

Progress, challenges and recent innovations in sustainable finance statistics

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Executive summary

On 14–15 September 2021, the Bank of France, the Deutsche Bundesbank and the Irving Fisher Committee (IFC) on Central Bank Statistics co-organised an **international conference on Statistics for Sustainable Finance** in Paris. Sustainable finance has attracted an increasing amount of attention in recent years and, in turn, the availability of relevant data has become a primary concern for policymakers, especially central banks and financial supervisors. Sustainable finance refers to the process of taking environmental, social and governance (ESG) considerations into account when making financing decisions, with the aim of fostering long-term investment in sustainable economic activities.

The event focused on the progress achieved so far in developing sustainable finance statistics. It also reviewed the remaining challenges as well as the opportunities opened up by technology innovation. As an international forum for central bankers, other officials, private sector participants and scholars, the conference provided a venue to discuss the present state of, and the outlook for, statistical sustainable finance frameworks across different jurisdictions.

A specific focus was put on the financial risks that have been rising in parallel with the growing **threat of climate change**, highlighting the urgent need to make available relevant climate-related data on a timely basis. Central banks have been at the forefront of the efforts to identify the core climate-related information needs and develop alternative solutions to address them. The most important data gaps identified include the lack of granular firm/asset-level data to meaningfully measure the carbon footprint of economic and financial activities. In addition, there is a need to establish forward-looking data (eg emission pathways). In both cases, the data

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currently available lack reliability and comparability, which would be essential if physical and transition risks are to be properly measured and monitored.

The conference confirmed that, given their dual role as both compilers and users of official statistics, **central banks are particularly well placed to contribute to these issues**. Indeed, the event was complemented by an IFC survey on sustainable finance data for central banks published in December 2021 (IFC (2021c)), which put forward three main recommendations for central banks' work on sustainable finance statistics, namely: (i) to intensify the identification of data needs to pursue relevant policies; (ii) to cooperate with traditional and new stakeholders, including providers of alternative data sources, to close data gaps; and (iii) to lead by example to enhance the use of sustainable finance data for policy purposes, ideally by covering the large spectrum of central bank policy tasks

The following points were highlighted during the conference in order to close the existing sustainable finance data gaps:

First, central banks and financial supervisors have an important role to play in developing sustainable finance statistics. Their main focus has been on establishing analytical frameworks, designing sustainability indicators and actual monitoring. This has allowed existing data shortages to be identified, eg on the relationship between sustainability and market performance (with due consideration for the pricing of climate-related risks); on the measurement of sustainable investment activities (ie "green finance"); and on indicators to estimate carbon footprint. Relatedly, there is a lack of harmonised standards and methodologies, which can give rise to undesirable incentives (eg "greenwashing" behaviour) and lead to misleading interpretations of developments in financial markets. A specific goal is to establish a comprehensive statistical framework for capturing the external costs of greenhouse gas (GHG) emissions (ie "carbon pricing"), which is a precondition for ensuring that climate-related risks are incorporated by market participants and that capital is efficiently allocated to sustainable activities.

Second, central banks/supervisors have become key users of relevant sustainable finance data, with a strong appetite for climate risk-related information. One reason is that global warming and the green transition are affecting a wide range of their policies. In particular, there is a clear link between physical/transition risks and financial stability objectives, for both micro- and macroprudential policy purposes. Climate change, and sustainability issues more generally, are also relevant for central banks' reserve management tasks and for the conduct of monetary policy. Reflecting these various use cases, central banks have set up increasingly detailed data sets; for example, to collect granular information at individual loan and security levels to assess firms' carbon footprints, financial institutions' exposures to climate risk etc. In addition, central banks and other public sector entities are relying increasingly on commercial data providers, but combining the various data sets involved raises challenges in terms of coverage, reliability and the difficulty to match the datasets as such.

Third, addressing sustainable finance data gaps requires careful prioritisation. In the medium to long run, there is a clear need for more comprehensive data sets, with greater consistency and quality. The promotion of common international standards is the prerequisite for the efficient development of adequate statistical definitions and classifications (or "taxonomies"). Common standards would also ensure that the collected data are articulated with policy

objectives and subject to proper disclosure requirements – which is the key to guiding investors and pricing the related risks effectively.²

Fourth, more and better cooperation between stakeholders is required, especially with the private sector and academia, and between jurisdictions. Such cooperation is essential for taking stock of useful statistical initiatives (for instance, as regards ESG data catalogues and information repository hubs),³ promoting best practice (eg for leveraging new approaches, compiling data in the required formats, or presenting information in useful dashboards),⁴ and identifying novel climate-relevant indicators.

Lastly, exploiting less conventional data sources and tools might be an important way of bridging existing information gaps. Innovative text-mining techniques can, for instance, help to extract relevant information from firms' climate-related disclosures, with granular firm-level data scraped from the web and used to estimate missing GHG emission data. Similarly, artificial intelligence (AI) approaches can be used to better monitor and understand the development of sustainable finance. Needless to say, substantial investments, especially in terms of IT hardware, software and staff skills are required to support such initiatives.

1. Introduction

The hybrid IFC Conference on "Statistics for Sustainable Finance" on 14–15 September 2021 was attended by almost 800 participants, representing about 90 institutions from the public and private sectors. The aim was to discuss how to best **address current measurement issues in the ESG area and develop economic and financial statistics on sustainable finance, also based on the use of innovative approaches.** Users and producers of such statistics – with a prominent intermediary role played by central banks as both compilers and consumers of statistics – saw the event as an opportunity to discuss the data and analytical needs as well as the challenges faced. The focus was on the various initiatives already undertaken by IFC member central banks ([Schmieder and Triebskorn](#)). A question more for the medium term was how to develop a comprehensive framework for developing sustainable finance statistics to support policy needs.

The conference provided a useful opportunity to review the importance of ESG issues for the conduct of economic and financial public policies (Section 2). It also allowed for an in-depth assessment of the resulting sustainable finance information

² Important efforts in this context are the proposed new G20 DGI initiative, aimed at strengthening and harmonising economic and financial statistics in the area of climate change (FSB and IMF (2021)), and the FSB roadmap on climate-related financial risks (FSB (2021)), aimed at promoting firm-level disclosure, compiling relevant (ie consistent) data, and establishing and running vulnerability analyses.

³ The forthcoming data repository established by the Network for Greening the Financial System (NGFS) of central banks and financial supervisors is an example of a key initiative to identify relevant data sources (NGFS (2021)). The IFC has also conducted a stock taking exercise of the ESG metrics and the underlying indicators considered of particular relevance by central banks when pursuing their policy objectives (IFC (2021c)).

⁴ See IFC (2019) and, as an illustration, the [IMF Climate Change Indicators Dashboard](#) developed in support of addressing data needs for macroeconomic and financial policy analysis.

needs (Section 3) and of the way to address associated data gaps (Section 4), with a specific focus on the tracking of green finance (Section 5). Lastly, the event shed light on alternative types of indicator to be developed in the area of sustainable finance (Section 6) and on innovative approaches that could be followed here (Section 7).

2. Importance of ESG issues for economic and financial public policies

Strong policy attention

Reflecting growing public interest in sustainability issues, the integration of ESG considerations into economic and financial policies is a focal point of interest.

For instance, a recent survey by [Volz et al](#) among 26 Asia-Pacific central banks and supervisory authorities shows that they had recently been paying considerably more attention to sustainability challenges, as compared with 2019, with most of them gradually implementing measures to monitor and act under relevant circumstances. The finding that climate change and the green transition are affecting a wide range of central bank and supervisory policies is in line with other studies (eg IFC (2021c)).

Financial stability is one of the main areas in which central bankers and supervisors need to better take sustainability dimensions into account. To the extent that sustainability-related issues are associated with growing risks, it lies within central bank and supervisory mandates to monitor the resilience of market participants and financial institutions. For example, firms with higher carbon emissions tend to have higher credit risk, and disclosure of forward-looking targets to cut their emissions would improve their carbon balance and thereby lower their credit risk, as argued by [Vozian et al](#). Hence, it is important for central banks and supervisors to account for these dimensions in their prudential policy framework, from both a micro- and macro- perspective.

The relevance of ESG metrics for credit risk assessment is also important for **the conduct of other central bank operations**, especially as regards their reserve and asset management activities as well as the conduct of monetary policy. This reflects the growing need of central banks to take ESG factors in consideration when assessing the balance sheet implications related to collateral operations and/or asset purchase strategies.

In turn, **central bank actions can have a significant impact on the pricing of sustainable financial instruments**. One case study presented by [Macaire and Naef](#) on green bonds in China suggests that their prices appear supported by their eligibility as collateral for central bank operations. This would suggest that monetary policy can help lower capital costs for ESG financing.

Data collection progress

Reflecting the above, it should not be surprising that public authorities in general, and central banks and financial supervisors in particular, are striving **to build comprehensive, reliable, standardised and granular ESG data**. Specific attention is being paid to climate-related risks, in the form of transitional and physical risks that could substantially affect the solvency of financial institutions and hence financial

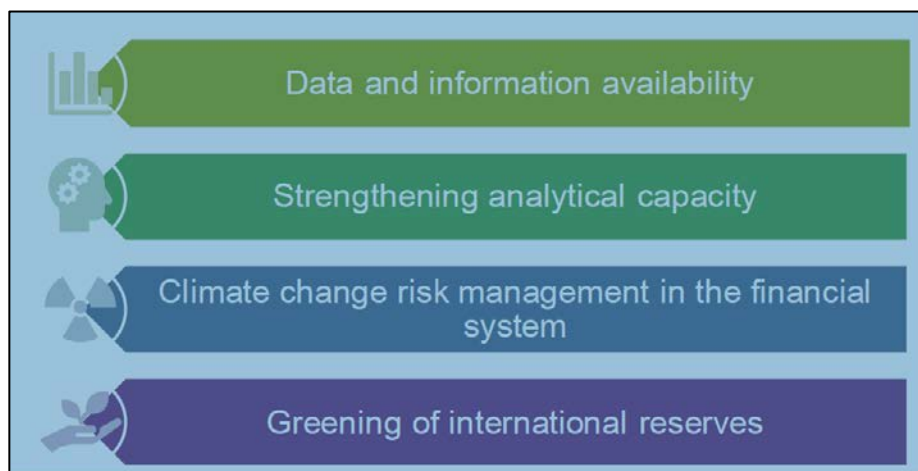
stability. The identification, measurement and monitoring of such risks is a key priority for national authorities and international financial institutions alike. If these stakeholders were to rely on misleading information, for example, they would miscalculate not only the impact of specific financial instruments designed to deal with climate change but also the risk profile of financial institutions.

A structured approach has proved helpful to ensure the integration of ESG-related factors in policy considerations. The strategic climate change roadmap of the Central Bank of Costa Rica, presented by [Alvarado-Quesada](#), provides one such example (Graph 1). A key message is that bringing cross-departmental experts together is beneficial as it fosters synergies for the pursuit of sustainable finance policies. Moreover, the improvement of data availability and the strengthening of in-house analytical capacities should go hand in hand. Another example is the ECB's monetary policy strategy review, in which climate change features prominently. Specifically, Lane (2022) highlights the importance of establishing relevant data (clarifying definitions and taxonomies while proactively dealing with data quality) as a basis for the measurement of macroeconomic and financial stability risks (Graph 2). Financial stability risks are captured based on the carbon footprint of activities and the risk exposure of financial institutions, including exposures in the balance sheets of central banks (such as the ECB).

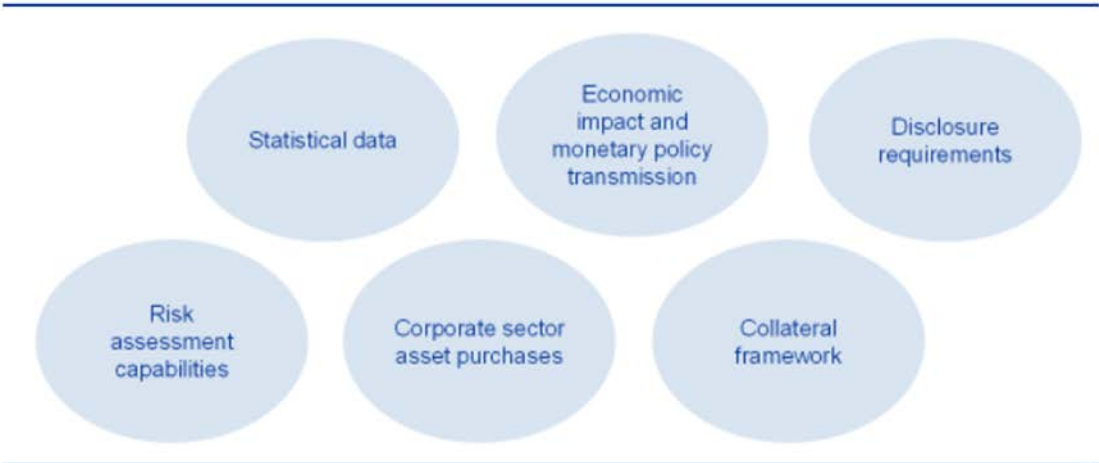
Moreover, there is value in the **development of rich data bases and robust IT infrastructure** to adequately conduct policies addressing ESG issues. Central banks have already launched several initiatives to support the compilation of granular information on financial institutions and develop sustainable metrics to support relevant analyses (Israël and Tissot (2021)). In the ESCB context, for example, investment data identified at the loan-by-loan (Ana credit) and security-by-security (Securities Holdings Statistics) levels using pertinent legal identifiers (from the Register of Institutions and Affiliates Database (RIAD)) were matched with firm-level data on carbon emissions by [Colangelo and Israël](#). Similarly, the Bank of Italy's central credit registry provides granular data on loans, which have been used by [Faiella and Lavecchia](#) to measure the carbon footprint of credit institutions and assess the exposure of the Italian financial system toward transition risks.

Climate change roadmap of the Central Bank of Costa Rica (BCCR)

Graph 1



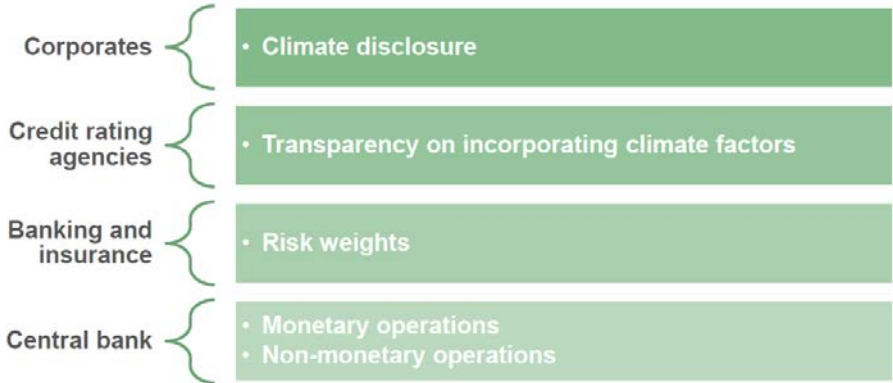
Source: | Alvarado-Quesada, "BCCR's experience in environmental accounting and advancements of the Climate Change Strategic Analysis Group", *IFC Bulletin*, no 56, May 2022.



Sources: ECB.

Source: Lane (2022).

Yet, a key challenge faced by this endeavour has been the lack of granular and comparable firm-level data, especially on carbon emissions. In practice, policy analyses have tended to rely on proxies derived from macro statistics such as air emission accounts. Authorities have also worked to ensure stronger firm-level disclosure requirements and the harmonisation of green data standards. Experience shows that another success factor has been the interaction between the various stakeholders involved in the provision of the related data, as illustrated in the case of initiatives to tackle transition risks (Graph 3). Central bank statisticians have been able to usefully support these coordination efforts, making use of their role as key intermediaries to promote a constant dialogue between producers and users of ESG-related data.



Source: S Carbone, M Giuzio, S Kapadia, J Krämer, K Nyholm and K Vozian, "The low-carbon transition, climate disclosure and firm credit risk", IFC Bulletin, no 56, May 2022.

from a wide range of disciplines (eg climate science specialists), which are usually not in the “standard” information universe of central bank statisticians.

Another point is to **ensure that the existing data provides useful information**. To this end, a structured approach can help to identify the relevant elements for sustainable finance; collect comprehensive information on the data considered (ie “metadata”), which could usefully be stored in dedicated data repositories/information hubs; assess the quality of these data⁵ and ensure sufficient conceptual consistency, not least to support harmonised international comparisons (being particularly important because of the global nature of sustainable development issues).

Options for making better use of existing data

Graph 5



Source: Authors' analysis.

Next, an important step is to carefully assess actual data needs, with due consideration for the heterogeneity of the various stakeholders involved in sustainable finance. For instance, a key objective for financial investors is to access detailed information on the climate footprint of companies to weigh the consequences of their investment decisions. Turning to public authorities, policymakers need micro and macro data sets of sufficient quality, for instance when setting carbon taxes or measuring and benchmarking carbon emissions.

Lastly, the comparison of the actual statistics available with users' information needs allows **data gaps to be identified as well as the ways to close them**. Here again, institutions such as central banks can play a key role in identifying these

⁵ The concept of “data quality” being considered in a broad sense, covering the various characteristics sought for official statistics (IFC (2021b)).

sustainable finance data gaps, not only by referring to their own experience as data producers but also, as data users, by providing direction on the new statistics to be developed. For instance, they have been at the forefront of the efforts to identify data needs to support forward-looking assessments of physical and transition risks or to track carbon pricing, especially by calling for the relevant data quality aspects and disclosure mechanisms to be developed.

Main statistical shortcomings

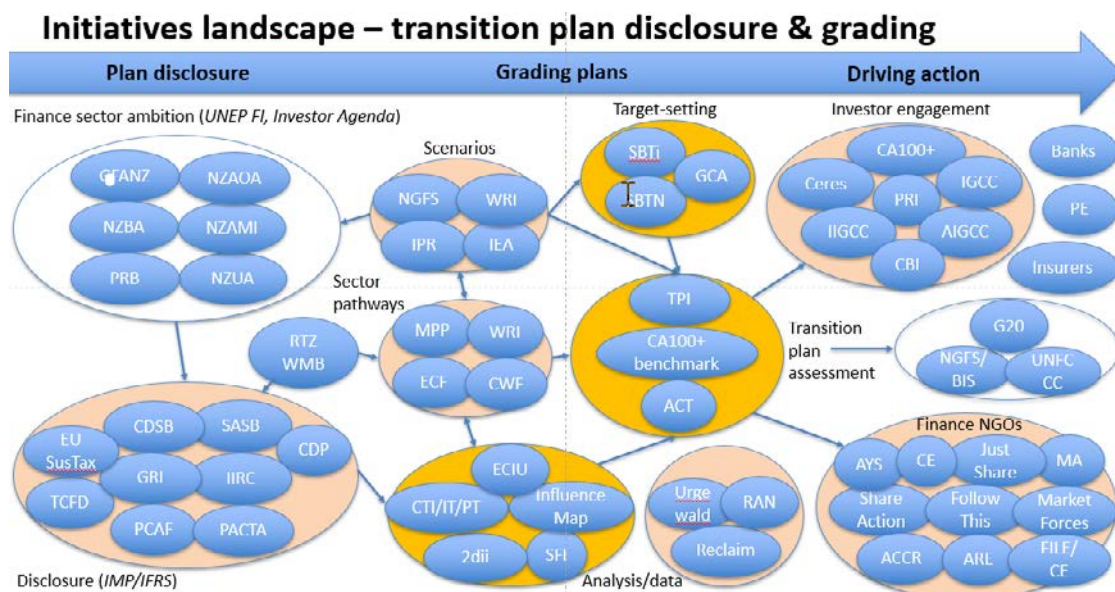
The approach described above has already helped to identify three main shortcomings of the current landscape for sustainable finance statistics:

First, the availability and reliability of granular firm-level data is incomplete (Grisey). Existing reporting standards are still fragmented, as illustrated by Hugman as regards the various initiatives related to transition plan disclosures and gradings (Graph 6). There is also a lack of adequate metadata information, which would be a key building block for starting the compilation of a comprehensive and consistent “cloud” of ESG data.

Second, more statistical methodological guidance is needed in the form of standardised definitions and taxonomies, as emphasised by the recently surveyed central banks from both advanced and emerging market economies (IFC (2021c)). Such guidance would help to overcome the challenges arising from both the complexity of the many data dimensions considered (eg from the past records of national disasters to the long-term horizon of climate change simulations) and the rapidly evolving debate surrounding ESG issues. It would also facilitate the various perspectives involved in tackling those challenges, eg to address the data needs supporting complementary top-down and bottom-up regulatory approaches, as noted by Gueddoudj.

Initiatives on transition plan disclosures and gradings

Graph 6



Source: M Hugman, “Private financial institution perspectives on climate and nature data”, *IFC Bulletin*, no 56, May 2022.

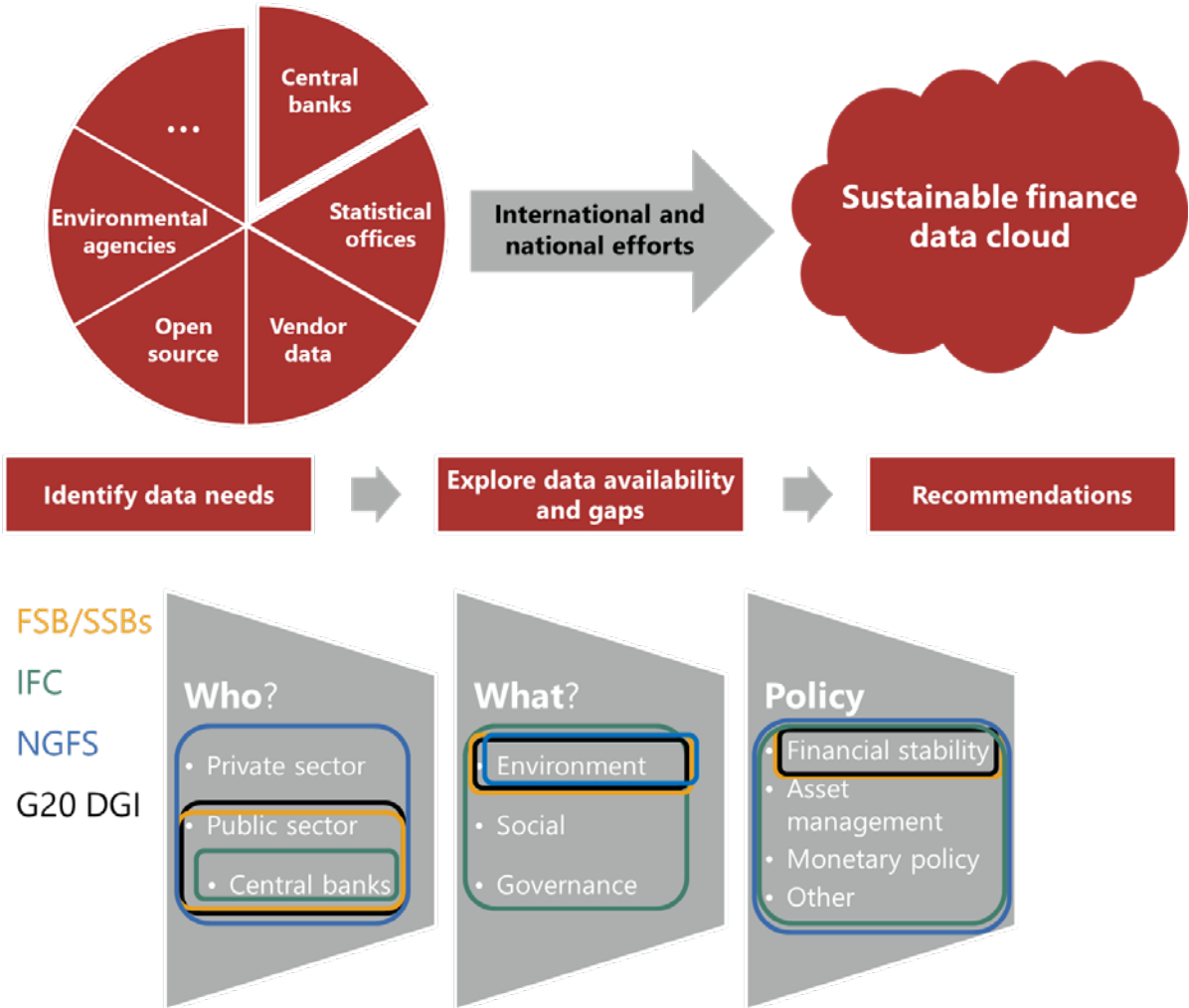
Third, better international cooperation is needed to address the intrinsic analytical complexity of global sustainability analyses. For instance, greater transparency on national practices related to ESG statistical compilation and on the concepts involved would improve international comparability. It would also reinforce disclosure efforts in the global financial industry, and raise the overall quality of the data compiled and the associated analytical exercises. Moreover, it would help users take advantage of the growing ESG data sources that could be drawn from outside the traditional perimeter of official statistics (Section 6).

4. Closing sustainable finance data gaps...

Numerous global initiatives have been launched in recent years to identify the most important ESG data needs and address the related data gaps (Graph 7), with a primary focus on climate change and its financial stability implications.

Overview of global initiatives on sustainable finance data

Graph 7



Source: IFC (2021c).

These initiatives have been **supported by a growing number of stakeholders**, including international organisations (eg BIS, IMF, OECD, UN), financial standard setters and the FSB, as well as the NGFS network of central banks and financial supervisors. Some key examples are the NGFS initiative to promote agreed benchmark scenarios (NGFS (2021)), the recent International Financial Reporting Standards (IFRS) initiative to promote global sustainability disclosure standards, and the ECB guidance on conducting economy-wide climate stress tests (ECB (2021)). The various working groups set up in the context of all these initiatives have involved private and public parties and helped spread knowledge and best practices – for instance, as regards climate scenario modelling, the use of commercial data sources, and the compilation of forward-looking indicators at the firm and country level.

To address sustainable finance data gaps effectively, these various initiatives have highlighted a number of important points to focus on:

- **International consistency.** Harmonising the various concepts, methodologies and processes involved in sustainable finance requires cooperation among a wide range of stakeholders. It is also essential to ensure a sufficient degree of consistency between the various national initiatives undertaken to collect sustainable finance data and to facilitate the dialogue between subject-matter experts and academics as well as policymakers.
- **Medium- to long-term perspective.** Near-term solutions may be useful in addressing urgent data needs but should be complemented by more sustained statistical efforts to develop comparable and comprehensive data sets. To be effective, the pursuit of such a holistic goal should follow a stepwise approach to deal with the complex, multi-layer ESG data universe – by identifying existing sources, as a first step, followed by establishing methodologies for compiling adequate data bases, and by developing relevant meta data to ensure the reliability of the information compiled. This is the approach foreseen for the implementation of the recommendations of the new G20 Data Gaps Initiative (DGI; IMF and FSB (2021)) that will comprise a detailed, multi-year workplan to address policy relevant data gaps with a specific focus on climate change.
- **Usefulness of the information collected.** In addressing sustainable finance data gaps, a delicate balance has to be found between having more data available (ie through disclosure requirements) and transforming these into useful information, in turn supporting policy knowledge (Drozdova (2017)).
- **Multi-pronged approach.** Using the maximum of available information while exploring new data collection opportunities in parallel calls for a constant updating of the stocktaking approach advocated in Section 3 (Graph 8). For instance, existing data could be stored in specific information repositories and complemented by a regular update of various elements (such as the existence of complementary sources, the availability of new tools, potential data overlaps and/or gaps), as suggested by [Triebkorn et al.](#) This approach would facilitate the development of useful statistical concepts, capacity-building (both in terms of infrastructure and staff skills) and the dissemination of innovative methodologies. Moreover, it would help address different and evolving user needs in terms of data sources and data quality requirements (eg accessibility, availability, reliability, comparability).

Dealing with data gaps requires a multi-pronged approach, using existing sources and frameworks while promoting new tools

Graph 8



Source: L Grisey, "The NGFS (Network for Greening the Financial System) Progress Report on Bridging Data Gaps and beyond", *IFC Bulletin*, no 56, May 2022.

5. ... with a focus on tracking green finance

Global policy attention has focused on green finance, ie the mobilisation of financial flows to fund sustainable development priorities. There has been a massive increase in volumes of such instruments, issued by private firms and the public sector, as well as a spike in the number of issuers.

Regarding climate change, for instance, an important policy objective is on the one hand to ensure the necessary financing (eg to meet the goals agreed on in the Paris agreement and the transition goals towards a net zero carbon economy); on the other hand, more insights are needed on how climate change might affect financial markets and financial stability in the short, medium and long term. The analysis of the issuance (ie suppliers) and holdings (ie recipients) of green bonds is an important element to assess these various points. For instance, the Portuguese experience presented by [Conceição et al](#) has shown the usefulness of monitoring investors' financing needs and the conditions on which these could be met. This is key for detecting the underlying risks and informing decision-makers and the public.

Sustainable finance represents a new area of economic activity. But significant data gaps stand in the way of analysis in this area. One challenge is that available data often do not meet high statistical standards. This calls for data quality to be improved as a prerequisite for developing robust analysis and assessing any potential policy implications. In particular, ensuring greater disclosure and availability of green financial instruments would facilitate a closer alignment of market prices and the greenness of firms' activities. Attention should be put on developing adequate definitions and standards for green finance market products, for example by setting up a consistent and harmonised system for ESG labels, as argued by [Capota et al](#) and further discussed in the box below.

Measuring ESG factors in debt statistics

Green, Social and Sustainability (GSS) bonds were created to fund projects that have positive environmental, social and/or governance (ESG) benefits. The market for GSS bonds reached a significant milestone in 2021, with the annual issuance of \$1 trillion of new debt. A growing literature (see the references listed below) suggests that certified GSS bonds are associated with better financing terms.

While the outlook for further growth in this market is promising, ESG investors face some challenges:

- The first relates to the lack of harmonised, formal criteria for what constitutes a green or sustainable bond. The International Capital Market Association (ICMA), which represents financial firms and promotes the smooth functioning of global debt securities markets, formulated Green and Social Bond Principles as well as the Sustainability Bond Guidelines, which have become important global standards for GSS activity-based debt instruments. Indeed, most issuers of GSS bonds follow the ICMA guidelines, and provide documentation for how the bond proceeds will be used and the ESG impact a bond is expected to have. However, the current guidelines lack precise definitions. Issuers thus have considerable leeway to interpret GSS credentials to their own advantage. As a result, self-labelled bonds may be “greenwashed” with unsubstantiated claims about a project’s impact. Regulators are increasingly stepping in to homogenise ESG taxonomies and standards across countries and sectors. Some jurisdictions have introduced rules explicitly requiring external reviews as a benchmark. Independent validation firms, however, remain unregulated and the proliferation of standards, concepts and taxonomies they employ makes it difficult to compare projects financed by GSS bonds. Public debate on taxonomies for GSS bonds is likely to continue for some time.
- The second challenge investors face is a lack of timely and accurate data on GSS-related activity. The availability and quality of such data varies across countries and sectors, and covers mainly large multinational firms. This calls for further harmonisation work at the international level. The Financial Stability Board has already set up the Taskforce for Climate-related Financial Disclosures (TCFD) to improve and increase reporting of climate-related financial information. Similarly, the IFRS Foundation, which promotes international financial reporting standards, has been charged with facilitating consistency of disclosure standards for sustainability-related projects. In late 2022, it will issue the climate disclosure standard based on its [International Sustainability Standards Board](#) (ISSB), eventually replacing the guidance provided by the TCFD.

① This box was prepared by Jakub Demski (BIS).

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Despite these shortcomings, existing data on green finance instruments can be used to analyse the impact of climate change and the associated physical and transition risks for financial markets. For instance, the available statistics on syndicated loans, as analysed by [Ehlers et al](#), suggest that climate-related risks are being more effectively priced since the Paris agreement, although the relative impact is modest in view of the step increase in carbon prices that is needed to meet the Paris goals. Another limitation is that only greenhouse gas emissions directly caused by firms (so-called “Scope 1”) are priced, not those indirectly caused by production inputs, transportation etc. (ie Scope 2 and 3).

Moreover, recent studies suggest that the financing of firms with strong ESG ratings may bring financial stability benefits. The main mechanism at stake appears to be through the impact on these firms' risk premia. According to [Liberati and Marinelli](#), there is a statistically significant negative risk premium on ESG bonds compared with conventional ones with the same characteristics. Furthermore, this negative risk premium appears to have increased following the Covid-19 shock, at least for some sectors. Similarly, [Capota et al](#) find that ESG funds did perform better than their non-ESG counterparts during the Covid-19 turmoil. Other studies suggest that sustainable finance might bolster corporates' resilience during crises, although further evidence might be needed to confirm this finding. One recent example has been the analysis of firms from different countries to understand the relation between their environmental and social score and their financial performance during the Covid-19 pandemic. The results typically show that some firms with better sustainability footprints were able to outperform others, but that this ability is difficult to confirm empirically for all firms in general.

6. Developing new indicators for sustainable finance...

As noted above, establishing meaningful definitions for relevant sustainability metrics is critical to support public policy. Yet ESG topics represent a new area for central bank statisticians, who should be proactive in identifying new types of indicator for sustainable finance. This often requires the bridge between economics and natural sciences to be crossed, eg with economists benefiting from the experience of climate experts and vice versa. Besides the core ESG issues analysed in this paper, a broader perspective should encompass concepts such as global sustainability accounting – cf for instance the new ledger proposed by [Bordt and Saner \(2022\)](#) in response to a call by the UN Secretary General for new metrics to complement GDP.

The starting point is to develop clear legal or regulatory requirements (eg in the context of global IFRS sustainability disclosure standards) **as well as voluntary guidelines to measure the sustainability of financial instruments and financial activities.** Yet the criteria governing ESG disclosures are found to vary considerably across data providers and even for the same firm ([Berg et al \(2019\)](#)). The fact that alternative climate risk metrics exhibit significant variation is confirmed by [Colesanti Senni et al](#), who analysed a wide range of forward-looking transition risk metrics covering 1,500 firms from 14 different sources. Given the deep uncertainty related to the analysis of climate risks, such differences in the data analysed may not be avoidable, and this should not be an issue per se if the causes were properly understood. However, the analysis suggests that firms' transition risk estimates are highly dependent on underlying assumptions as well as scenario and model characteristics. Such elements should therefore be explicitly understood to ensure that, first, ESG metrics rely on a sound and homogeneous methodology and on coherent assumptions; and second, that the data reported in this context are sufficiently reliable and homogeneous to support policy needs.

Another point is to **ensure statistical harmonisation**, arguably one of the most important challenges when it comes to establishing relevant sustainable finance indicators. However, agreeing on harmonised metrics involves many stakeholders at a time when concepts as well as regulations are still evolving. One way is to collect

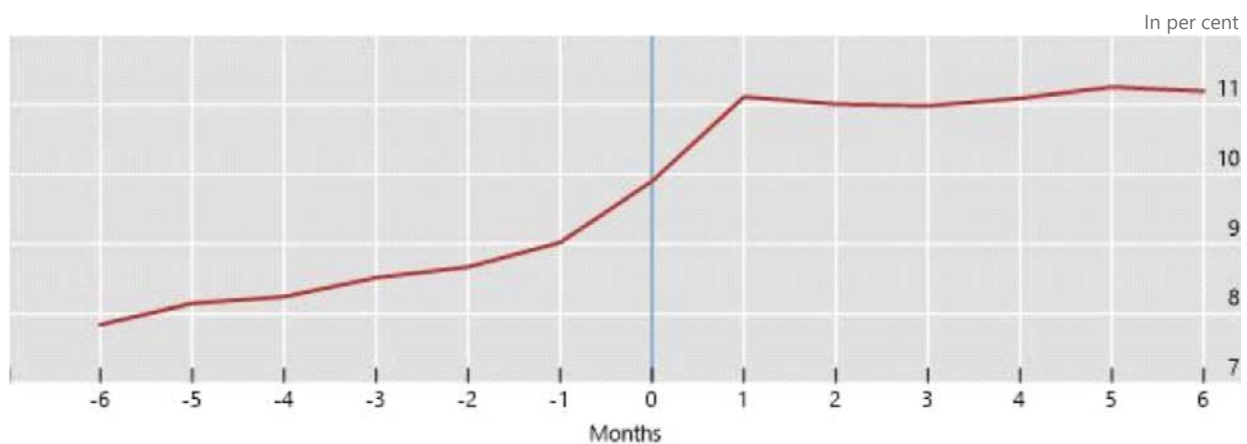
“best practice indicators” collected outside formal frameworks but, at least indirectly, influenced by ongoing international and other harmonisation initiatives. The example provided by [Ortiz](#) shows how a set of such (“informal”) indicators can be derived to measure the contribution by the financial system to achieving the (clearly formalised) Sustainable Development Goals (UN (2015)).

Many national initiatives are already under way to improve existing metrics with a specific focus on clarifying ESG labels applied to financial instruments.

These aim to serve investors as a “guarantee” for the asset composition of their portfolios, allowing them to align their sustainability preferences with their asset management strategies. For instance, the carbon footprint of two French labelled funds was compared by [Nefzi](#) with that of other funds to assess their environmental performance. The results, illustrated in Graph 9, emphasised the importance of granular entity-level data to precisely estimate the carbon footprint of financial institutions and the contribution of ESG labelling to climate change mitigation.

Average share of green bonds in portfolios before and after the labelling

Graph 9



Source: D Nefzi, “Measuring the development of French labelled funds and their contribution to sustainable financing of the economy”, *IFC Bulletin*, no 56, May 2022.

A final issue is **that any statistical formalisation of the ESG indicators to be collected should have a global nature**, requiring the support of all financial authorities and market participants to use the same “proper” metrics across borders. The new G20 DGI, as expected to develop after 2022, will provide a framework for developing the needed concepts, methodologies and processes. These efforts are being complemented by those of the BIS, the FSB and the financial standard setters, as well as the IMF, the NGFS, the OECD and the UN, covering a wide range of topics. In view of these ongoing initiatives, sustainable finance metrics are likely to continue evolving rapidly ((IFC (2021c); NGFS (2021)). As argued in Section 4, it will therefore be important to set up adequate information repositories to keep track of these developments.

7. ... by leveraging innovation

New tools

Innovation can be applied to collect, analyse and synthesise sustainable finance statistics more efficiently. It can facilitate the construction of new indicators and enhance computational/visualisation capacities. This can, in turn, support analyses that are still in their infancy (eg climate risk pricing), ensure regulatory compliance (eg disclosures requirements), and improve the capture of complex information – eg through natural language processing (NLP) tools.

However, the ability to use innovative approaches (eg data science, AI) **requires a quantum leap in the available infrastructure, both from a statistical and an IT perspective.**

On the **statistical side**, important efforts are also needed to cope with large amounts of granular data, for instance in terms of statistical nomenclatures and concepts (eg taxonomies, instrument labelling), granular identifiers (eg the Legal Entity Identifier (LEI)), data-sharing possibilities (IFC (2016b)) and transmission standards (eg Statistical Data and Metadata eXchange (SDMX); IFC (2016a)). The importance of enhancing the global statistical infrastructure to improve existing core statistics and address new data needs has been highlighted by the consequences of the recent Covid-19 pandemic (Rosolia et al (2021)).

On the **IT side**, there is an increasing demand for high-performance computing (HPC) and big data capabilities, for instance to develop data-centric analytical models and benefit from advanced types of computing technology (eg graphics processing units (GPUs); see IFC (2020)). More powerful hardware supplemented by new software can also help to make use of vast amounts of structured and unstructured data. As argued by Papenbrock and Schwendner, such IT infrastructure can facilitate a number of tasks to compile and make use of sustainable finance data (eg timely risk identification, monitoring and early warning exercises, quality control, interpretation and optimisation).

International organisations (eg the OECD and NGFS) and central banks have already worked on developing comprehensive ESG databases that exploit IT and statistical innovation. Such databases can help to effectively calibrate ESG models, which can serve as important benchmarks supporting sustainability policies. Yet, there are many challenges involved. For instance, it is important to allow interested stakeholders to get (at least partial) access to this information. Another issue relates to shortages in terms of IT budget and staff skills, especially in public institutions. Furthermore, there is a constant need to trade off short- and long-term solutions, in terms of both the staff resources to be mobilised and the underlying infrastructure to be set up.

A practical roadmap

The experience of central banks suggests a number of ways to address the challenges above and make the most of innovation.

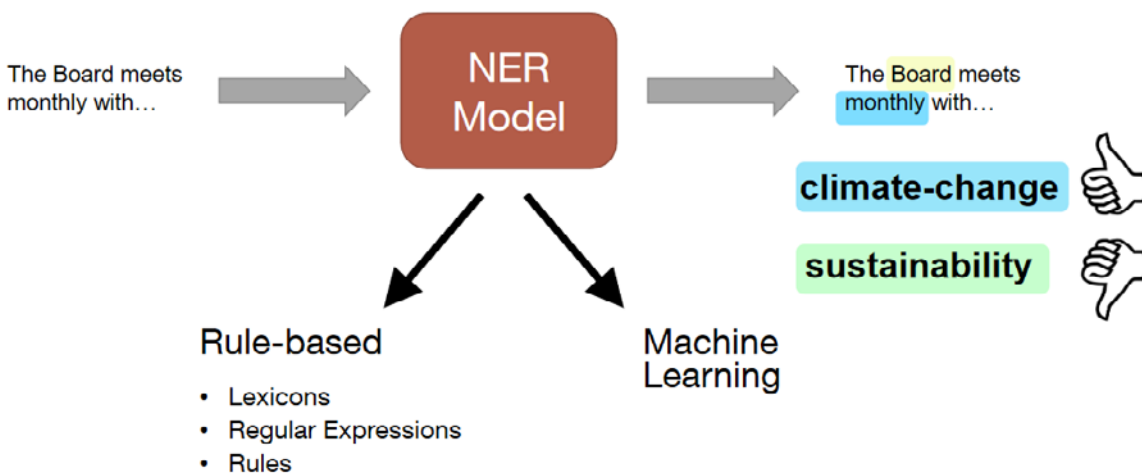
First, there is a clear business case for **developing comprehensive ESG data platforms that would benefit all stakeholders.** Such centralised information repositories will typically disclose information on carbon costs, including industry

averages and firm-level estimates (putting pressure on companies to disclose more information themselves). Central banks, statistical institutes and international organisations would be best placed to foster such a development. These efforts could be complemented by a micro-level auditing of environmental disclosures to favour the dissemination of consistent indicators, as argued for instance by [von Kalckreuth](#) to assess the direct and indirect carbon impact of industries, companies and products.

Second, the use of data science and AI should be accelerated in the private financial services industry as well as in supervisory circles (Wibisono et al (2019)). Establishing complex investment/risk management activities in green finance, as well as the need to develop data-driven policies, require the use of massive amounts of rich data and can greatly facilitate their interpretation (eg large-scale visualisation tools, clustering techniques, network analyses). At the same time, these innovative approaches can help their users to compile new types of data or enhance their quality (IFC (2021a)).

Named entity recognition (NER) model

Graph 10



Source: A Moreno and T Caminero, "Application of text mining to the analysis of climate-related disclosures", *IFC Bulletin*, no 56, May 2022.

Attention has focused on using specific techniques to analyse climate-related disclosures and in turn support investors' decisions as well as the design of public policies. [Moreno and Caminero](#) have, for instance, developed a scraping solution to analyse Spanish banks' ESG disclosures (in the form of their Pillar 3 reports; see BCBS (2018)) and information on their directors' remuneration, which pointed to significant improvements in terms of governance. The approach was complemented by the use of machine learning (ML) techniques to input textual information on a massive scale and provide insights on selected topics of particular interest (eg climate change, sustainability) (Graph 10). Similarly, [Bua et al](#) have applied a textual-based framework to construct indicators for the two key climate risk types (ie physical and transition risks) and analyse the sensitivity of French equity prices to them. This was done by comparing information from Reuters News with textual databases related to scientific work on climate change (Graph 11).

Third, an effective near-term solution for bridging data gaps is to construct "transitory" indicators by proxying missing data. For instance, the Netherlands

and efforts undertaken by the various stakeholders formally or informally involved in the sustainable finance agenda.

The **new G20 DGI** represents a key opportunity to further support these various efforts. First, because it emphasises the priority of developing adequate statistics on climate change, and second, because of its focus on facilitating access to private and administrative sources of data as well as on data-sharing. This will undoubtedly open up additional avenues for improving sustainable finance statistics.

Central banks can contribute significantly to ensuring the success of this DGI, in line with the IFC's recommendations for dealing with sustainable finance challenges and gaps (IFC (2021c)), namely, (i) identifying data needs from a policy perspective; (ii) ensuring cooperation between traditional and non-traditional stakeholders so as to overcome data gaps, especially at the micro level; and (iii) leading by example by improving central banks' use of sustainable finance data.

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