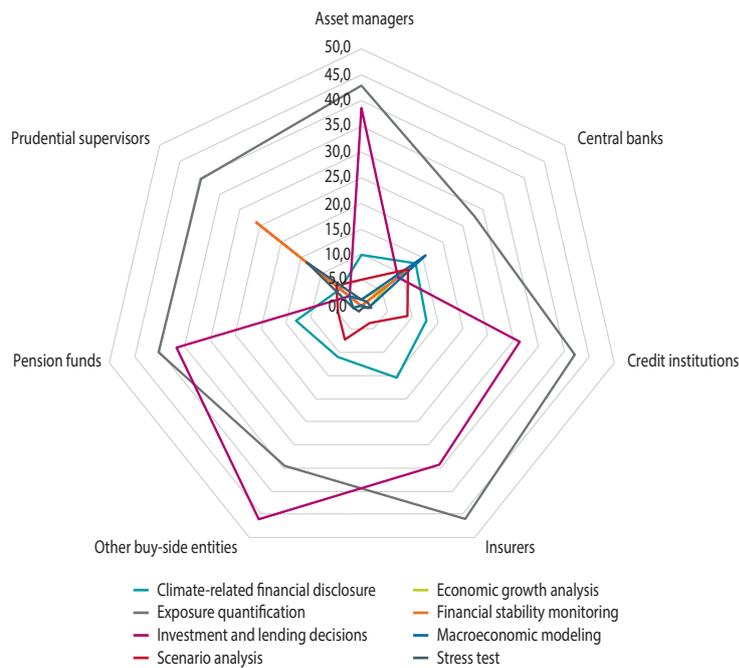
In total, the final directory (see the Annex: Directory extension and harmonisation) contains 329 unique metric/methodology combinations¹ and 1,262 raw data items, of which 62% are backward-looking and around 26% have an annual frequency. More than 40% of the combinations of asset classes and use case (i.e., more than 2,200 combinations) in the directory involve data items related to transition. Most of the data are aggregated at counterparty level (about 30%) and at country level (23%).

Main use cases

The main use cases for climate-related data in the directory are for “Exposure quantification” and “Investment and lending decisions” (Figure A). Use case subcategories also give interesting results. “Transition risk” use cases are typically associated more with asset managers, central banks and prudential supervisors, whereas physical risk metrics are associated more with credit institutions and insurers (Figure B). This points to the variety in climate-related data needs depending on the type of analyses undertaken.

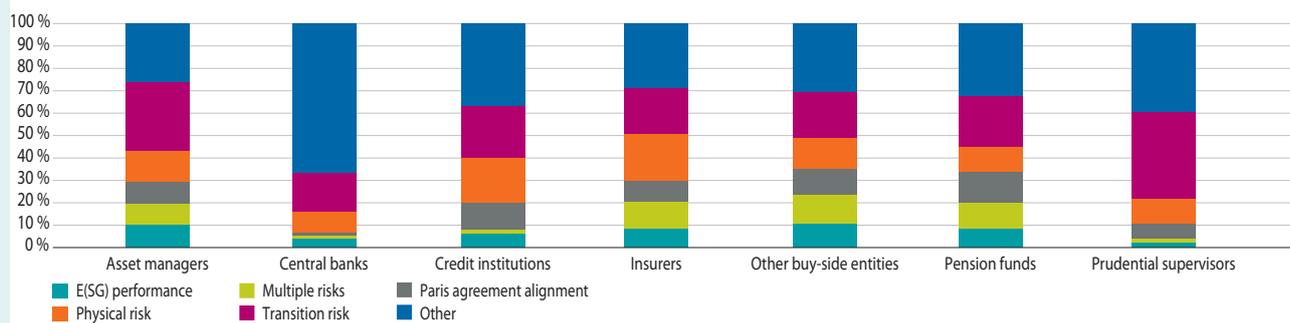
.../...

Figure A Use cases for each stakeholder, %



¹ The directory has an asset variable (e.g., equity, bonds, loans) that registers for which assets the metric is relevant on a row-by-row basis. Before this dimension was removed to obtain unique metric/methodology combinations, the directory contained 748 metric entries.

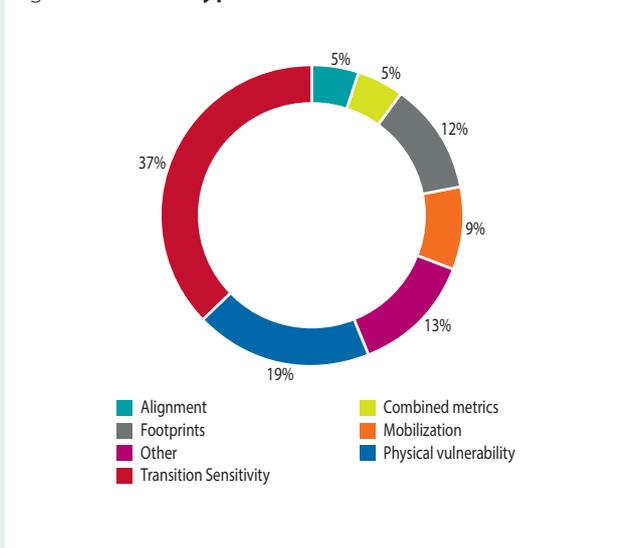
Figure B Use cases subcategories by stakeholder



Main metric types

About half of the metrics in the directory refer to “Transition sensitivity” (37%), showing both the importance of such data as well as its availability. This is followed by “Physical vulnerability” (19%), “Footprints” and “Mobilisation” metrics² (Figure C). These results then also point to time-horizon considerations for these metric types, as set out in the next section.

Figure C Metric types



Metric types and accessibility by time horizon

The importance of forward-looking data is stressed by the stakeholders³. While “Physical risk” metrics typically rely on forward-looking data, “Transition risk” metrics are still largely based on backward-looking data (Figure D). Physical risk data are often the product of forward-looking assessments (e.g., climate scenario analysis) given that physical risk-exposure data cannot be as easily exploited as transition risk exposure data (such as GHG emissions). The larger share of backward-looking assessments also presumably reflects the much broader scope of transition risk data-based assessments. As forward-looking transition risk data often refers to data collected on commitments to climate targets, increasing the collection of data on such commitments would increase the availability of forward-looking transition risk data. The share of proprietary data is higher for forward-looking data compared to backward-looking data (Figure E). This could be partly due to the fact that there are estimations involved in providing forward-looking data given that it cannot be readily observed. Physical risk data tends to be more public, while transition risk data tends to be more proprietary. For instance, the NGFS scenarios are an example of publicly available forward-looking indicators. .../...

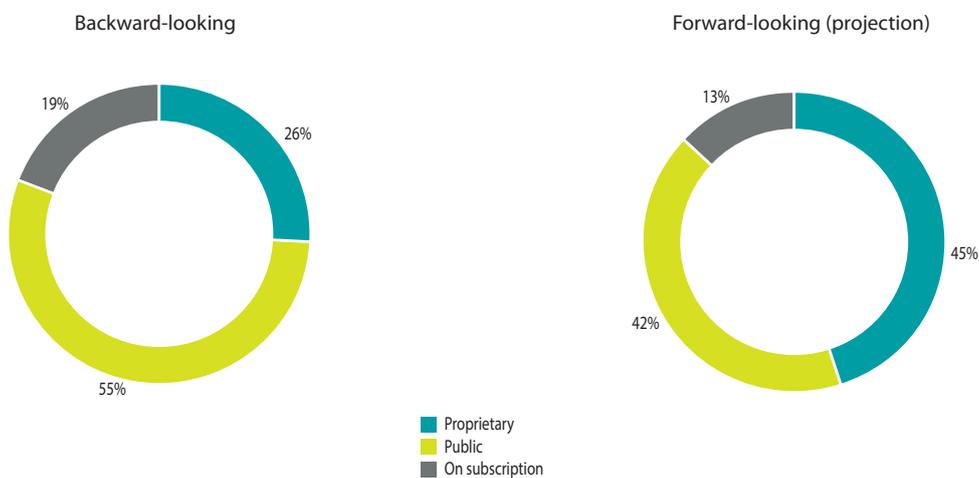
2 Footprint metrics refer to GHG emissions caused directly or enabled by an individual, event, organisation, service or product. Mobilisation metrics capture growth in green financing.

3 Progress report on bridging data gaps, NGFS, May 2021.

Figure D **Share of forward and backward-looking metrics for transition and physical risks**



Figure E **Share of data accessibility by time horizon**



Data availability by source data and jurisdiction

Figure F shows the share of proprietary data is higher for asset, accounting and geospatial data types than for public and on subscription forms of accessibility. General Statistics have the greatest share of publicly available data, these often relate to macroeconomic data. Once analysts move from these figures to a more granular data level, the share of information that is not publicly available increases.

The majority of available climate-related data, emission and technology data types are available globally, while for the other types the data are generally available in certain jurisdictions only (Figure G). The smallest share of data available globally is for General Statistics. This highlights the fact that progress could be made here to improve the global data availability of macro data (progress is under way, see Box 1 on the New Data Gaps Initiative).

.../...

Figure F Data availability by source

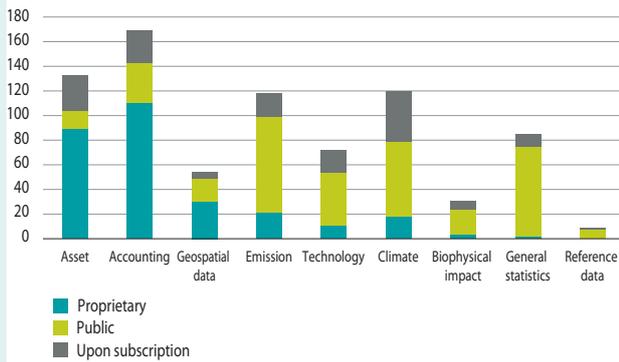
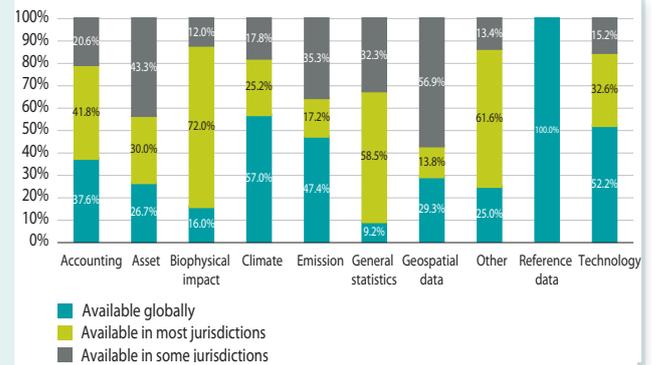


Figure G Data availability by jurisdiction



Data accessibility and quality

More than 29% of all data items identified in the directory are either not available currently, unknown or under construction, and more than 28% of data have accessibility issues. This once again sheds light on the unavailability of about one-third of the climate-related data that would be needed to conduct analyses based on the directory results, but progress is under way. In addition, improving the accessibility

of climate-related data would open up the possibility of using an additional quarter of data items listed in the directory. Less than a quarter of all data items are either official statistics or verified data, while about 39% of all data items are based on estimations. While this is a necessity for forward-looking data, transparency of methodologies differs across vendors and firms. This points to the variation in quality of the climate-related data available, making it difficult for users to establish trust in climate-related data.

3.2. Evidence-based conclusions on the main gaps and key challenges in climate-related data

The content of the final version of the directory can be used to draw evidence-based conclusions on the main climate-related data gaps (Chapter 3.2.1), and highlight key challenges to close such gaps (Chapter 3.2.2).

3.2.1 Evidence-based conclusions on the main gaps

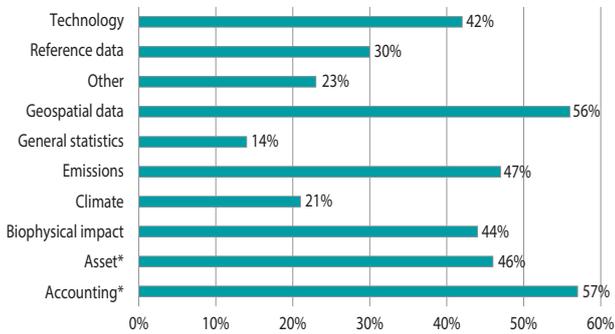
In linking the climate-related data needs to sources, the directory allows us to identify gaps: if raw data items cannot be linked to a source, they can be considered to be gaps in the directory.

In the final directory, there are 514 (out of a total of 1,262) raw data items lines for which no link to a data source could be referenced. This does not necessarily mean that

there are actual 514 gaps, but rather that information was not observable for these 514 raw data items at the time of writing this report. Similarly, the NGFS has observed that the data sources referenced in the directory could still suffer from gaps across the three following dimensions: availability, reliability and comparability. The aim of the directory is to be a living collection of available data sources to deliver on use cases in the financial sector. Hence, further extensions of the directory could demonstrate that some of these gaps could be closed with existing data sources, while it is likely that many others will need to be addressed by policymakers. However, given the breadth of data needs and sources, uncertainty remains and conclusions are of intermediate nature. Ongoing extensions and improvements to the directory are needed to refine and specify these insights over time.

The following statistics on the potential data gaps can be derived from the directory at the time of writing this report (see Figures 6, 7 and 8 below).

Figure 6 **Raw data items without a link to a source/provider by raw data item, % of links to data sources that are missing within raw data types**



Examples of raw data types: 'Accounting' (e.g., total sales, revenue, market capitalisation of a company), 'Asset' (e.g., asset-level, total amount of green debt, ISIN-codes/values), 'Climate' (e.g., CO₂ emissions and related), 'General statistics' (e.g., employment, GDP, trade), 'Geospatial data' (e.g., latitude/longitude of asset data), 'Reference data' (e.g., data relating to IEA Pathways / IPCC scenarios), 'Biophysical impact' (e.g., related to biodiversity, forest depletion, floods, droughts, storms, etc), 'Technology' (e.g., hydropower capacity, energy used by IT equipment').

*Accounting and asset data are typically confidential or access is restricted to central banks, supervisors, etc. It is therefore relatively logical that a link with data sources often cannot be made for these raw data items in the directory. Excluding those two reasons, data gaps are most often present within the biophysical impact, emissions and geospatial data types.

We find that for these three raw data types, the data gaps are mainly found to limit application in use case categories related to investment and lending decisions and exposure quantification (see Figure 7). A link with the other use cases is less often found for emissions, biophysical impact and geospatial data items (also see Figure 4: Interconnectedness of stakeholders, use cases, metrics and data types items).

Figure 7 **Use case categories for which data sources related to emissions, biophysical and geospatial data items are missing, relative weight (%) of use cases categories that are interconnected**



Regarding the metric types that feed these use cases, “Physical vulnerability” and “Transition sensitivity” are the leading metric types that benefit from emissions, biophysical impact and geospatial data items, and are

thus the most problematic when data gaps for these three raw data items exist (see Figure 8). For emissions, metrics related to alignment also show a relatively large data gap.

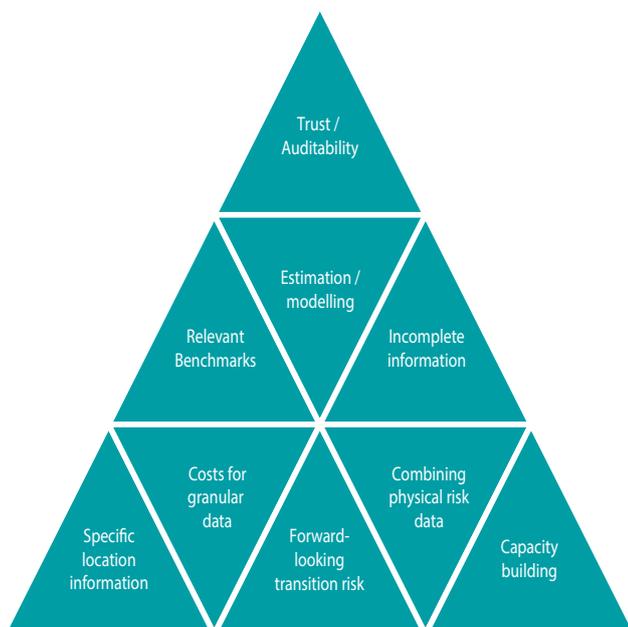
Figure 8 **Metric types for which data sources related to emissions, biophysical and geospatial data items are missing, relative weighting (%) of metric types that are interconnected**



3.2.2 Key challenges for climate-related data derived from the directory

Nine key challenges for climate-related data can be derived from the directory (see also Figure 9 below):

Figure 9 **Key challenges for climate-related data**



1. *Auditability of data is needed to provide high quality data*

Analysis of the directory points to a great deal of variance in the quality, availability, and comparability of raw data items. Reliable data are essential for ensuring trust in climate-related data and avoiding “greenwashing”. Reliability of firm-level data can be enhanced by establishing audit mechanisms.

2. *Climate-related data lack relevant benchmarks*

The information currently available in the directory on raw data items makes it difficult for a financial or non-financial entity to conduct a proper assessment of its climate-related exposures. More specifically, given the lack of relevant benchmarks, it would also limit these entities’ ability to compare against peers.

3. *Climate-related data often relies on estimations and modelling*

There is significant reliance on estimation and modelling methods, with around 50% of all emissions data being estimated/modelled or based on unknown data. With respect to emissions data available from private vendors, half are estimated/modelled data. As such estimation or modelling methods often require detailed or specific technical expertise and/or are the proprietary knowledge of private vendors, there is a need for stakeholders to build the capacity to understand the advantages and disadvantages of the methods of different providers.

4. *Information on climate-related data is at times incomplete*

Use cases can present deficiencies (i.e., blank entries for some or several characteristics) which also extend to the metrics and/or raw data items these use cases are based on. Cleaning and harmonisation efforts have reduced these issues (see the Annex: Directory extension and harmonisation), but deficiencies remain. The directory could benefit from further extension, harmonisation and cleaning efforts.

5. *Climate-related data lack specific location information*

The directory highlighted granularity issues. For example, geographical data at entity and asset levels lack specific location information. It would therefore be challenging for a financial or non-financial entity, for example, to properly assess its counterparties’ exposure to localised physical risks or to assess its concentration risk in a specific location.

6. *Granular data often comes at a cost*

Where granular data are available, it is often at a cost, which limits accessibility. In the directory, more than 65 organisations or private vendors provide different levels of emissions data, yet only seven of them are open sources. In terms of granularity, most (30%) of the data provided are at counterparty level, with only 3% at location level. As most corporates are facing difficulties in calculating Scope 3 emissions, such data are quite limited in the public domain, although there are some private vendors that provide counterparty or location level Scope 3 emissions

data at a cost. Data on emissions avoided are even more difficult to access, with only one data provider in the directory that, again, charges a fee.

7. *Forward-looking data are limited for transition risks*

Emissions-related raw data items are mostly used for metrics that measure transition sensitivity and alignment, supporting over one-fifth of the total metrics in the overall use case and stakeholder combinations, and accounting for more than 14% of the total raw data types collected in the directory. Of these, only around 3% are forward-looking. Alignment and transition plans are available through firms' own disclosures or reports, as are backward-looking operating-expense (OpEx) and capital-expenditure (CapEx) data. In the directory, forward-looking OpEx and CapEx data are available through five providers only, and the data are usually modelled instead of reported or audited.

8. *"Physical risk" metrics rely on a combination of forward-looking, biophysical and geospatial data*

Analysis of the directory shows that "Physical risk" metrics are generally based on forward-looking data, as expected. For instance, physical vulnerability metrics (e.g., physical value-at-risk; exposure to vulnerable firms, sectors, and sovereigns) are significantly more forward-looking than the relatively more backward-looking "Transition risk" metrics. Forward-looking metrics still remain a challenge given that raw data items on biophysical impact and geospatial information are often unavailable.

9. *Understanding science based metrics requires capacity building*

Among the raw data items supporting the various metrics in the directory, 13% are science-based data relating to biophysical impacts and climate. About 20% of the raw data items that support the metrics for measuring physical vulnerability and transition sensitivity are science based. Without specific domain knowledge, it would be challenging for financial institutions to use the data and interpret the results.

3.3. Lessons learned from the directory and how it could be used to address some of the climate-related data challenges

The NGFS first intended its directory to serve as a comprehensive assessment of the climate-related data needs and their availability to allow for the identification of climate-related gaps, from which evidence-based conclusions would be derived.

The NGFS has realised, however, that the directory could potentially serve further uses for financial-sector stakeholders (and beyond) and could address the *Progress report's* building blocks. The directory was released for public consultation between 26 April and 6 May 2022 (see Box 6: Consultation on the directory) in order to test these potential uses.

Consultation on the directory

The Web interface

The NGFS decided to seek feedback from financial market stakeholders through a public consultation on the potential uses of the directory:

- (i) to allow financial sector stakeholders to search and discover the data item sources needed for climate-related use cases and metrics; and,
- (ii) in the process, to identify data gaps in applying use cases and metrics, to eventually bridge them.

A custom-built Web interface was deemed necessary to achieve the objectives of the directory, given that each use case requires multiple metrics that can utilise overlapping data sets. Table – or spreadsheet – based commercial-off-the-shelf software was used to organise the directory records, but it would have been difficult to navigate for the purpose of identifying available information.

The first prototype of the directory focused on enabling users to find data items that were relevant to various use cases and metrics. It was built using React¹ within the Python-based Django Web development framework.

A design thinking process was undertaken by a group of Workstream Members to trace out how users could interact with the content in the directory.

Two possible user objectives were identified:

- (i) Users from the different stakeholder groups typically start searching the directory with a use case (e.g., scenario analysis or exposure quantification) in mind to understand the metrics and data items required (and that are available);
- (ii) Users also browse by broad categories of metrics to get a firm handle on how specific aspects of climate-related risks (e.g., physical vulnerability or carbon footprints) are tracked and assessed, alongside the data items that are associated with these metrics.

To provide for these user experiences, the directory was designed so that users could navigate the interface based on their initial use case(s) or types of metrics of interest:

- The “Browse by use cases” button allows users to discover data items (and providers, if available) associated with the use cases;
- The “Browse by metric types” button is allows users to explore the different underlying metrics/methodologies available for quantifying climate-related risks.

When users select a particular metric record, the interface displays the data items needed to build the metric (see Figure A), as well as other information, such as a simple description of the metric and the methodology provider, if available. Users can browse through the data items displayed and find out which metrics are constructed from those data (see Figure B).

.../...

¹ React is a free and open-source JavaScript library for building user interfaces.

Figure A An example of a metric record

Metric
Weighted Average Carbon Intensity

Methodology:	Urgentum Climate Transition Catalysts
Metric:	Footprints
Asset classes	Corporate bonds
Other asset class(es)	-
Aggregation level / Resolution:	Portfolio
Time horizon:	Backward-looking
Additional comments:	-

8 data items are used to construct this metric.

Data item: GHG Emissions
Description: Annual Emissions data per company
Data provider: Urgentum

Data item: GHG Emissions
Description: Annual Portfolio emissions data
Data provider: Urgentum

Data item: GHG Emissions
Description: Annual Country emissions data
Data provider: Urgentum

Figure B An example of a data item record

Data Item
Risk/Vulnerability indicator (Policy Risk)

Description:	Policy Risks and Opportunities Climate Value-at-Risk in USD
Data provider:	MSCI ESG
Type of data:	Other
Unit:	USD
Aggregation level / Resolution:	Counterparty
Data Quality:	Unknown
Time horizon:	Forward-looking (projection)
Availability:	Available globally
Accessibility:	Unknown
Frequency of update:	-
Timeliness:	-
Additional Comments:	-

20 metrics are constructed from this data item.

Metric: Distribution of Fis' portfolio of assets by country vulnerability class of risk
Metric classification: Other, Transition sensitivity, Combined Metrics, Physical vulnerability
Methodology: Policy Sensitivity of Fis' Exposure

Metric: Percentage of high transition risk ratings in portfolio
Metric classification: Other, Transition sensitivity, Combined Metrics, Physical vulnerability
Methodology: UK CFRF (incorporate long term view in risk appetite)

Metric: Climate Value at Risk

To accommodate visitors who desire a less guided data discovery process, the interface provides users with an additional option of a keyword search of the full contents of the directory.

.../...

The public consultation on the directory

The purpose of the public consultation, which was based on a questionnaire, was threefold:

- (i) to seek feedback on the format and functionalities of the current prototype Web interface;
- (ii) to obtain feedback on the contents of the directory in terms of identified climate-related data sources and gaps;
- (iii) to gather suggestions on the future of the directory.

The questionnaire consisted of three sections and 13 questions (many of them formulated as open-ended answers to allow respondents to provide their opinions and make multiple suggestions):

- the questions in the first section were aimed at collecting feedback on the user-friendliness of the Web interface, on the easy-of-use of the navigation tools available to users and on any possible problems occurring during navigation;
- the questions in the second section were focused on assessing metrics, methodologies and/or raw data items currently missing in the Web interface, and to identify relevant data gaps; and,
- the questions in the last section were intended to address the issue of maintenance of the directory in the long run, to collect suggestions on the types of institution (e.g., public, private or public-private partnerships) that might maintain the directory and on the update frequency and process.

In total, **26 respondents** answered the survey (of which **16 were data users** and **10 were data providers**). Many of them provided multiple suggestions. With respect to their profile, data users were mostly banks, with a few central banks and some industry or non-profit associations or think tanks. Data providers included commercial data providers, non-profit organisations, and government entities with expertise in climate-data production.

With respect to **the first section**, many survey respondents found the tool to be very intuitive and user friendly, appreciating the three-layered structure of the directory organised by use cases, metrics and raw data items/data sources available to build the metrics. Many suggestions were also provided on how to improve either the user

experience of the interface (nearly 60%) or the available navigation tools (more than 40%).

- Regarding the **suggestions to improve user experience** of the tool:
 - a large majority (more than 60%) of respondents pointed to the need to completing the tool with some in-flow user guidance (e.g., guidance and frequently asked questions (FAQs) on how to navigate in the tool or to introduce new metrics into the directory, a glossary of terms, pop ups explaining concepts or methodology for calculating metrics);
 - some feedback (about 20%) pointed to the need for the inclusion of links to data providers (to make the directory an active “point of access” to data sources) and to legal frameworks on reporting requirements;
 - another set of suggestions (about 15%) proposed the introduction of certain visualisation facilities (e.g., sorting options for search results, facilities for scrolling up pages or for selecting a number of items for pages).
- In terms of **suggestions to make the navigation easier and more fit-for-purposes**:
 - the majority of those replying asked for a broadening of the search possibilities (more than 50%) by adding further searches/browsing functionalities (e.g., by data item, data provider or full text search);
 - the remaining suggestions pointed to the need for more detailed searches for existing functionalities by adding information to better filter information (e.g., by broadening details to be able to filter use cases, metrics, risk types, data source types) and to improve the tool’s backward navigation.

With respect to the second section, **many respondents identified metrics and data gaps that were missing in the directory**.

- In terms of the **metrics that respondents deem to be missing from the current directory**:
 - half of the respondents noted the lack of metrics from both private providers (e.g., S&P Global Ratings²) and public/not-for-profit sources (such as the Carbon Disclosures Project (CDP), the Science-based Targets Initiative (SBTi) and IEA programmes), suggesting a need to add that data; .../...

2 It should be noted that data from Trucost was incorporated into the directory after the consultation.

- a quarter of respondents highlighted the need for ESG scores and environmental metrics, observing that the available measures were mostly concentrated on climate-related risk.³ They cited, in particular, environmental data on biodiversity, deforestation, company climate targets, and building energy efficiency.
- Many comments were focused on **the directory data gaps**:
 - about half of the comments outlined the need to integrate the environmental metrics. Given the breadth of the topic, the list of the metrics proposed is very heterogeneous, encompassing alignment metrics on temperature targets and existing environmental taxonomies (EU, China, Colombia, Russia, etc.), deforestation and energy performance certificates;
 - some feedback (about 20%) related to climate risk, in particular chronic and acute physical risk events, transition and physical risk measures for sovereigns and climate stress-test measures;
 - other suggestions (about 15%) were about facilitating issuers identification through identification codes, such as the Legal Entity Identifier (LEI), and fields to allow the breakdown of companies' activities (NACE (the EU Statistical Classification of Economic Activities), the Standard Industrial Classification (SIC), and the North American Industry Classification System (NAICS), given the complexity of assessing conglomerates;
- other responses suggested the integration of specific metrics from data providers, including, in particular, those able to assure global coverage; moreover, a need also emerged for metrics necessary to comply with prudential disclosures.

Regarding **maintenance of the directory in the long run**, the vast majority of respondents (16 out of 26) expressed a preference for a public institution to host the directory long term, while nine out of 26 opted for a public-private partnership. Several participants stressed that good governance was needed to ensure the long-term integrity of this directory as a public resource.

Regarding the **update frequency for the directory**, no strong preference emerged: about 30% of respondents opted for continuously updating, another 30% for a quarterly frequency, and about 25% for annual update. The remaining suggestions pointed to semi-annual and monthly updates.

Lastly, almost all of the survey participants **welcomed the possibility of allowing stakeholders to reference new data sources**. However, many respondents warned of the need to check the quality and reliability of the sources added by the users and of the need for proper data governance.

³ It should be noted that, given the breadth and magnitude of climate-related risks and the urgent need for action, the work of the NGFS Workstream on bridging the data gaps is narrowly focused on climate-related data issues.

The directory can therefore be thought of, and used, as a **catalogue of available climate-related metrics and data sources** based on specific stakeholder use cases. Indeed, once the user has identified a specific use case, the directory can be used to choose from the multiple metrics and methodologies suitable for the requisite purpose across the six metric types. Once a specific metric or methodology has been selected, the directory displays all the raw data items that are needed to construct it. The directory can then direct the user to raw data items for which the sources are known/available.

As such, and although it does not offer direct access to actual data, **the directory could help financial-sector stakeholders to identify important and relevant climate-related data sources to meet their needs, facilitate access to data, and thus improve the broader dissemination of existing climate-related data** (including by pointing to sources that have not been identified so far or are for confidential use). **Similarly, by linking the climate-related data needs to available sources, the directory can improve broader knowledge of missing climate-related data items**, by pointing to potential data gaps that have not been identified so far and creating incentives to bridge such gaps. **Such a directory of available climate-related metrics and data sources can offer a practical solution to bridge the gaps.**

Indeed, the potential role of the directory as a public good was highlighted by several respondents to the NGFS public consultation, who found the tool to be a “vital resource for coordinating data and tool development for climate-aligned finance”. Currently, the directory gives a point-in-time picture of the current climate-related data needs and gaps. It would therefore need to be enhanced to allow for long-term use (see Chapter 4.1).

Finally, the directory could also help to foster progress on the data availability challenges related to the *Progress Report’s* first and third building blocks – disclosures and metrics/methodologies. First, the directory could help to foster climate-related disclosures by pointing to the existing-climate-data sources needed for the application of the corresponding use case. In addition, in displaying 329 unique metric/methodology combinations, the directory could highlight trends in the use of metrics and methodologies, thus supporting the broader use of common metrics and methodologies.

3.4. The NGFS practical solution to help to bridge the gaps

The NGFS sees the directory as a public good, a living tool aimed at fostering better dissemination of climate-related data and offering a practical solution to bridge climate-related data gaps.

Taking onboard the feedbacks from the public consultation, the NGFS is currently working to develop a new website and to identify a possible long-term solution for housing and updating the directory. The update of the directory could be managed centrally or on a collaborative basis (users could reference new metrics, raw data items and sources, and provide expert feedback on both those already referenced and those that are newly added). With respect to the future hosting of the directory, the choice will be guided by the principles that the directory should be a public good and should be broadly and easily accessible by financial-sector stakeholders and the general public in both advanced and emerging market economies.

4. Addressing persisting gaps in data availability and consistency, while ensuring greater reliability and capacity building – Our policy recommendations

Despite steps taken by policymakers and financial-sector stakeholders, analysis of the directory showed that some challenges hinder the ultimate objective of bridging climate-related data gaps. Therefore, the need for further progress on the climate-related data front remains pressing. **Against this backdrop, this final report provides specific NGFS policy recommendations to**

improve the quality, availability, and comparability of climate-related data. These recommendations will also help foster progress on the three building blocks (see Figure 10). If these are implemented, the directory could play an important role in advancing this policy agenda, as highlighted below (see Figure 11).

Figure 10 Our policy recommendations to foster progress on the building blocks and address the data gaps

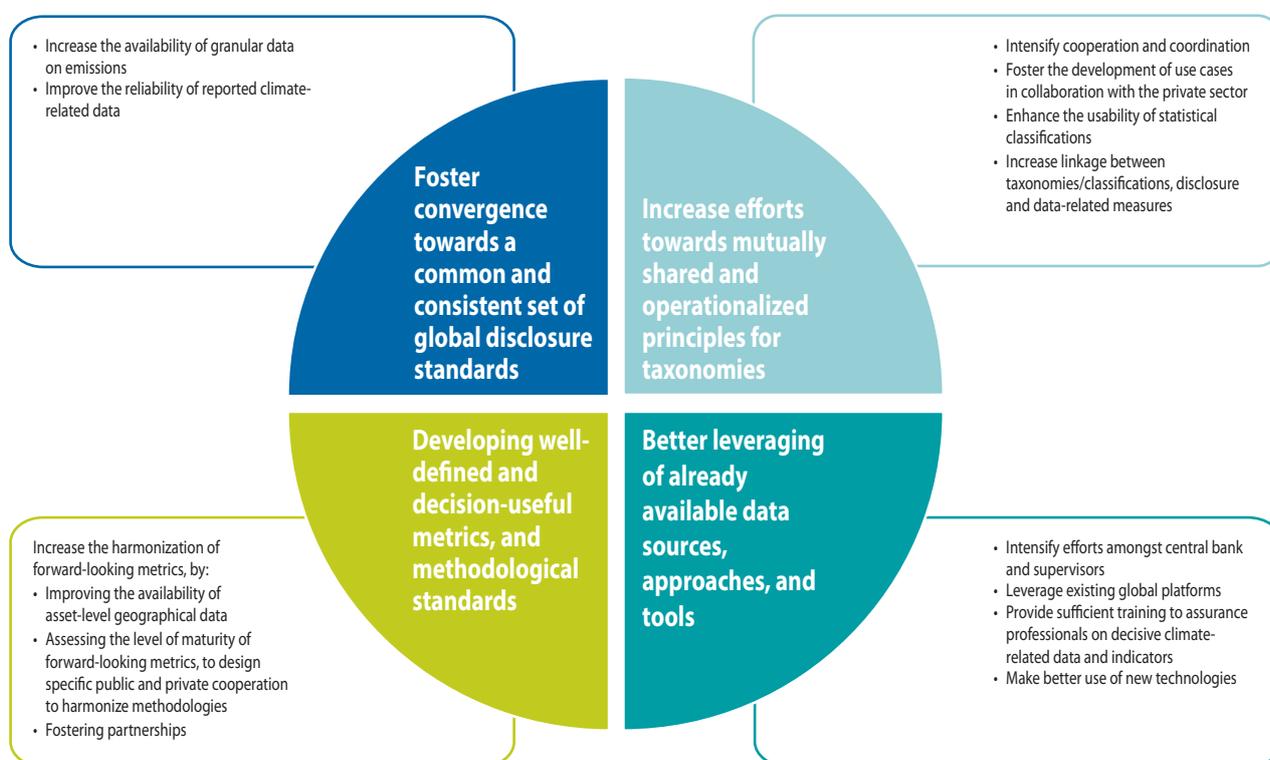
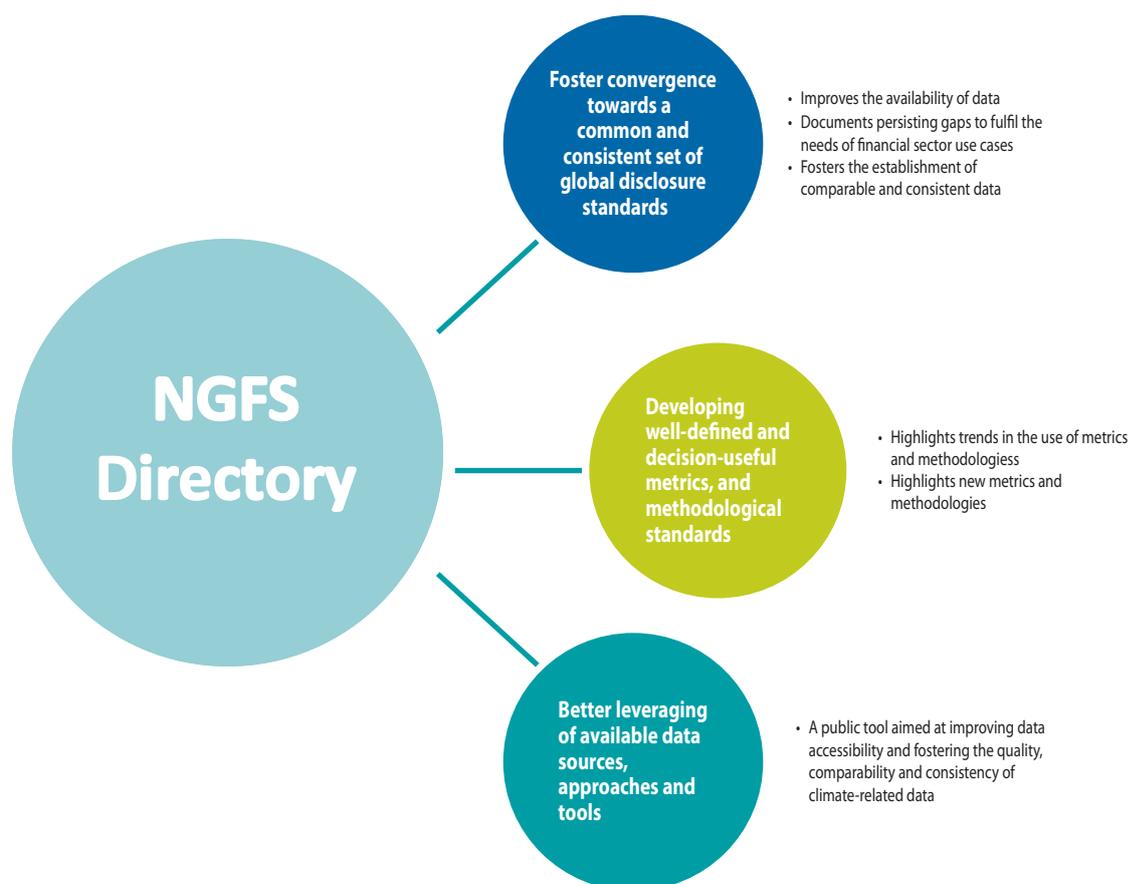


Figure 11 **How the directory could play a role in advancing the policy agenda and fostering progress on the building blocks**



Recommendation 1: Foster convergence towards a common and consistent set of global disclosure standards

To further advance this goal, in the light of the creation of the ISSB⁶³ by the IFRS, there is a need to substantially increase the availability of decision-useful, granular data on emissions and to improve the reliability of reported climate-related data, by:

- i. Intensifying the dialogue between standard setters, regulators and supervisors, the financial industry and non-financial entities, and other stakeholders (i.e., environment and energy agencies, academics, and climate scientists) to identify existing limitations in the quality of reporting.** Leveraging existing initiatives set out in Chapter 2 – namely the GFANZ One Planet Data Hub Initiative, the IMF Climate Indicators Dashboard, the DGI (see Box 1) – would, in all likelihood, maximise impact.
- ii. Fostering discussion at the global level, including through the ISSB, to develop more granular, sector-based methodologies for climate-related disclosures.** .../...

63 The ISSB published the *Exposure Draft for Climate-related Disclosures* in March 2022 (open for consultation through end of July 2022).

iii. Increasing reporting requirements for non-financial corporates.

- Increasing disclosures for large and listed corporates, as a primary policy focus, especially for those companies operating in the climate policy relevant sectors.⁶⁴
- Encouraging disclosure requirements across industries, notwithstanding company size, for Scope 1 (direct GHG emissions that occur from sources that are controlled or owned by an organisation) and Scope 2 (indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling) GHG emissions, as a prerequisite for meaningful and consistent disclosure of Scope 3 GHG emissions for large companies.
- Increasing the focus on disclosure by private companies due to the need to avoid blind spots and mitigate the risk of activity migration as a result of a regulatory focus on publicly listed entities.

iv. Building trust in reported climate-related data

- Setting up relevant assurance mechanisms for reported climate-related data, notably by encouraging the development of new specific assurance standards to address sustainability reporting (e.g., such as those of the International Auditing and Assurance Standards Board (IAASB)).
- Encouraging the adoption of a progressive approach, starting with limited assurance through sustainability reporting standards, to reach a reasonable assurance level in a second stage.
- Encouraging the development of certification labels in parallel with auditing standards and practices.

The directory could play a role in achieving/fostering this goal by:

- **Improving the availability of data:** helping financial-sector stakeholders to identify relevant climate-related data sources for the application of specific use cases (e.g., climate-related disclosures) and facilitating access to that data.
- **Documenting persisting gaps to be met to fulfil the needs of financial-sector use cases:** emphasising progress in bridging them and pointing to areas that policymakers and other stakeholders need to urgently address.
- **Fostering the establishment of comparable and consistent climate data:** paramount to support the implementation of the ISSB global standards.

Recommendation 2: Increase efforts towards mutually shared and operationalised principles for taxonomies and sustainable finance classifications⁶⁵

There is a need to harmonise taxonomies and sustainable finance classifications across the globe and foster interoperability. The availability of comparable and consistent data could help to achieve this objective. To further advance this goal, it is essential to:

- Intensify cooperation and coordination among existing taxonomies and sustainable finance alignment approaches,** building on the work of the IPSF, the ongoing IMF/World Bank/Organisation for Economic Co-operation and Development (OECD)/Bank for International Settlements (BIS) project on operationalising the G20 Sustainable Finance Working Group (SFWG) high-level principles for sustainable finance alignment approaches⁶⁶, and G20 SFWG Action 1 priority on a transition finance framework (for year 2022).
- Foster the development of use cases in collaboration with the private sector.** The application of sustainable finance alignment approaches *de facto* differs across jurisdictions and can lead to operational difficulties for financial-sector stakeholders. This is particularly challenging, especially in EMDEs where authorities face significant challenges in terms of data collection, comparability, and reliability. Information sharing and identification of use cases relevant to EMDEs could help to improve data availability and foster harmonization of taxonomies and sustainable finance classifications. .../...

⁶⁴ Battiston *et al.* (2017).

⁶⁵ For more details on taxonomies-related issues, please see: NGFS, *Enhancing market transparency in green and transition finance*, 2021.

⁶⁶ See further details in Adrian T. (2022) "Shaping The Frontier of Sustainable Finance in Emerging Markets", Speech to the 7th Global Meeting of the Sustainable Banking and Finance Network, 26 April. A guidance report will be published in the fall of 2022.

- iii. Enhance the usability of statistical classifications in the deployment of sustainable finance alignment approaches in order to improve data collection.** For instance, the design of correspondence tables may prove useful⁶⁷, and could be achieved by cross-referencing existing taxonomy structures for data processing (e.g., the XBRL taxonomy) with statistical classifications (such as the International Standard Industrial Classification of All Economic Activities (ISIC), the NACE, the Bloomberg Industry Classification System, the Thompson Reuters Business Classification system, etc.) used in most existing sustainable finance alignment approaches. This would be useful to provide analytical reasoning with regard to the relationships between existing statistical classifications. Moreover, such work would facilitate the coverage of sectors, activities and assets that are currently not fully encompassed by the existing statistical classifications – for instance infrastructure and real assets.
- iv. Increase linkage between sustainable finance alignment approaches (e.g., taxonomies and other classifications) and disclosure and/or data-related measures, to enhance data availability and pave the way for interoperable and more globally consistent classifications.** This could help foster the interoperability of sustainable finance classifications and thus implicitly support the development of globally consistent disclosure.

Recommendation 3: Develop well-defined and decision-useful metrics, and methodological standards

To further advance this goal, there is a need to substantially increase the harmonisation of forward-looking metrics⁶⁸, by:

- i. Collecting more granular data, notably by improving the availability of asset level geographical data:**
- Make better use of the geographical data available in the science community and make them fit for purpose for the financial world (Copernicus⁶⁹, the European Bank for Reconstruction and Development (EBRD)).
 - Further promote multidisciplinary collaboration and research on spatial finance and reinforce policy priorities on upskilling and capacity building within supervisors.
 - Build on and leverage existing private initiatives emphasising the crucial role of forward-looking data (e.g., the Future of Sustainable Data Alliance, OS Climate).
 - Ensure greater cooperation among public-sector entities at international level in order to improve access to environmental data sets and enhance the temporal and spatial resolution of environmentally relevant geospatial datasets (notably by building on ongoing improvements in technology – i.e., artificial intelligence (AI), machine learning, satellite data).
- ii. Assessing the quality of forward-looking metrics to increase reliability and fostering public-private cooperation to harmonise methodologies for designing forward-looking metrics.** Key areas of work include:
- Trends, i.e., exposure to carbon-intensive assets and business models, GHG reduction momentum (often based on historic GHG emissions, current expenditure, and planned investments – such as Capex or research and development expenditure).
 - Targets, i.e., short, medium, and long-term (real) emission-reduction targets (e.g., SBTi) which extends to probability assessments, the relationship with carbon emissions budgets, scenarios, geography and sector characteristics, and the implied temperature rise.
 - Climate risk exposure, i.e., physical and transition risk exposure, climate value-at-risk.⁷⁰ .../...

67 Eighty-three correspondence tables are tools for comparing statistical data collected and presented using different classifications. In the case of taxonomies, they are useful for mapping one nomenclature used to reference sectors and/or activities and /or assets to another.

68 Commitments to science-based targets or other climate-related goals, targets, results of scenario and sensitivity analysis, projections, and transition plans.

69 For more information, see *Europe's eyes on Earth: Looking at our planet and its environment for the benefit of Europe's citizens*, Copernicus homepage.

70 Dietz, S. et al. (2016), "Climate Value at Risk' of Global Financial Assets". *Nature Climate Change*, Issue 6, 4 April, pp. 676–679; Jorion, P. (2002), "How Informative Are Value-at-Risk Disclosures?", *The Accounting Review*, Vol. 77, No 4, American Accounting Association, October, pp. 911-931.

iii. Fostering partnerships with non-financial institutions, in particular with those designing energy-climate scenarios at global and regional level (e.g., the IEA, IPCC, WRI, etc). Such partnerships are crucial to ground forward-looking metrics in science and to account more effectively for transition-related specifics across industrial sectors and assets. Accelerating research and development efforts for economic and financial models that enable the translation of energy-climate scenarios into risk and opportunity metrics at entity, portfolio, and security levels across different time horizons is key to deploying useful and reliable forward-looking metrics. Contemplating the design of transparent and open-to-scrutiny methods would be useful in order to fill the conceptual gap between financial-sector needs and climate science.⁷¹

The directory could play a role in achieving/fostering this goal by:

- **Highlighting trends in the use of metrics and methodologies**, thus supporting the broader use of common metrics and methodologies.
- **Highlighting new metrics and methodologies.**

Recommendation 4: Better leveraging of available data sources, approaches, and tools

Many existing data sources, approaches, and tools already have improved data availability. Knowledge sharing and capacity building are key to enhancing their use and development, by:

i. Intensifying efforts amongst central banks⁷² and supervisors to develop:

- Publicly available dashboards to make the best use of the macro data already available (e.g., the IMF Climate Change Dashboard).
- Publicly available repositories of data sources to facilitate the use of micro data where proprietary issues could be a concern (such as the NGFS directory described in this report).
- Other structures/tools to automatise data collection, centralise data in a single access point, facilitate access to data (e.g. data hubs, the BIS Innovation Network and BIS Innovation Hub (BISIH) – see Box 8 on the BISIH Eurosystem Centre Green Finance focus).

ii. Leveraging existing global initiatives and platforms, such as the NGFS, the IPSF and the ISSB to enhance capacity building and knowledge sharing in this area.

iii. Providing sufficient training to assurance professionals on decisive climate-related data and indicators, with the support of non-financial authorities (i.e., environment and energy agencies, the International Organization for Standardization (ISO), the CDP, etc.) and standard setters, for instance on forward-looking information based on scenario analysis and transition planning. Training contributes to building up the expertise required for assurers to validate datasets, assess their accuracy, and ensure that no material data has been omitted.

iv. Making a better and wider use of new technologies, such as artificial intelligence, machine learning, satellite data (e.g., geospatial and meteorological data are provided by public platforms such as the WRI's Global Forest Watch or the European Space Agency (ESA) Climate Data Dashboard) and open-source platforms (e.g., OS-Climate and the collaborative ESA-National Aeronautics and Space Administration (NASA) platform have also been recently created). Central banks and supervisors are also eager to further explore the use of innovation in the data field, as illustrated by the work on green finance carried out by the BIS Innovation Network and the BIS Innovation Hub⁷³). Expertise on the use of available data and tools must still be shared if we are to make the most of them.

As a public tool aimed at improving data accessibility and fostering quality, comparability and consistency of climate-related data, the NGFS directory itself is an important step towards achievement of this goal.

71 T. Fiedler et al. (2021), "Business risk and the emergence of climate analytics", *Nature Climate Change*, Issue 11, pp. 87-94.

72 See the Box 7 – Sustainable Finance Data and Central Banks – Key takeaways from the Irving Fisher Committee on Central Bank Statistics.

73 A working group within the BIS Innovation Network is conducting an initiative aimed at increasing their use in the financial sector.

Sustainable Finance Data and Central Banks – Key takeaways from the Irving Fisher Committee on Central Bank Statistics

In parallel with the growing importance of sustainable finance the availability of relevant data has become a primary concern for central banks. Central banks' efforts are directed towards identifying the main climate related data gaps and potential solutions to address those.

Flanking these ongoing efforts, the Irving Fisher Committee on Central Bank Statistics conducted a survey among its members in 2021 to identify data needs, availability and gaps from the perspective of the central banking community.¹ A key finding is that central banks' growing interest in sustainable finance data stems from pursuing their core mandates, i.e. micro- and macro-prudential supervision, asset and reserve management activities, and the conduct of monetary policy.

The findings of the survey point to three main recommendations for central banks:

- Intensify the identification of sustainable finance data needs to pursue their policy objectives;
- Cooperate with traditional and new stakeholders to close data gaps, especially at the micro level;
- Lead by example by improving the usage of the new data being collected.

To provide an international forum for central bankers and scholars to discuss the status quo of and the outlook for statistical sustainable finance frameworks in different jurisdictions, the Bank of France, the Deutsche Bundesbank and the Irving Fisher Committee on Central Bank Statistics co-organised an international conference on Statistics for Sustainable Finance² on 14-15 September 2021 in Paris. The event focussed on progress, challenges and recent innovations in sustainable finance statistics. During the conference, the following key findings were identified³:

- 1. Central banks have an important role in monitoring sustainable finance activities.** So far, their attention has focussed on establishing analysis frameworks, designing sustainability indicators and actual monitoring activities. In the latter context, the lack of harmonised standards and methodologies can give rise to greenwashing behaviour and result in misleading interpretations of emerging trends, while other data gaps and shortages should also be addressed.⁴
- 2. Central banks are key users of relevant sustainable finance data.** The event illustrated the broad use of sustainable finance data by central banks, with a strong focus on climate risk. Climate change and the green transition are affecting a wide range of central bank policies. To this end, central banks have created rich datasets: for example, some central banks maintain highly granular datasets at the individual loan and security levels, which can be matched with other relevant data. Commercial data providers are a useful complement for data collected by central banks and other public sector entities.
- 3. Addressing data needs requires prioritisation.** In the medium- to long term, there is a clear need for more comprehensive data, as well as higher quality and greater consistency. Facilitating international standards is a key starting point. Accordingly, there is a need for common definitions and taxonomies, articulated with clear policy goals and proper disclosure requirements.
- 4. Exploiting less conventional data sources could be an important complement to bridge data gaps.** Leveraging innovations, granular firm-level data can be mined from the web and such information can be used to proxy missing emission data, for example. Besides its contribution to establish data, new technology (such as AI/text mining) is a means to free up resources for novel analysis.

1 *Sustainable finance data for Central Banks: 2021 survey conducted by the Irving Fisher Committee on Central Bank Statistics*, IFC Report, No 14, Bank for International Settlements, 17 December 2021.

2 *International Conference on "Statistics for Sustainable Finance", 14-15 September 2021 (bis.org)*.

3 *"Statistics for Sustainable Finance"*, Irving Fisher Committee on Central Bank Statistics Bulletin, No 56, Bank for International Settlements, Basel, May 2022; *"International Conference on Statistics for Sustainable Finance"*, Banque de France, Paris, 14-15 September 2021.

4 See for example: *Misleading Footprints. Inflation and exchange rate effects in relative carbon disclosure metrics*, De Nederlandsche Bank, 2021.

Box 8

The BISIH Eurosystem Centre Green Finance focus¹

The G20, FSB and NGFS, among others, highlight the need to close existing climate data gaps and to render existing information usable. Publicly available company reports in textual form on sustainability-related disclosures remain a largely underused source of information. Disclosures are progressively being standardized for future reporting, but a gap remains for historical information as well as for non-mandatory data. Private data providers aspire to fill this gap, but are not transparent on how data is mined, incomplete with regards to variables provided, and less usable due to data sharing restrictions. This means that certain information will remain unstructured for an indefinite period, requiring web-based research of lengthy documents.

That is where the *BIS Innovation Hub* (BISIH) comes into play. Established in 2019, the BISIH's mission is to lead and coordinate central bank responses to digital innovation and foster international collaboration. The BISIH is a group of multidisciplinary centres located in the Nordics, the Eurosystem, Singapore, Hong Kong SAR, Canada, Switzerland, and the UK. The BISIH's work is directed towards practical solutions rather than conceptual research, building a portfolio of projects – typically as proofs of concept or prototypes – around six key themes of critical importance to the central banking community:

suptech and regtech; next-generation financial market infrastructures; central bank digital currencies; open finance; cyber security and finally, green finance.

Complementarity with other key themes and proximity to standard-setting bodies have led the BISIH to identify data and information availability and analysis as initial priorities for its green finance agenda. Against this background, one of the first projects of the Eurosystem Centre of the BISIH seeks to create a repository of textual corporate reports coupled with a full-text search engine to identify excerpts with specific sustainability-related disclosures based on the TCFD (Task Force on Climate-related Financial Disclosures) recommendations. Through machine learning and natural language processing, relevant data is envisaged to be scraped from corporate reports in a structured form. The project can provide valuable inputs to the setting up of climate-related data hubs while also filling existing data gaps.

A report summarising the findings of the project is envisaged addressing architectural considerations and to share insights learned, and where relevant, recommendations. Outreach to inform the project and explore how it might complement/contribute to on-going work/initiatives will be explored.

¹ Raphael Auer (BIS) is thanked for his generous contribution in the drafting of this box.

5. Looking forward

Climate-related data needs will continue to grow as both the public and private sector address the challenges posed by climate change. Despite recent progress, there is an urgent need for further action on the climate data front. This is why the NGFS work programme for 2022-2024 sets out plans for **the Workstream on bridging the data gaps to evolve into an internal data experts' network following publication of this final report.**

Acknowledgements

This report is a collaborative effort of the members of the “Bridging the Data Gaps” Workstream of the NGFS. This document was prepared under the auspices of the co-chairs of the Workstream, Patrick Amis (European Central Bank) and Fabio Natalucci (International Monetary Fund), with support from the NGFS Secretariat at the Banque de France (Léa Grisey, Marie Ney-Brochard and Nathalie Rouillé) and the Workstream’s team leads (Justin Dijk from De Nederlandsche Bank, Guan Schellekens from the European Central Bank and Elena Triebkorn from the Deutsche Bundesbank).

The co-chairs of the Workstream are grateful for the contributions provided by all Workstream members, and, in particular: Renita Au (Hong Kong Monetary Authority), Marco Basulto (Banco de México), Celso Brunetti (Federal Reserve Board), María Antonieta Campa Rojas (Banco de México), Shu Wen Chew (Monetary Authority of Singapore), Kim Creminger (National Bank of Belgium), Johnny Di Giampaolo (Banca d’Italia), Maurice Fehr (Deutsche Bundesbank), Charlotte Gardes (International Monetary Fund), Laura Graziani Palmieri (Banca d’Italia), Sanjeev Kumar Gupta (Reserve Bank of India), Ana Laura Gutierrez Elizalde (Banco de México), Diana Hancock (Federal Reserve Board), Nitin Jain (Reserve Bank of India), Anu Karhu (Bank of Finland), Lydia Kimumwe (Office of the Superintendent of Financial Institutions of Canada), Csilla Koenigswieser (Oesterreichische Nationalbank), Mahmut Kutlukaya (International Monetary Fund), Gurubala Kotta (Federal Reserve Board), Marco Laes (Central Bank of Brazil), Gor Lazyan (Central Bank of Armenia), Harry Lee (Monetary Authority of Singapore), Rogelio López Cámara (Banco de México), Julien Mazzacurati (European Securities and Markets Authority), Li Ming Ong (Bank Negara Malaysia), Christian Schmieder (Bank for International Settlements), Cristina Taberner (Central Bank of Brazil), Saori Takahashi (Japan Financial Services Agency), Maria Luisa Tejedor (Banco de España), Abdoulaye Traore (Office of the Superintendent of Financial Institutions of Canada), Brenda Van Tendeloo (National Bank of Belgium), Jan Welz (European Central Bank) and Warwick Yuen (Hong Kong Monetary Authority).

List of acronyms

ASEAN	Association of Southeast Asian Nations
BIS	Bank for International Settlements
CDP	Carbon Disclosure Project
COP26	26 th United Nations Climate Change conference held in Glasgow from 31 October to 13 November 2021
CRA s	Credit rating agencies
CRSD	Corporate Sustainability Reporting Directive
DGI	Data Gaps Initiative
EBA	European Banking Authority
EBRD	European Bank for Reconstruction and Development
ECB	European Central Bank
EFRAG	European Financial Reporting Advisory Group
EMDE s	Emerging markets and developing economies
ESAP	European Single Access Point
ESEF	European Single Electronic Format
ESG	Environmental, Social and Governance
ESMA	European Securities and Markets Authority
EU	European Union
FDIC	Federal Deposit Insurance Corporation
FSB	Financial Stability Board
GFANZ	The Glasgow Financial Alliance for Net-Zero
GHG	Greenhouse gas
GRI	Global Reporting Initiative
IAASB	International Auditing and Assurance Standards Board
IEA	International Energy Agency
IFRS	International Financial Reporting Standards
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPSF	International Platform on Sustainable Finance
ISIC	United Nations International Standard Industrial Classification of All Economic Activities
ISO	International Standards Organization
ISOCO	International Organization of Securities Commissions
ISSB	International Sustainability Standards Board
LIC s	Low-income countries
MoU	Memorandum of Understanding
NACE	Statistical Classification of Economic Activities in the European Community

NAICS	North American Industry Classification System
NGFS	Network for Greening the Financial System
NY DFS	New York State Department of Financial Services
OCC	Office of the Comptroller of the Currency
OECD	Organisation for Economic Co-operation and Development
OPDH	The One Planet Data Hub Initiative
OSC	Ontario Securities Commission
SBTi	Science Based Targets initiative
SCAV	Standing Committee on Assessment of Vulnerabilities
SEBI	Securities and Exchange Board of India
SEC	Securities and Exchange Commission
SFRD	Sustainable Finance Disclosure Regulation
SFWG	G20 Sustainable Finance Working Group
SIC	Standard Industrial Classification
SMEs	Small and medium-sized enterprises
TCFD	Task Force on Climate-related Financial Disclosures
TNFD	Taskforce on Nature-related Financial Disclosures
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change
US	United States of America
WRI	World Resources Institute
XBRL	eXtensible Business Reporting Language

List of boxes and figures

List of boxes

- Box 1** New Data Gaps Initiative – Climate Change
- Box 2** The European Single Access Point
- Box 3** Perspective of credit rating agencies
- Box 4** What is the rationale for regulatory disclosures?
- Box 5** Detailed directory results
- Box 6** Consultation on the directory
- Box 7** Sustainable Finance Data and Central Banks – key takeaways from the Irving Fisher Committee on Central Bank Statistics
- Box 8** The BISIH Eurosystem Centre Green Finance focus

List of figures

- Figure 1** Interconnectedness of stakeholders, use cases, metrics and raw data items types in the directory
- Figure 2** Key challenges in climate-related data
- Figure 3** Building blocks to bridge the data gaps
- Figure 4** Interconnectedness of stakeholders, use cases, metrics and raw data items types in the directory
- Figure 5** The point-in-time directory
- Figure 6** Raw data items without a link to a source/provider by raw data item, % of links to data sources that are missing within raw data types
- Figure 7** Use case categories for which data sources related to emissions, biophysical and geospatial data items are missing, relative weighting (%) of use cases categories that are interconnected
- Figure 8** Metric types for which data sources related to emissions, biophysical and geospatial data items are missing, relative weighting (%) of metric types that are interconnected
- Figure 9** Key challenges for climate-related data
- Figure 10** Our policy recommendations to foster progress on the building blocks and address the data gaps
- Figure 11** How the directory can play a role in advancing the policy agenda and fostering progress on the building blocks

Annex: Directory extension and harmonization

The second phase of the Workstream's work was first devoted to extension of the directory to encompass more comprehensive data needs, metrics types and underlying data sources available in order to support the different use cases and to identify the gaps.

To this end, the NGFS has engaged in technical outreach sessions with methodology providers. Twelve methodology providers¹ took part in this three-phase exercise: (i) the circulation of a survey, (ii) interviews of the methodology providers, and (iii) additional iterations to fill-in the directory based on the methodology providers' input. In the surveying process, the methodology providers were asked about the characteristics of the metrics they use, the existing gaps they have already identified, and their views on how to overcome these shortfalls. The interviews were aimed at clarifying the details of the use cases, metrics, and raw data items that the methodology providers reported in the surveys. Finally, and on the basis of the responses to the surveys and the documentation provided by the methodology providers, and with the help of the methodology providers themselves, the NGFS recorded in the directory information on the use cases, metrics and raw data items used by the methodology providers. As part of this exercise, nine contributions² were integrated to the directory. **As a result of this exercise, the directory now comprises 1,379 entries for all of the use cases (compared with 411 at the time of publication of the Progress Report), 748 entries for all the metrics³ (compared with 365 previously) and 1,262 raw data item entries (compared with the previous 604).**

From the moment the directory was set up, the need to cleanse and harmonise it was identified as a priority. Indeed, given that the directory had been filled in using a decentralised process, many duplications, as well as inconsistencies in the language of metrics and raw data items, were identified. Two types of actions were carried out in order to resolve this. In a first stage, an in-depth revision of the directory was conducted that was aimed at removing duplicates. In a second stage, consistent terminology and categories were developed and applied to all the metrics and data items to harmonise language and therefore to enhance analysis of the directory⁴.

1 2°ii/PACTA, Acclimatise, Carbone4, FourTwentySeven, ISS-Ethics, Morningstar (and Sustainalytics), MSCI, PCAF, Refinitiv, Trucost, Urgentem and Vivid Economics.

2 2°ii/PACTA, Acclimatise, Carbone4, MSCI, PCAF, Sustainalytics, Trucost (incorporated after the consultation process), Urgentem and Vivid Economics.

3 It should be noted that metric 'entries' do not represent individual metrics given that this is the result of counting individual rows of data (incl. for instance the same metrics for different asset classes). They are 329 unique metric/methodology combinations in the final directory.

4 It should, however, be noted that some repetitions may remain in the directory.



NGFS
Secretariat

