Network for Greening the Financial System

2026 NGFS Nature package

Foreword and Cover Note

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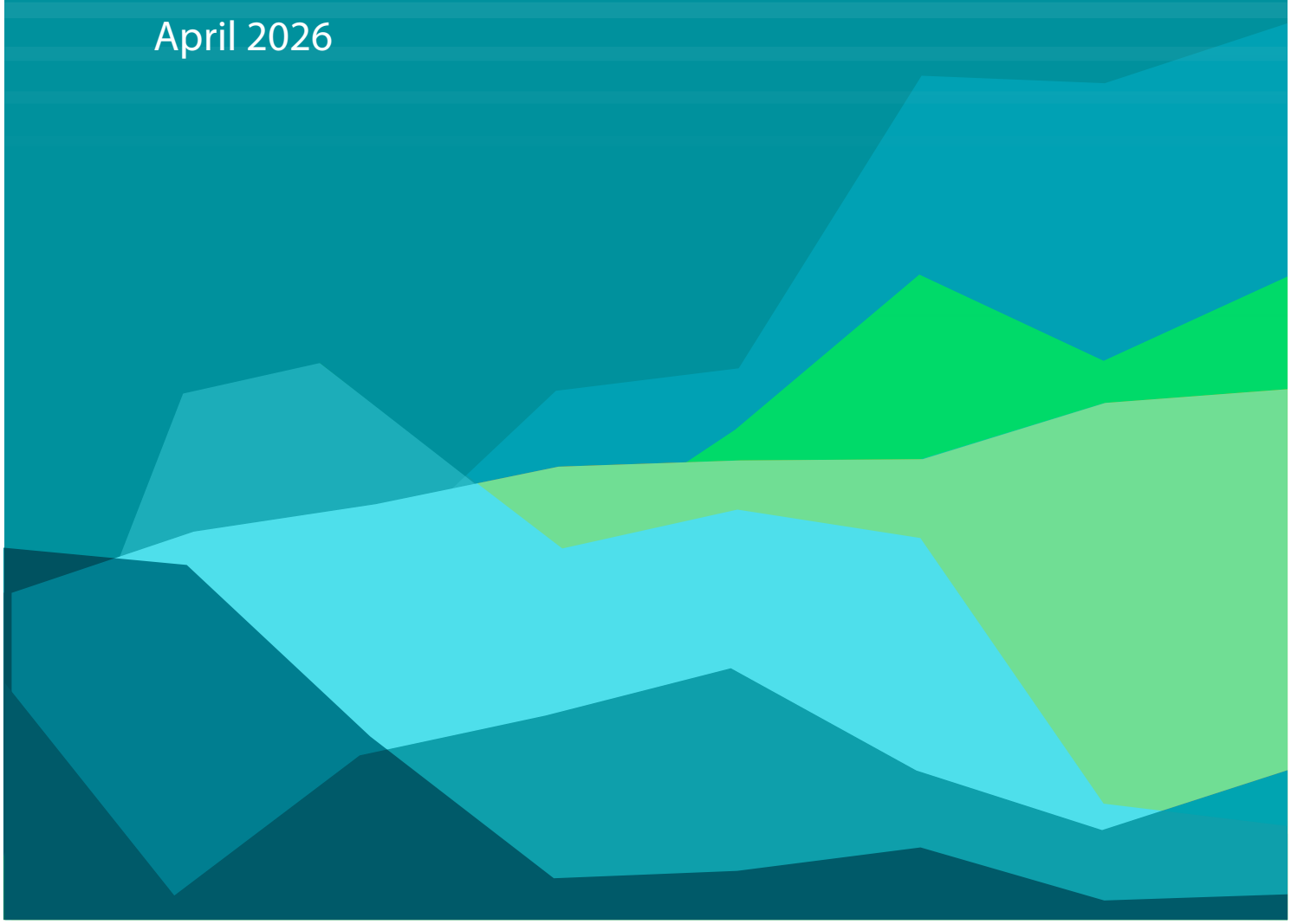

NGFS
Central Banks and Supervisors
Network for Greening the Financial System

Joint foreword

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Nature is a complex topic on which a shared stance and coordination of efforts are key to make concrete progress. Since 2022, the NGFS has worked on this issue to develop a common, science-based understanding of nature-related risks and their impacts on the financial system. Our previous nature-related publications[1] have laid the groundwork for a common understanding of nature across central banks and supervisors. They provided a useful framework, highlighted the materiality of nature-related financial risks, and outlined the key steps involved in their assessment. The focus now shifts from conceptualisation to implementation, which is the core objective of this package.

The three notes included in this nature package provide a comprehensive set of perspectives – technical, practical, and forward-looking – for understanding, assessing, and managing nature-related risks within the financial system. They show that existing methodologies and practices can already be applied. Central banks and supervisors should not hesitate to utilize the nature-related tools that have been developed in recent years, while looking at future enhancement – particularly for complex tools such as nature-related scenarios. This package also highlights that data availability is one of the linchpins of nature-related work. Despite the constraints related to data access and treatment, existing datasets and indicators already enable meaningful progress in risk assessment and supervisory practices.

We are proud to publish this first nature-related toolbox, which marks a milestone in our efforts to mainstream nature-related considerations across the work of the NGFS, alongside climate-related risks with which they are deeply interlinked. Such incremental steps are key to ensure that we act in a timely manner, leveraging on a growing base of knowledge and tools.

This package is the result of an unprecedented collaborative effort among our working groups, which we commend and encourage further in our future endeavours. We will continue to work to assist NGFS members in the challenging but crucial task of incorporating broader nature considerations in macroeconomic and financial stability analysis. We genuinely appreciate the commitment and dedication of all Workstream, Expert Network and Task Force members, who contributed to these three notes, as well as the valuable input and feedback provided by other stakeholders. Our special thanks go out to the team leads whose effective leadership ensured the seamless coordination for this package.

1 Such as NGFS (2024), Nature-related financial risks: a Conceptual Framework to guide Action by Central Banks and Supervisors.

Cover Note

Nature-related risks could pose significant risks to the global financial system. The collapse of key ecosystem services – such as pollination, fisheries, and timber – could reduce global GDP by up to US $2.7 trillion annually by 2030[2, 3]. This underscores both the scale of dependency on the ecosystem services provided by nature and the need for the financial system to integrate nature-related considerations into risk frameworks. Despite this context, the inherent complexity of nature[4] compared with climate-related work have so far limited widespread risk assessment efforts by central banks and supervisors. This does not imply, however, that the tools at their disposal cannot be used, let alone improved.

Following the publication of the NGFS Conceptual Framework on nature-related financial risks (2024)[5], the NGFS continues to support the analysis of nature-related financial risks with the publication of this Nature Package, to further operationalise the common understanding of these risks, notably as established in its earlier work.

The package includes:

- A technical note on nature-related data showcasing relevant indicators and methods that can be used for the financial analysis of these risks.
- A note on nature scenarios providing a picture of current technical discussions aimed at narrowing the gap in modelling and financial risk scenario design, and subsequent recommendations on nature scenario design.
- A note on the supervision of nature-related financial risks demonstrating concrete examples and tools taken by supervisors to assess nature-related financial risks and proposing a step-by-step approach for supervisors to assess these risks.

Overall, two main cross-cutting messages can be drawn from this set of notes. **First, data availability, despite complexity, enables action, by supervisors and central banks.** While nature-related risks lack a single metric equivalent to CO_2 for climate, existing datasets and indicators (e.g., ENCORE, input-output tables, TNFD frameworks) allow meaningful progress in risk assessment and supervisory practices. **Second, existing methodologies and practices can already be leveraged.** Tools have been developed in recent years (e.g., system-wide risk mapping, impact measurement using indicators, use of heat maps). These methodologies – some of which are already operational – could be enhanced in the future, particularly regarding nature-related scenarios. [6]

The material comprised in this package can therefore be used as a toolbox to explore the implications of nature-related risks for their activities and undertake the relevant nature integration work.

The NGFS invites supervisors and stakeholders to use this package as a complement to the NGFS Conceptual Framework on nature-related financial risks for developing supervisory frameworks and strengthening financial system resilience.

2 World Bank (2021), Protecting Nature Could Avert Global Economy Losses of $2.7 Trillion Per Year. While only considering a subset of ecosystem services, this lower-bound estimate of economic impacts already suggests the macroeconomic and financial stability consequences of further nature degradation would be of first order.

3 Global GDP stood at around USD 111 trillion in 2024 according to the World Bank.

4 E.g. no single metric or policy that would be the equivalent of CO_2-eq or net zero, importance of tipping points and non-linearities, local phenomena with potentially global consequences; see NGFS (2023), *Recommendations towards the development of scenarios for assessing nature-related economic and financial risks.*

5 NGFS (2024), Nature-related financial risks: a Conceptual Framework to guide Action by Central Banks and Supervisors.

6 These conclusions are consistent with the findings of recent academic work. See https://www.lse.ac.uk/granthaminstitute/news/time-to-align-economic-practice-with-ecological-reality-the-critical-need-to-include-nature-in-macroeconomic-models/.

1) Note on navigating nature-related data: metrics, sources and uses

This note provides an overview of available nature-related indicators and methods that can be used for the financial analysis of nature-related risks. In fact, the inherent multidimensionality of nature-related risks has led to the development of a large set of indicators and measures, which may become difficult to navigate. In this context, the first aim of this note is to provide guidance for the identification of the relevant metrics, based on different use cases – monetary policy, micro-prudential approaches, etc. – across which targeted metrics and data requirements may differ. This "use case" approach is necessary to assess the practical usefulness of the indicators.

Prioritizing metrics and indicators is important to ensure their relevance for risk and impact assessments. After introducing the various conceptual frameworks that have been designed, the note explains how to explore the *Task Force for Nature-Related Financial Disclosures*' (TNFD) metrics and indicators for disclosure, based on the specific use cases of the NGFS members and stakeholders. It puts the focus on a subset of TFND's recommended metrics and indicators by applying five criteria: focusing on metrics of land use and land cover change; accounting for the climate-nature nexus; taking into consideration the geographical location of impacts and dependencies; selecting complementary metrics to capture the multidimensionality of nature-related risk; and considering the relative data availability. This selection provides a subset of 50 TFND metrics that are the particularly relevant as an entry point for the different macroeconomic and financial analysis use cases identified in this note.

A series of case studies illustrate how nature-related data indicators can be integrated in financial risk analysis. The note explores **4 cases,** ranging from the **dependency of economic sectors** on ecosystem services in the **Euro area** and in **Malaysia** to **water pollution analysis in the Oder River** up to **Milan's green infrastructure initiatives.** The challenges are important, especially regarding the data harmonization and inter-operability. Altogether, these 4 cases studies teach a few key lessons, such as the need for a dedicated data infrastructure to support risks assessment and the role of climate change as an amplifier of nature-related risk. They also show some of the limitations of the current methods, especially regarding the accounting for geographic variations or supply chain dependencies.

For financial authorities, nature-related risks need to be addressed both at the individual and systemic level. The case studies show that nature-related risk assessment requires the combination of several databases to overcome time and/or spatial gaps within each data source. Although a systemic approach can be effective, access to granular credit databases is key for nature-related financial risks assessment. This note highlights several thematic dimensions of data measurement, ranging from agricultural geospatial analysis to the location, characterization and valuation of infrastructure and various other asset types.

Despite these advancements, progress must be made in terms of data quality and availability. Due to the need for physically collected samples, nature-related data may not be available at all the relevant geographical locations. The assessment of environmental processes is especially sensitive to data gaps and quality issues, requiring precise geospatial data, such as detailed precipitation data for flood analysis. To overcome these challenges, the note presents emerging techniques involving AI tools and collaboration initiatives, such as public-private coordinated data collections.

2) Note on the improvement of modelling tools for nature-related scenarios

This note proposes a forward-looking approach to scenarios that could be developed in the future to better assess nature-related risks, according to different socio-economic trajectories and their interdependencies with ecosystem integrity and functions. While scenarios are strategic planning tools that will be crucial in considering the economic and financial implications of nature degradation, models currently available still struggle to capture the complex features of nature[7]. This is notably true for nature-economy models, as highlighted by the NGFS in 2023[8]. The strong interlinkages between climate and the broader dimensions

7 See footnote 3.

8 See NGFS (2023). *Recommendations toward the development of scenarios for assessing nature-related economic and financial risks.*

of nature ('climate-nature nexus') add a layer of interactions that ultimately requires joint assessment and solutions.

The note takes stock of the growing availability of practical tools aimed at helping central banks and financial actors assess the consequences of nature degradation. These tools are varied and range from specific databases (e.g. ENCORE[9], GLORIA[10], EXIOBASE[11]) to specific frameworks integrating global data with local context (ESGAP-SESi framework) or focusing on the creation of tailored narratives for nature-related risks (NVaR framework). Among these, the note highlights new tools and methods used or developed by NGFS members: De Nederlandsche's Bank's Ecosystem Service Degradation Sensitivity Indicator[12], the NVaR framework used by the European Central Bank[13], and Banque de France's model-based analysis of the macroeconomic materiality of nature degradation.[14] These approaches are entry points for understanding the implications of nature degradation but also highlight opportunities for further development, that the note then elaborates upon.

A key field of improvement on the way to developing accurate nature-related scenarios is data infrastructure and analytical tools. The note therefore lists key priorities for action in this field, including enhancing granularity, embracing multi-disciplinary approaches and standardizing uncertainty analysis.

The note goes beyond modelling and data to list core design considerations that should be considered for future NGFS nature scenarios, such as balancing plausibility with severity, including the possibility of tipping-points; choosing an analytical perspective depending on final use; deciding on scale ("local-global tradeoff") and time horizon; and choosing between standalone nature scenarios or integrated climate-nature scenarios.

Based on all this, it lists several high-level recommendations addressed to modellers in central banks, supervisors, and the potential academic stakeholders that they would collaborate with to go ahead with the next steps towards the development of full-fledged scenarios:

1. Even if nature is multi-dimensional and local, a unified set of global nature risk scenarios could be very beneficial for the policy and business community.
2. Fostering the collaborative development of analytical capabilities, both within central banks and in the broader research community, is essential.
3. It is important to build upon the aforementioned methodologies that have already been developed and applied, while complementing those with new approaches.
4. A core principle underpinning the credibility of all efforts must be the commitment to strong validation.
5. NGFS's envisioned scenarios aim to capture nature-specific features, while maximising consistency and complementarity with existing NGFS climate scenarios.

3) Note on the Supervision of nature-related financial risks

This note shows that financial institutions are increasingly exposed to nature-related financial risks. Banque de France[15] highlighted that 42% of the value of securities held by French financial institutions comes from issuers highly or very highly dependent on at least one ecosystem service. Systemwide studies show clear links between nature degradation and macrofinancial stability, as well as strong climate-nature interconnections.

The note begins by recalling the definition of nature-related financial risks and their links with climate-related financial risks. Building on the prior work of the NGFS, nature-related financial risks cover both environmental and climate-related financial risks, and reflect both physical

9 ENCORE.

10 Gloria.

11 Exiobase – Home.

12 Gallet, Sebastien, Antje Hendricks, and Julja Prodani. *Integrating Nature Dependence and Degradation into Credit Risk Estimations: The Ecosystem Service Degradation Sensitivity Indicator (EDSI)*. Working Paper no 814, August 27, 2024.

13 Ceglar, A., *et al.* (2025). *Nature at risk: Implications for the euro area economy and financial stability*. ECB Occasional Paper Series no 380.

14 Wegner, O., *et al.* (2025), *Seeds of Inflation: Macro Modelling of Nature-Related Risks through Agricultural Prices*, Banque de France Working Paper no 1006.

15 Banque de France (2021), A "Silent Spring" for the Financial System? Exploring Biodiversity-Related Financial Risks in France.

risks (ecosystem degradation, biodiversity loss, water scarcity) and transition risks (policy, regulatory, market and technology changes associated with global biodiversity objectives). These risks are transmitted to financial institutions through traditional financial risk categories (i.e. credit, market, operational, liquidity, underwriting). Financial exposures to nature, and potential destabilising effects on the financial sector, are leading supervisors to examine existing methods for assessing these risks. Supervisors could play a significant role in catalysing and guiding financial institutions' actions by developing a supervisory framework calibrated to the estimated financial exposures and vulnerabilities.

The note highlights a growing set of existing qualitative and quantitative tools (ENCORE, TNFD LEAP, biodiversity footprints, water risk indicators, scenario analyses) that supervisors can rely on. The note also highlights concrete initiatives taken by supervisors to assess nature-related financial risks (e.g., analysis of exposures, adjustment of the micro-prudential framework, conduct of materiality assessment).

While receiving growing attention, methodologies, data and supervisory practices remain less mature than those for climate. Accordingly, the note recognises that challenges remain when assessing nature-related financial risks. Among these challenges, it highlights data gaps and methodological fragmentation (no single metric equivalent to CO_2; complex, localised ecosystem processes), proportionality issues (risk is not necessarily linearly correlated with institution size; smaller, concentrated institutions may be disproportionately vulnerable), and the need for climate nature integrated supervisory approach (risks are interdependent, and supervisory frameworks can build on climate supervision to expand to broader nature issues).

Despite these limitations, supervisors do have scope for action. The note proposes a four-step supervisory approach, adapted to progressively overcome these challenges:

1. Enhance understanding of nature-related financial risks: supervisors can start by identifying and assessing nature-related risks and their link to the financial stability mandate.
2. Define supervisory expectations: based on initial assessments, supervisors can set supervisory expectations for individual financial institutions and at the market level.
3. Engage with financial institutions: supervisors can engage proportionally with financial institutions to assess their practices and make sure they perform their risk analysis taking into account nature-related risks, when present.
4. Support risk management by financial institutions through supervisory tools: supervisors could integrate nature-related financial risks into traditional risk categories (e.g., credit, market, operational risks) and develop future supervisory tools (e.g., nature stress-testing, integration of nature into transition plans).

The note lays the foundations for a pragmatic, progressive and integrated supervisory approach to nature-related financial risks. It encourages supervisors to leverage existing climate supervisory frameworks, address data and methodological gaps, and gradually build a coherent prudential architecture that enhances both micro and macrofinancial resilience to nature loss.


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