

Short and medium-term approaches to closing climate data gaps: German experiences and conclusions on the way forward

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Abstract

This paper describes short and medium-term approaches to closing climate-related data gaps. We use examples from actions taken within the Deutsche Bundesbank to leverage on already existing data sources and approaches to bridging data gaps. In a first step, short-term responses include creating an appropriate intra-institutional organizational setting, taking a multi-source approach and improving external data availability. In a second step, medium-term responses entail enhancing central bank cooperation, working with non-traditional stakeholders and fostering international coordination and cooperation. In the long term, the statistical community should work towards adhering to fundamental statistical principles, taking concrete steps towards a statistical framework and making use of climate-related disclosures.

Keywords: Sustainability, Green Finance, Data Gaps, Climate Change, Central Bank Policy

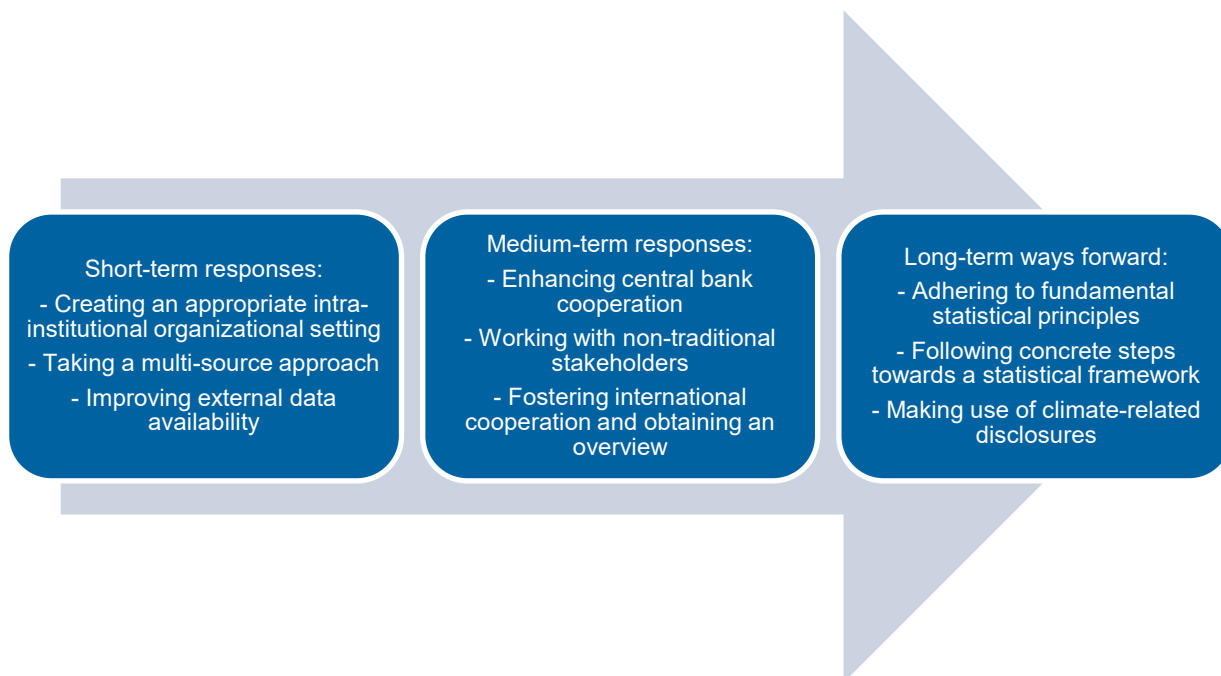
¹ The views expressed are those of the authors and do not necessarily reflect those of the affiliated institution.

1 Introduction

The lack of good quality and accessible climate-related data poses a challenge for policymakers, researchers, the private sector, regulators as well as compilers of climate-related data, such as official statistics in central banks and statistical offices. Recent reports from the Financial Stability Board (FSB) and the Network on Greening the Financial System (NGFS) have all highlighted the need to accelerate progress in making climate-related data available. The new G20 Data Gaps initiative has identified improving climate-related data as a major task for the coming years.² Global progress on improving climate data, including voluntary and mandatory disclosure regimes, is under way.³ However, in the short and medium term, central banks need to examine how leveraging data sources and approaches that are already available can bridge some of the data gaps in order to fulfil the various data needs in monetary policy, financial stability and banking supervision.

This paper describes the steps taken by the Bundesbank to overcome the shortage of data, outlines the lessons learned and first empirical results, and draws general conclusions in the form of wishes for the statistical way forward. Short-term solutions require an appropriate institutional set-up to bring together the in-house demand for and supply of climate-related data. This enables an institution to address internal and external data requests in a coordinated manner. In the medium term, increasing cooperation and collaboration can help those involved to learn from each other and avoid duplication of work. Quality of data is a key issue. Given the importance of this new statistical field in the coming years, the international statistical community should work towards adherence to fundamental statistical standards.

Key messages: central banks' statistical response to help close climate-related data gaps

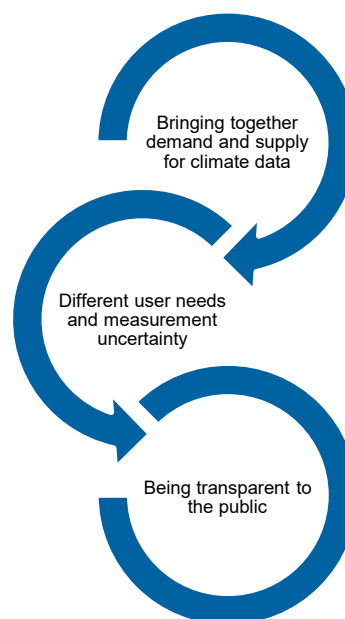


² Envisaged priorities for the next Data Gaps Initiative (DGI-3) are mentioned in: [G20 Data Gaps Initiative \(DGI-2\): The Sixth Progress Report—Countdown to December 2021 - Financial Stability Board \(fsb.org\)](https://www.fsb.org/2021/12/02/g20-data-gaps-initiative-dgi-2-the-sixth-progress-report-countdown-to-december-2021/)

³ Such as the Proposal for a Corporate Sustainability Reporting Directive (CSRD) in Europe, which would amend the existing reporting requirements of the NFRD (https://ec.europa.eu/info/business-economy-euro/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en#review). The proposal extends the scope to all large companies and all companies listed on regulated markets (except listed micro-enterprises), requires the audit (assurance) of reported information and introduces more detailed reporting requirements; furthermore, a requirement to report according to mandatory EU sustainability reporting standards stipulates that companies must digitally 'tag' the reported information, so it is machine readable and feeds into the European single access point envisaged in the capital markets union action plan.

2 Short-term response: we need to act fast

There is an immediate need for climate-related data. Data are the first step in analysing climate-related risks and the need for adaptation within an economy. Central banks need to act fast and provide a short-term statistical response. Given various user needs and the fact that a variety of climate-related data are already available in different levels of aggregation and disaggregation, frequency and quality, a structured approach is needed within central banks to address these issues. It further needs to be examined and addressed what internal as well as external data are needed, leveraging on the information that is currently available.



2.1 Bringing together demand and supply for climate data: using an appropriate intra-institutional organizational setting

Climate change and its ramifications affect the work of central banks in many ways. For example, physical risks, which could result from extreme weather conditions, as well as transition risks, which could be induced by political action to counter climate change, have to be considered when fulfilling the various tasks and mandates of a central bank. There is an increasing need for climate-related data in various divisions within the Bundesbank.

Looking at the supply side, data availability is a rather complex issue. Climate change-related issues are a comparably new field of interest. Therefore, no well-established data sources and statistics existed in the Bundesbank when the first users needed data for their empirical work. They all had to look for suitable data from other institutions or private data suppliers and had to take care of procurement. To have applied this process on a permanent basis would have been highly inefficient in terms of time and money.

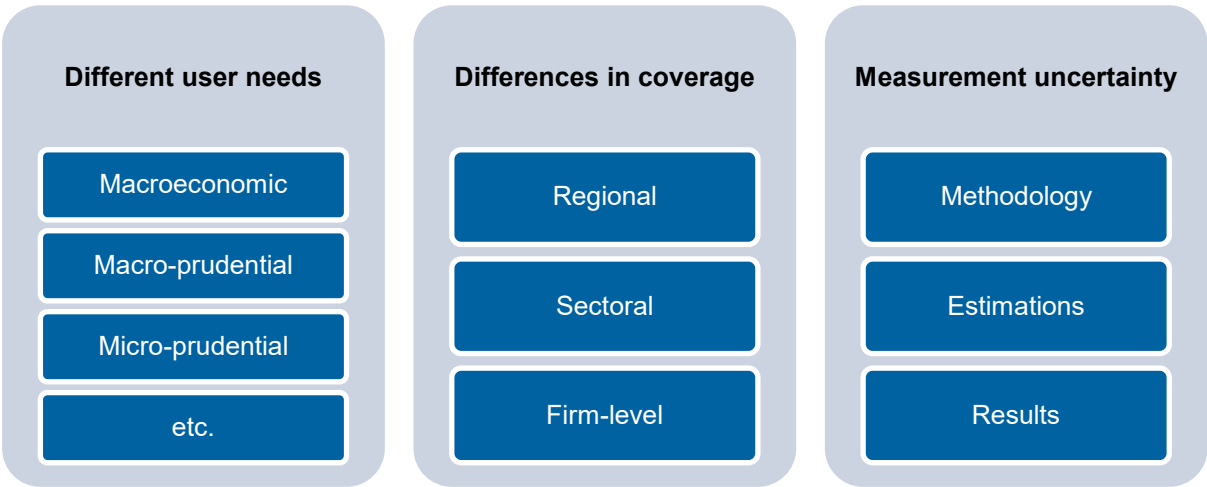
In order to promote efficiency, the Bundesbank in early 2020 set up a central data hub within the statistics department to collect climate-related data. The Sustainable Finance Data Hub is tasked with examining market data that serve inter-divisional and permanent needs within the Bundesbank. Data demand is explored through an intense exchange with users, and data are then procured on the market. The data hub is the first contact for questions regarding data and methodology and constitutes a link between users and data providers. Feedback from users is essential to improve the database.

The data hub is also responsible for most of the data provision process, starting with market exploration and ending with the provision of data to its users. This process includes, for example, establishing the first contact with data providers, organizing test data sets, assisting colleagues in the procurement office with contract negotiations and, especially, cleaning and processing the data received from the providers. Depending on the data structure, this latter process in particular can be complex and time-consuming. The data hub makes the data provision process efficient. It avoids duplication of work and creates synergies.

Part of the data hub’s work also consists in participating in and contributing to international sustainable finance-related data discussions. To this end, the data hub brings its expertise to international statistical working groups on climate-related data issues.⁴

2.2 Different user needs and measurement uncertainty: the need to take a multi-source approach

Metrics and data on sustainable finance are a comparatively new phenomenon and there is therefore no unified, agreed upon framework yet. Rather, the market is dominated by third-party data providers, who use different methodologies and definitions and in some cases focus on different markets and regions. There are three main reasons why the Bundesbank’s Sustainable Finance Data Hub follows a multi-source approach in acquiring data from third-party providers. These refer to different user needs, difference in coverage across providers, as well as measurement uncertainty:



In a recent survey within the Bundesbank, this multi-source approach was acknowledged. The results showed that over 70% of the survey respondents who used data used data from two providers. Robustness checks were mentioned as one of the main reasons for using the same metric (carbon emissions) from two different providers.

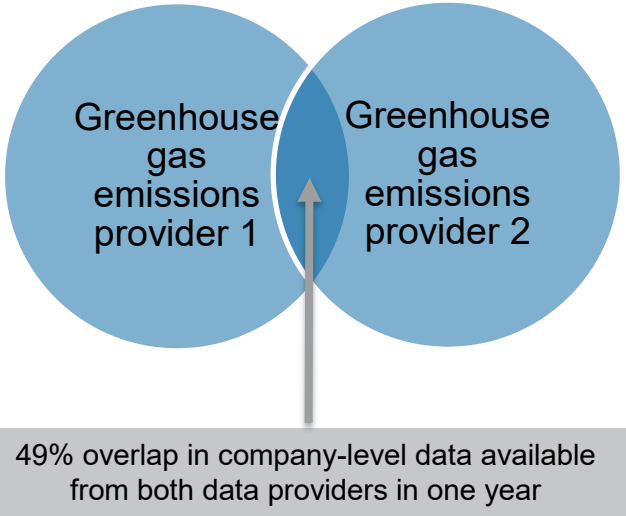
2.2.1 Different user needs

Within central banks, sustainability-related data is used for a variety of purposes: for example, use cases can range from stress tests for micro-prudential supervision or macro-prudential analysis to macroeconomic research. This multitude of use cases means that users are interested in various different metrics, for example greenhouse gas emissions, ESG ratings, transition risk or physical risk. A single data provider usually does not offer every sustainability-related metric, so the product ranges of different data providers may complement each other. Our internal survey, mentioned above, showed that a broad set of indicators from the two providers we asked about were used, depending on the respective use case within the Bundesbank.

⁴ For example, the Network on Greening the Financial System Workstream on bridging data gaps (NGFS BDG), Irving Fisher Committee (IFC) survey on sustainable finance, European System of Central Banks Statistics Committee (STC) Expert Group on Climate Change and Statistics, Committee on Monetary, Financial and Balance of Payments Statistics (CMFB) Task Force on Statistics on Sustainable Finance and Climate Related Risks.

2.2.2 Differences in coverage

In addition to differences in metrics’ definitions and the use cases they serve, differences in coverage are another reason for using multiple data sources. Regional, sectoral as well as firm-level coverage can differ between data providers, meaning that one provider may offer data on companies that another does not cover. Firm-level data from different sources can therefore be used complementarily. For example, an analysis of our two data providers’ coverage of greenhouse gas emissions data shows that, for 2019, only about half of all available ISINs are covered by both providers. Using multiple data providers therefore enhances firm-level coverage.



The difference in firm-level coverage then also leads to differences at a regional and sectoral level across providers, which is an important consideration in the calculation of aggregates.⁵

Coverage of greenhouse gas data by data provider 1/2

| Provider 1 | | | | | | | Provider 2 | | | | | | |
|--------------|------------|------------|------------|------------|------------|------------|--------------|------------|------------|------------|------------|------------|------------|
| NACE | China | USA | EU | India | Russia | Japan | NACE | China | USA | EU | India | Russia | Japan |
| A | | | | | | | A | | | | | | |
| B-E | Dark Blue | Dark Blue | Dark Blue | Dark Blue | Light Blue | Light Blue | B-E | Dark Blue | Dark Blue | Light Blue | Light Blue | Light Blue | Dark Blue |
| including: C | Dark Blue | Dark Blue | Dark Blue | Dark Blue | Light Blue | Light Blue | including: C | Dark Blue | Dark Blue | Light Blue | Light Blue | Light Blue | Dark Blue |
| F | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | F | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue |
| G-I | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | G-I | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue |
| J | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | J | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue |
| K | Light Blue | Dark Blue | Light Blue | Light Blue | Light Blue | Light Blue | K | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue |
| L | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | L | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue |
| M-N | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | M-N | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue |
| O-Q | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | O-Q | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue |
| R-S | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | R-S | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue | Light Blue |

Dark blue signifies a high and light blue a low coverage in the respective sector and country or region.

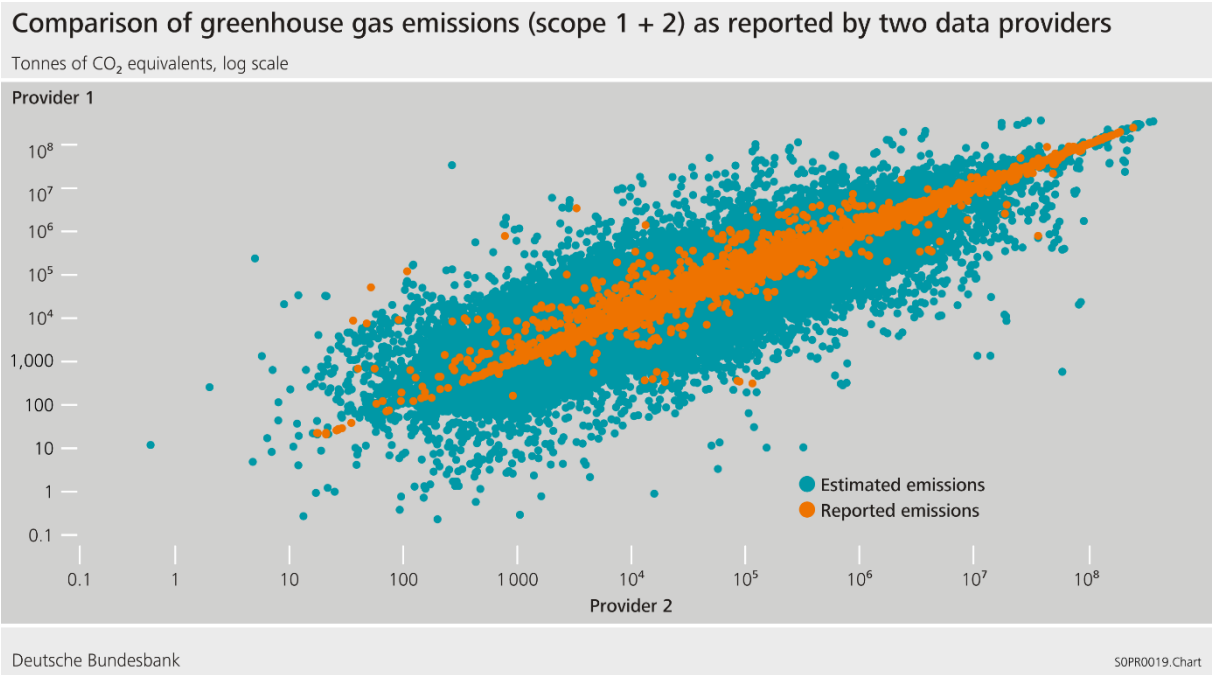
2.2.3 Measurement uncertainty

Measurement uncertainty implies that even if different data providers offer the same metric for the same companies, a multi-source approach can still bring valuable insight. For example, there is no clear definition of how an ESG rating has to be calculated, resulting in a variety of contradicting ratings from different providers for a single company. Relatively clearly defined metrics such as greenhouse gas emissions should in theory be free from such issues. However, in practice, we observe immense differences in the data from different providers. To a certain degree, these differences can be explained by different estimation techniques for modelled data: due to a lack of (mandatory) disclosure standards, most emission data has to be based on estimation models rather than reported information. This is especially true for scope 2 and scope 3 emissions.

Looking, for example, at the two data providers’ emission data available in the Bundesbank shows the following: we see immense deviations between the data providers for the same observations (same

⁵ Coverage is measured as the absolute number of companies in the data provider’s data set.

company in same year) for both absolute emissions and emission intensity. To give a sense of the disparity between emission data from different sources, we plotted the absolute direct emissions (scope 1 + 2) as reported by the two data providers we currently work with at the Bundesbank. Each point in the scatterplot represents one company in one year. Since the x and y axis denote the same item as reported by different providers, we should see a perfect 45° line (corrected for axis length). In fact, we see a cloudy scatterplot, especially for estimated emissions. The reported emission data show far less disparity than the estimated data, but are also nowhere near a straight line. With the spread between data from different providers being that large and without clear criteria to determine which provider is the “right” one, using a multi-source approach for robustness checks is sensible.



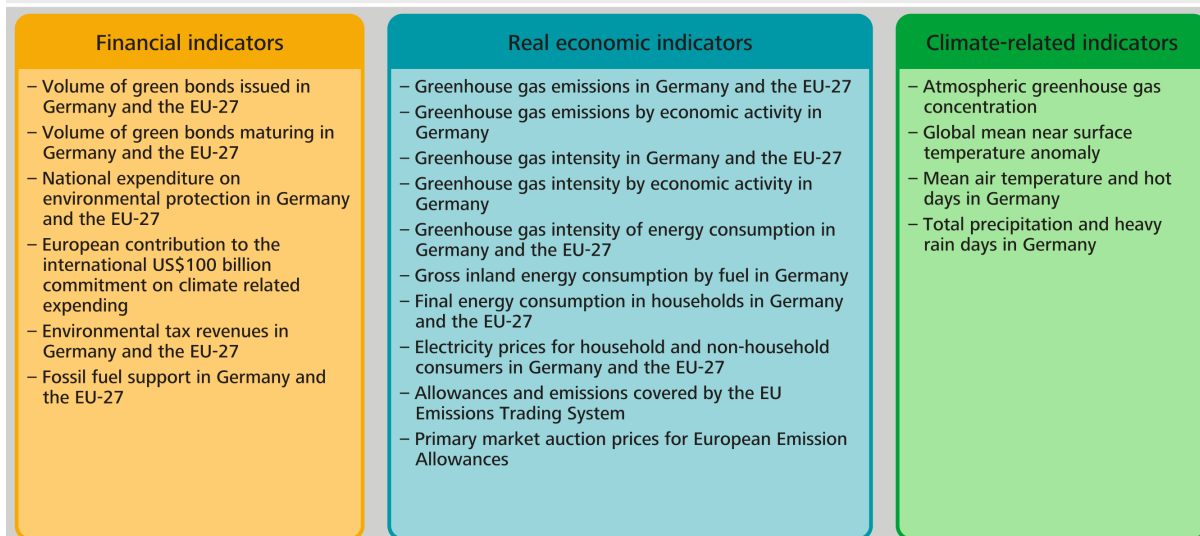
2.3 Being transparent to the public: Improving external data availability

Publicly available data are rare. The data that can be found are usually scattered between different institutions. Gathering these data, and processing and presenting them in such a way that relevant information can be extracted easily is a benefit for analysts within the Bundesbank as well as the public. It improves transparency and increases public awareness of the status quo of climate change.

The Bundesbank data hub has established a dashboard which makes climate-related macro-data available to the general public.⁶ It consists of a manageable number of informative indicators, pictured using charts, which provide a quick and comprehensive overview of green finance in Germany and its latest developments versus the rest of the EU. The measurable effects of climate change are shown from several perspectives. The chosen indicators shed light on issues that are connected to physical and transition risks. The dashboard distinguishes financial, real economic and climate-related indicators. Financial indicators contain information on the development of green bonds, environmental tax revenues and fossil fuel subsidies, for example. Real economic indicators capture greenhouse gas emissions and information about energy consumption. Climate-related indicators include information about the mean air temperature and heavy rain days, for instance. Additionally to the charts, the underlying data and data sources are published on the Bundesbank webpage. The dashboard is updated annually.

⁶ The Bundesbank's green finance dashboard is published here: [Green finance dashboard | Deutsche Bundesbank](#)

Green finance dashboard

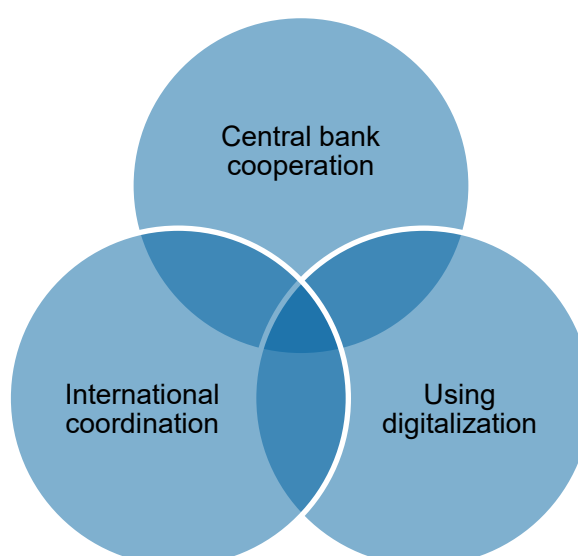


Deutsche Bundesbank

The dashboard is almost entirely based on public data, available free of charge. In the absence of such data on sustainability-related financial products like green bonds, the Bundesbank reached an agreement with a third-party data provider. This allows aggregates on sustainable bonds to be published on our website, for example the dashboard indicators about the volume of green bonds. In the long term, publicly available data fulfilling certain statistical standards are essential; for the time being, however, arrangements with third-party data providers could help to bridge data gaps and inform the public. The work with a non-traditional stakeholder also forms part of the NGFS's activities for the dashboard on scaling up green finance, which the Bundesbank updates annually.⁷

3 Medium-term response: We need to work together and use comparative advantages

Central banks around the world face similar challenges when addressing climate-related data needs. Intensified collaboration can avoid duplicating work and make use of comparative advantages. Given the urgency of the topic, many initiatives are currently under way to foster such cooperation, but there is a need for greater coordination of these efforts. Because this is a new field of study for many, there is the opportunity to make immediate use of digitalisation to bridge data gaps. Not all skills can be and need to be immediately available in central banks; working with non-traditional stakeholders can be beneficial for both parties.



⁷ The NGFS dashboard on scaling up green finance is published here: [Dashboard on scaling up green finance | Banque de France \(ngfs.net\)](https://www.ngfs.net/en/press-releases/2022/06/2022-06-20-1)

3.1 Enhancing (regional) central bank cooperation

The Eurosystem aims to take a leading role in promoting international research and innovation partnerships and in strengthening innovative solutions for green and climate-related issues.⁸ In this context, interdisciplinary cooperation between different institutions/central banks is a cornerstone of achieving the ambitious goals of (i) improving access to, the quality and the scope of climate-related data, (ii) closing data gaps and (iii) creating a level playing field among members of the European System of Central Banks (ESCB). Comparative advantages and synergy effects can be realised, saving effort, cost and time.

A prototype example for such central bank collaboration is the current joint procurement of climate-related data within the Eurosystem/ESCB. In June 2021, the Bundesbank published a public tender for climate-related data on behalf of all ESCB central banks.⁹ The joint procurement is looking for up to two climate-related Sustainable and Responsible Investment (SRI) data providers with which to enter into framework agreements.¹⁰ All participating ESCB central banks will have the right, but not the obligation, to participate in the framework agreements resulting from the public tender procedure. The Bundesbank as lead central bank is responsible for specifying the tender documents, the nature of the joint activity and the structure of the contractual relationships.

Business experts from different central banks and departments (e.g. capital markets, risk management, statistics, sustainable finance), with years of experience in the use of climate-related data, have been involved, representing a key element of collaboration. Considering the different requirements of the Eurosystem central banks and the fast evolving and changing environment, the core team formulates (minimum) requirements (e.g. in terms of methodologies, coverage, technical access paths, usage rights, etc.) and assesses the quality of the data from competing providers. The benefits of this approach are the broad consideration of users' perspectives in order to maximise the value-added for all ESCB central banks. To a certain extent, it also provides benefits from a division of labour (e.g. pooling staff to tackle special business aspects or consulting other important parties such as procurement and legal experts). From an overall perspective, cooperation on procurement generates synergies in terms of defining the business requirements, selecting the most suitable data providers and as regards contract management after a contract has been concluded.

Coordination activities are vital in ensuring the realization of advantages from cooperation: business managers of projects with time-critical deadlines need to direct their attention to both effective and efficient ways of pursuing the implementation of the project. Clear responsibilities and decision-making structures are important where interests diverge due to different institutional demands (e.g. smaller central banks tend to have less complex user needs and are often more price-sensitive than bigger ones). The success of cooperation depends also on open, transparent communication and the willingness to compromise.

⁸ [What's our roadmap to greening monetary policy? \(europa.eu\)](#)

⁹ [Bundesbank publishes public tender for climate-related SRI data on behalf of all ESCB central banks | Deutsche Bundesbank](#)

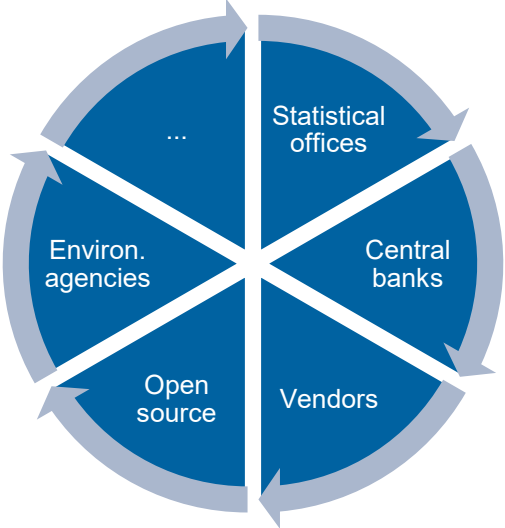
¹⁰ The current procurement procedure follows the definition of a common stance for applying SRI principles in the euro-denominated non-monetary policy portfolios (NMPPs), which each central bank manages under its own responsibility. The Eurosystem agreed on this common stance in February 2021 and will continue to work jointly on it and its implementation to harmonise approaches. In particular, all Eurosystem central banks aim to start climate-related disclosures for their euro-denominated NMPPs in Q1/2023 using the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). The climate-related SRI data to be procured will promote such disclosures. It prepares the ground for the measurement of greenhouse gas emissions and other climate-related metrics relating to these NMPPs in order to enhance the awareness and understanding of climate-related risks.

Given that many central banks face similar challenges, sharing abilities and combining complementary strengths allows for effective cooperation, which minimizes duplication of effort and achieves synergies. Hence, cooperation and coordination activities strongly support procedures that are more successful from an organisational point of view: channelling available resources and competences leads to an optimization for the benefit of the users of climate-related data. Users may well receive data in better quality, with less effort, more value for money and in less time than without such cooperation. In addition, cooperation activities in connection with procuring and gathering climate-related data ensure consistency/harmonization of analysis and improve the comparability of reports across central banks through the broad use of the same data providers (also benefiting from a multi-source approach).

The Bundesbank’s Sustainable Finance Data Hub is currently working with the International Monetary Fund (IMF) to construct macro-indicators on sustainable finance. The indicators are a work in progress, so the final set of indicators is not yet fixed. The current plan is to aggregate micro-data (company-level data) on absolute emissions, emission intensities, physical climate risk and transition risk to the level of sectors and countries, where possible. Depending on the specific sector or country, aggregation is not always feasible as the sample size may be too small. Our first goal is to aggregate data for the manufacturing sector in the United States and the European Union, given the relatively good data coverage there.

3.2 International coordination and overview needed

In recent years, various work streams have been set up to tackle climate-related data gaps and harmonize existing data sources. This includes public and private initiatives, given that a multiplicity of stakeholders can contribute to closing data gaps, such as statistical offices, central banks, private data providers and open source initiatives. Given the variety of initiatives under way, there is a need for international coordination of initiatives, to avoid duplication of work and to make use of the comparative advantages of each stakeholder.¹¹



3.3 Using digitalisation

To contribute to closing climate-related data gaps, while at the same time promoting digitalization in central banks’ work in general, Banco de España and Deutsche Bundesbank jointly submitted a project proposal to the BIS Eurosystem Innovation Hub. The proposal on “Information extraction applied to sustainability-related disclosures” as well as another proposal, the G20 TechSprint on Green Finance, which builds on it, aim to create a data-scraping algorithm that draws information out of sustainability-related disclosure reports. As a first step, the TechSprint proposal suggests focusing on the extraction of specific metrics from corporate reports (e.g. TCFD-based) using ML techniques. The idea is to use this experience as a basis for developing a list of the main issues identified when scraping this data and

¹¹ Presentation by Michael Hugman on “Private financial institution perspectives on climate and nature data” at the BdF/BIS/BBk International Conference on “Statistics for Sustainable Finance”, 14 and 15 September 2021 in Paris. Link to presentations: [Events \(bis.org\)](https://www.bis.org/events)

stating how these problems could be overcome in the future. Although the most common specific disclosures will probably be ones related to metrics and targets (such as scope 1, 2 and 3 emissions, water consumption, energy consumption or waste), other areas are also prone to have specific disclosures with values comparable across companies (such as whether there is a sustainability committee and the frequency of meetings with the Board).¹²

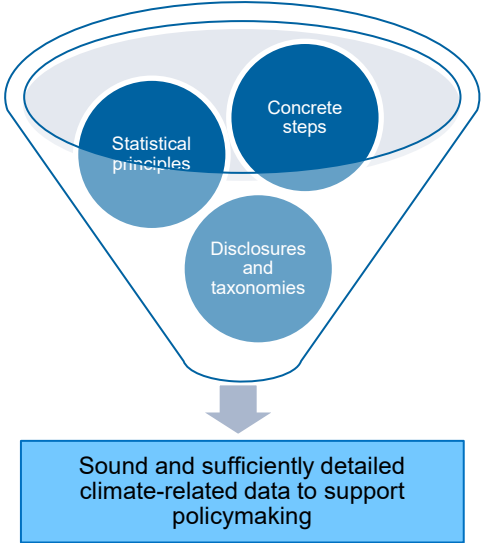
Sustainability-related disclosures are mostly limited to large listed companies. The lack of unified standards for the structure of sustainability-related disclosures might prove to be a hurdle for successful implementation of a data-scraping algorithm. However, insights gained from the difficulties encountered in developing such tools would be a useful input for the ongoing discussion on how to improve voluntary climate disclosures.

The Bundesbank plans to cooperate with Iryna Gurevych of the Technical University of Darmstadt, an international expert on multimodal NLP (natural language processing). As far as sustainable finance is concerned, the cooperation focuses on two areas: the first one is disclosure reports, where the cooperation may help to produce the data-scraping mechanism planned for the G20 TechSprint and the BIS Innovation Hub. The other focus is a model for predicting companies' asset locations, which may be useful for further work on physical climate risk.

4 Long-term ways forward fulfilling fundamental principles of statistics

Given the growing importance of climate-related data for policymaking, data quality is a key issue. Fulfilling the UN's Fundamental Principles of Official Statistics will be an important aim for statistical work and provide guidance on the steps we must take – steps that must be taken worldwide, for climate change is a global phenomenon. Adhering to such statistical principles requires setting up a statistical framework. The existing frameworks for statistics on climate change are not yet sufficiently developed to provide sound data for evidence-based policymaking.

Dashboards are a first step towards improving the availability of macro-level climate-related data. Various examples already exist: the Deutsche Bundesbank's dashboard focuses on developments in green finance in Germany, the NGFS dashboard is based on a set of indicators that track the greening of the financial systems worldwide at a comparatively highly aggregated level. The IMF has also published a Climate Change Indicators Dashboard.¹³ This is an interactive dashboard which shows indicators for individual countries. All three dashboards serve different user needs, complement each other and contribute to more transparency.



¹² Presentation by Ángel Iván Moreno and Teresa Caminero García, Banco de España, on "Application of text mining to the analysis of climate related disclosures" at the BdF/BIS/BBK International Conference on "Statistics for Sustainable Finance", 14 and 15 September 2021 in Paris. Link to presentations: [Events \(bis.org\)](https://www.bis.org/events)

¹³ The IMF Climate Change Indicators Dashboard is published here: [Climate Change Indicators Dashboard \(imf.org\)](https://www.imf.org/Climate-Change-Indicators-Dashboard)

In view of micro-data needs and possible proprietary data issues, catalogues listing data sources with an internationally harmonized structure make it easier to access climate-related data. A comprehensive approach requires the contribution of traditional stakeholders, such as statistical offices and central banks, as well as non-traditional stakeholders such as private data vendors. They all form part of a sustainable finance data universe. Unifying their resources in one data hub would be a big improvement for various data users, inside and outside of central banks.

We are looking forward to the follow-up to the G20 Data Gaps Initiative and to seeing concrete steps associated with these efforts. In the end, such long-term statistical initiatives require the underlying data to be collected in a harmonized and well-structured manner. Global taxonomy and disclosure efforts are therefore the basis for a sound statistical response.

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