NGFS
Central Banks and Supervisors
Network for Greening the Financial System

NGFS Public Outreach Nature Package

April 9th 2026

Agenda

- Introductory remarks by Sabine Mauderer (NGFS Chair)
- Keynote speech by Nicola Ranger (pre recorded) (Executive Director of Earth Capital Nexus and Professor in Practice, Grantham Institute)
- Presentation of the note on modelling tools for nature-related risk scenarios by Elias Albagli (Co Chair, TF Nature)
- Presentation of the note on nature-related data by Li Ming Ong (Co Chair, EN Data)
- Presentation of the note on the supervision of nature related risks by Alberto Casillas (Co Chair, WS Supervision)
- Q&A

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Introductory remarks

Sabine Mauderer, NGFS Chair

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Keynote speech

Nicola Ranger, Executive Director of Earth Capital Nexus and Professor in Practice, Grantham Institute

Note on modelling tools for nature-related risk scenarios

Elías Albagli (Banco Central de Chile)
Co-Chair of the Task force on nature-related risks

Nature-related scenarios are necessary for macro-financial risk assessment. Developing them requires overcoming several challenges

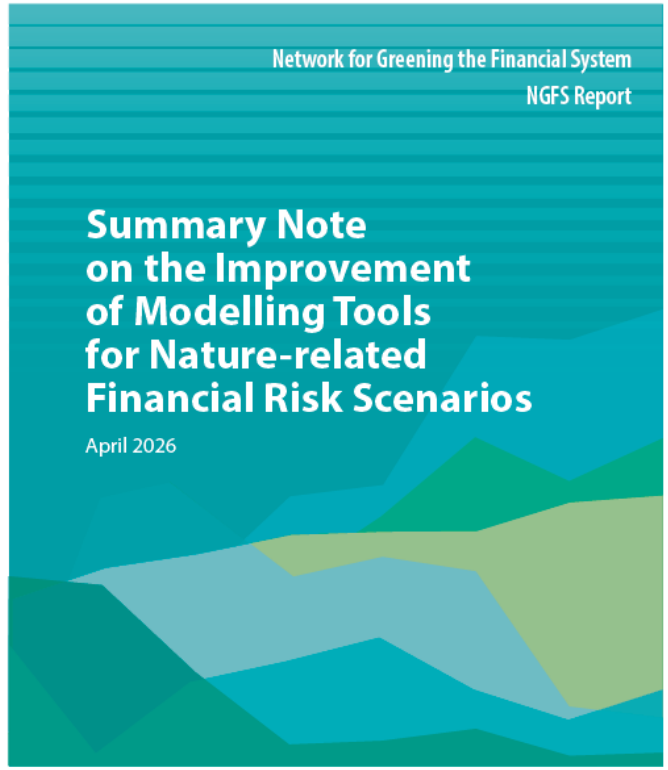
- **NGFS (2024) conceptual framework on nature-related financial risks:**
  - Ecosystem services are indispensable to long-term economic development.
  - Human-induced degradation of these services creates **physical risks**, as well as **transition risks** from the policy responses needed to halt the degradation of natural capital.

- **The NGFS is focused on developing scenarios to enable central banks and supervisors to evaluate such risks.** This requires addressing several challenges:
  - Ecosystem functions at stake are **numerous**, subject to **multiple stressors**, and spanning **interconnected dimensions** of the biosphere, including ***climate-biodiversity*** interactions.
  - Ecosystem dependence and impact on economic activity is highly **location-specific** and **non-linear** – ***tipping points*** being a key feature.
  - **Data** availability and quality on ecosystem dependence and impact across locations and economic sectors is highly heterogenous.

- **The note on modelling tools for nature-related scenarios:**
  - **Takes stock of emerging methodologies** for economic and financial modelling of nature-related risks.
  - Highlights recent progress, **including work by NGFS members** and researchers.
  - **Acknowledges remaining gaps** and sets a **forward agenda** to embed nature-related risks into macro-financial analysis and prudential oversight.

Structure of the note

1. Introduction
2. The Climate-Nature Nexus
3. Noteworthy Advances Are Emerging
4. Bridging the Gaps in Data and Modelling for Nature-Related Risk Assessment
5. Towards nature risk scenarios
6. Recommendations for the Development of Nature-related Financial Risk Scenarios



The climate-nature nexus

Several dimensions of nature jointly determine the stability of our biosphere. The climate-biodiversity nexus represents one of these key interactions.

- **Reinforcing feedback loops**: Climate change accelerates nature degradation, weakening ecosystems' ability to regulate climate (e.g., reduced carbon storage).
- **Hidden vulnerabilities**: partial/separate analysis of these dimensions can miss critical interaction dynamics –e.g., species migration that disrupts ecosystems.
- **Policy interactions**: climate adaptation may degrade or enhance ecosystems; nature-based solutions can contribute to climate mitigation and adaptation.

This requires a joint assessment of these dimensions:

- Integrated scenarios provide **more accurate and granular** risk assessments.
- Credible nature-related financial risk frameworks require **interdisciplinary collaboration** (ecology, earth sciences, economics, finance, data science).

Connection
Climate change as a driver of nature risk
Nature degradation as a driver of climate risk
Climate change mitigation and adaptation as a potential driver of nature risk
Nature as a solution to decrease climate risk (i.e. nature-based solutions[1])

Noteworthy advances are emerging

- Practical tools have emerged in recent years to help central banks and supervisors measure whether degradation could threaten financial portfolios.
- These approaches provide entry points for understanding nature-economy linkages but need to be complemented by emerging methods addressing some of their limitations.

Databases

ENCORE

Input-output tables

EXIOBASE

GLORIA

Essential to map dependances and pressures.
But, **overlook area-specific contexts, are <u>essentially static</u>, <u>unable to capture tipping points</u>, <u>macroeconomic feedback loops</u>, <u>multiplier effects</u>.**

Emerging methods

EDSI Framework – moves beyond static exposure

NVaR – sector-specific nature-related value-at-risk

Biophysical models – incorporate specific linkages between ecosystems and the economy

Macroeconomic models – assess impacts of nature degradation on macroeconomic outputs

Address some of the current limitation by integrating global data with local context, creating narratives and **<u>provide a more refined analysis</u>.**

Bridging data and modelling gaps for nature risk assessment

Challenges remain regarding data infrastructure and analytical tools, including:

- Nature-related data exhibits significant variations in **quality, coverage**, and **consistency.**
- Standard macroeconomic models are often not **spatially-explicit** or **lack sufficient sectoral and spatial detail** to capture important features of economy-ecosystem dependencies.
- Even advanced nature- economy models struggle to handle more than a handful of ecosystem services and connections to specific sectors.

The note lists key priorities for action in this field, notably:

- **Enhancing granularity** (for geospatial data, in modelling frameworks)
- Using an **integrated modular approach** (e.g. coupling macro-financial models with sector-specific models)
- Strengthening **biophysical-economic linkages** in modelling frameworks
- Standardizing **uncertainty analysis** (e.g. running diverse models in parallel, conducting sensitivity analyses and robustness checks)

Towards nature-related financial risk scenarios

When designing NGFS nature risk scenarios, several **core considerations** beyond modelling and data are crucial:

- Balancing **severity** (economy-centered view) with **plausibility** (ecosystem-centered view)
- Choosing the analytical perspective (**macro vs. micro**)
- "***Local-global trade-off***"
    - Global focus → system-wide shocks (e.g., global scale tipping points) and their impact on global trade and outcomes in broad economic areas.
    - Local focus → location-specific disruptions and impacts.
- Choice of the time horizon (**short-term vs. long-term scenarios**)
- Trade-off between **simplified and more in-depth assessments** (few or several ecosystem services and economic linkages).
- Trade-off between developing **stand-alone nature risk scenarios** versus those **integrated with climate change**

Recommendations for the development of nature-related financial risk scenarios

1- Develop a unified set of global nature-related financial risk scenarios - Drawing inspiration from NGFS climate framework used for climate analysis

2- Fostering co-development of analytical capabilities – both within central banks and supervisors and in the broader research community

3- Build upon the promising methodologies that have already been developed and applied – Valuable insights for both methodological advancement and practical risk management can be gained by further refining the approaches currently utilized while complementing those with new approaches

4- Rigorously test model outputs against observed, real-world data – strong validation can be maintained by developing transparent frameworks, conducting sensitivity analysis and maintaining open-source code and documentation

5- Maximize consistency and complementarity with existing NGFS climate scenarios – the integration of climate- and nature-related financial risk scenarios will allow for the assessment of cumulative and amplifying risks

➔ **Next step for the NGFS: model comparison exercise taking these recommendations into account**

Navigating nature-related data: metrics, sources and uses

Li Ming Ong (Bank Negara Malaysia)
Co-chair of the Expert Network on Data

Key messages

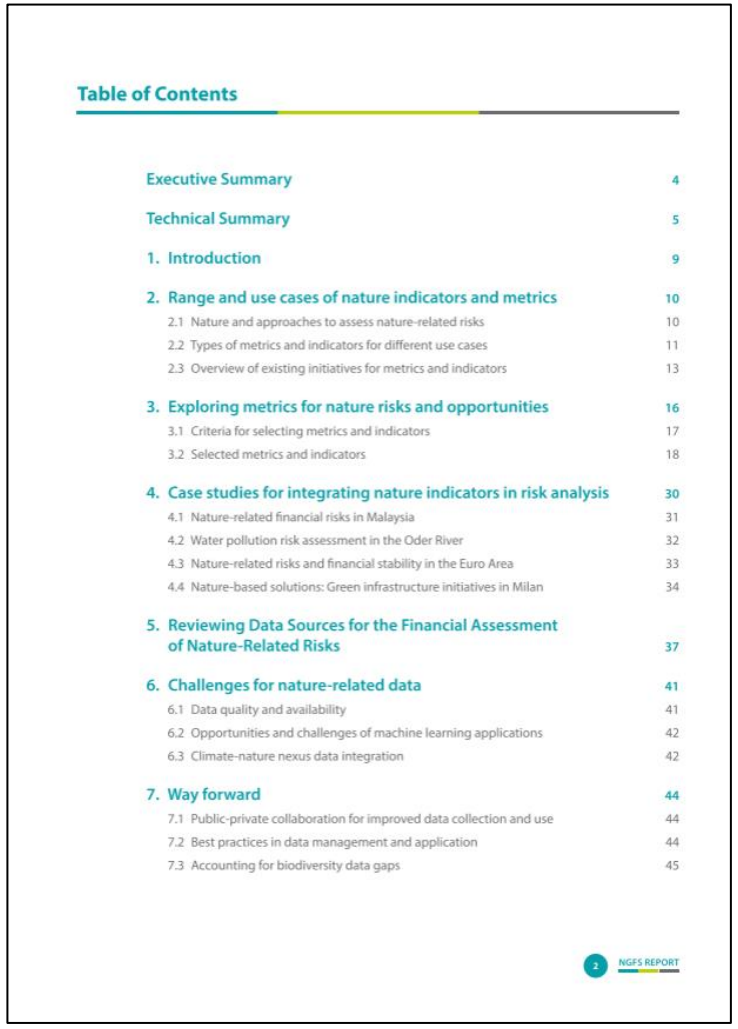


Table of Contents

The note provides **an overview of available nature-related data resources and methods to integrate them in risks assessment** by gathering the experience of various actors.

It is designed to address multiple use cases, including micro-prudential supervision, macro-prudential oversight for financial stability, macroeconomic analysis for informing monetary policy, statistical indicators, general research, non-supervisory engagement, and portfolio management.

The note spans a **broad set of data themes**, from agricultural geospatial analysis to the location, classification, and valuation of infrastructure and other asset types.

A subset of TNFD's indicators can be used as an entry point

Based on various use cases among central banks and supervisory functions…

- Micro-prudential supervision
- Macro-prudential supervision for financial stability
- Monetary policy
- Statistical analysis and research
- Non-supervisory engagement
- Portfolio Management

…combined with a set of criteria to perform risk and opportunities assessment…

1. **Land-use change**
   A priority given it is the main driver of nature degradation, biodiversity loss and water stress.
2. **Climate-nature nexus**
   Consideration given due to the relevant interaction between climate change and nature change.
3. **Multidimensionality**
   Select complementary metrics to account for complexity in risk assessment.
4. **Geographical location**
   Location of impacts and dependencies on nature is crucial for accurate assessments.
5. **Data availability**
   For the implementation of metrics and indicators.

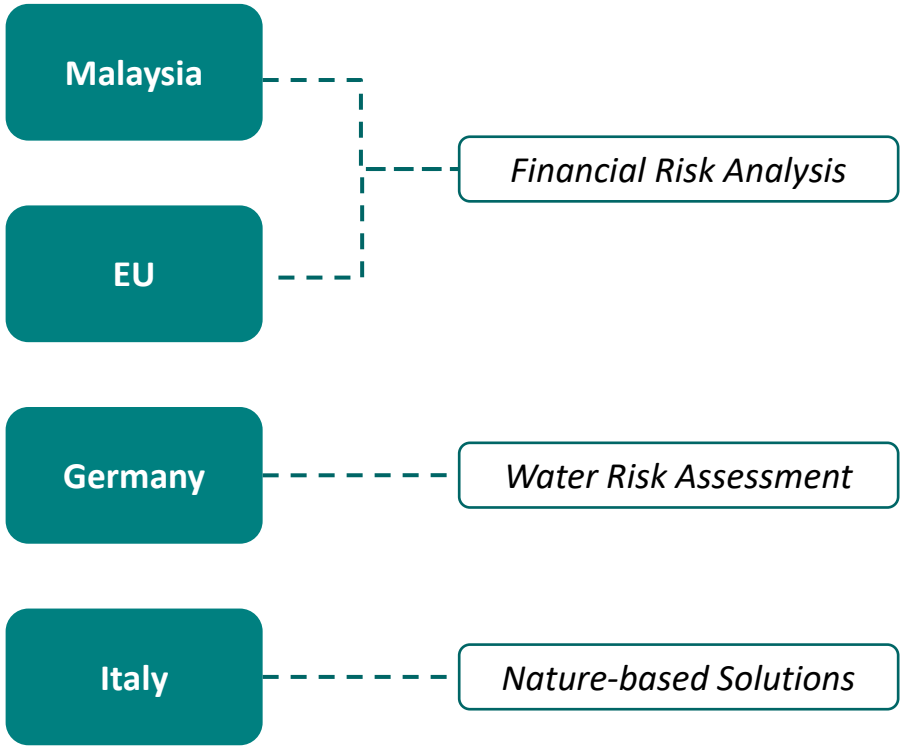
…50 TNFD metrics and indicators were identified as having good practical usability

Distribution of Selected TNFD Metrics		
	Core	Additional
Nature-related dependencies and impacts	7	9
Nature-related risks and opportunities	2	6
Responses to nature related issues		1
Sectoral metrics (core and additional)		
Aquaculture	2	
Biotech and pharma	0	
Electric utilities and power	2	
Food and agriculture	11	
Forestry, pulp and paper	4	

Note: This metrics-selection initiative does not constitute an NGFS position, nor a recommendation toward standard-setting initiatives. It should be understood as an entry point into the broader TNFD data landscape.

Case studies for integrating nature indicators in risk analysis

Four case studies illustrates existing methodologies used to assess nature-related risks and opportunities



How different datasets are applied in practice

- Combine financial exposure data (sectoral loans, firm locations) with nature-risk indicators
- Assess how physical nature risks translate into financial vulnerabilities (e.g. credit and concentration risks)
- Support supervisory monitoring and scenario-based risk assessment

- Link macro-environmental indicators (climate, biodiversity, land use) with firm-level financial data
- Ensure comparability across countries using consistent indicators and classifications
- Quantify system-wide exposure to nature-related risks

- Use hydrological and water-quality datasets to assess pollution and water stress
- Overlay environmental risks with economic activity and infrastructure
- Identify high-risk locations and vulnerable sectors

- Combine urban, land-use, and ecosystem data to identify nature-based infrastructure options
- Evaluate benefits in terms of risk reduction, resilience, and co-benefits
- Support policy design and investment prioritisation

Challenges

Data quality and availability

- Nature-related data is geographically constrained, weakening biophysical modelling reliability.
- Global datasets are useful, but accuracy improves with finer geospatial granularity.
- Gaps in key ecosystem-service parameters limit business-relevant assessments.
- Entity-level risk analysis requires data reported directly by companies.

AI applications

- Machine and deep learning can uncover input–output relationships in environmental data
- However, AI is data-intensive and may oversimplify complex processes.

Climate-nature nexus

- Assessing nature-related risks requires data capturing interactions between climate and nature risks.
- Persistent data gaps constrain integrated climate–nature assessments.
- Location-specific and complex interactions constrain the applicability of global models.

The way forward

Strengthening public-private collaboration

- Improve coordination on nature-related data collection, sharing, and use.
- Better align data efforts with policy and supervisory needs.
- Leverage technology and support locally driven data generation.

Advancing data management and application

- Promote more systematic and transparent use of validated datasets.
- Strengthen model calibration using observed data where available.
- Use proxy approaches where necessary, with clear limitations.

Addressing biodiversity data gaps

- Apply statistical methods to improve usability of incomplete data.
- Complement official data with citizen science and ground-based observations to improve spatial coverage and reduce monitoring gaps.
- Strengthen consistency through standardised monitoring and sustained investment.

Note on the Supervision on Nature-related Risks

Alberto Casillas (Banco de España)
co-Chair of the NGFS WS Supervision

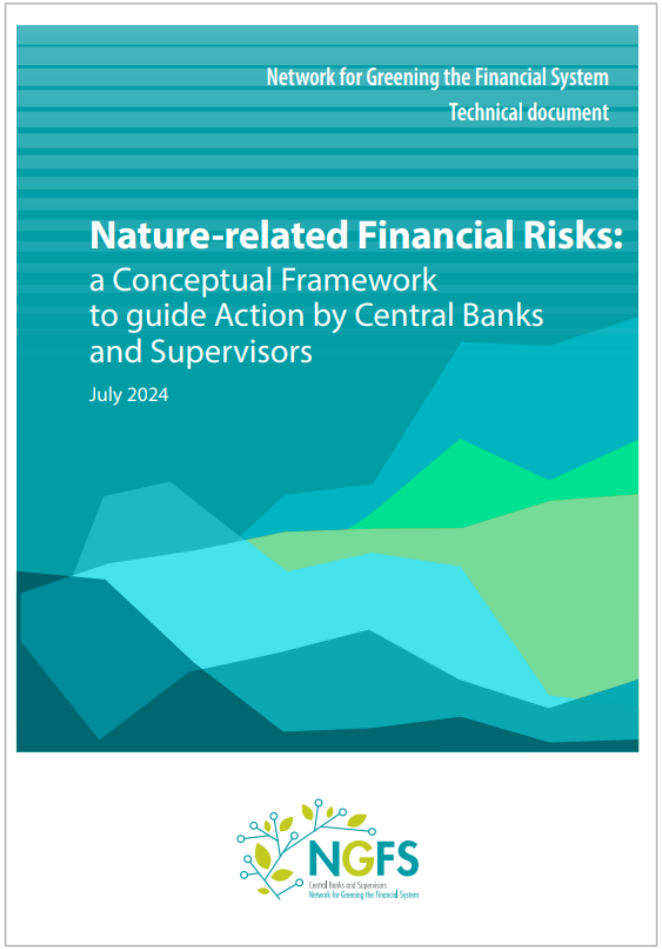
Context

Objective: consolidate and exchange supervisory practices on the integration of nature related risks within supervisory frameworks and practices.

2-step approach:

- Stocktake of supervisory practices through a series of 8 presentations
- Literature review and in-depth analysis to draft a note for supervisors

Foundational document: NGFS Conceptual Framework on Nature-related financial risks



Key messages

Section 1: Understanding and assessing nature-related financial risks

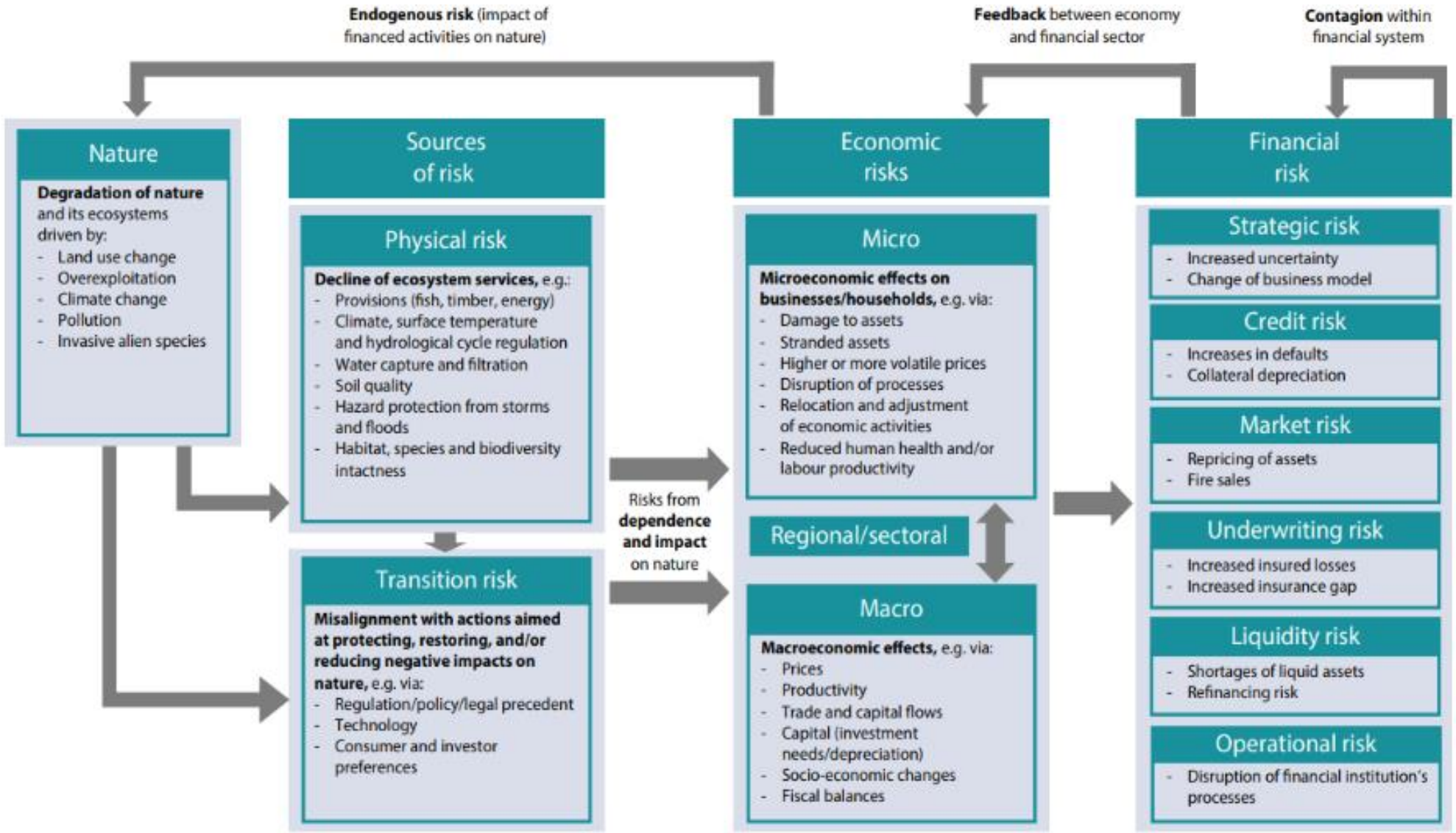
Micro-level
Current practices for assessing risk (institutions and supervisors)

- Frameworks (e.g., NGFS)
- Heat maps and risk assessment methods (e.g., LEAP and ENCORE for dependencies, EXIOBASE for transition risks)
- Metrics (e.g., Biodiversity Intactness Index) with a focus on financial impacts (e.g. Ecosystem Degradation Sensitivity Indicator)

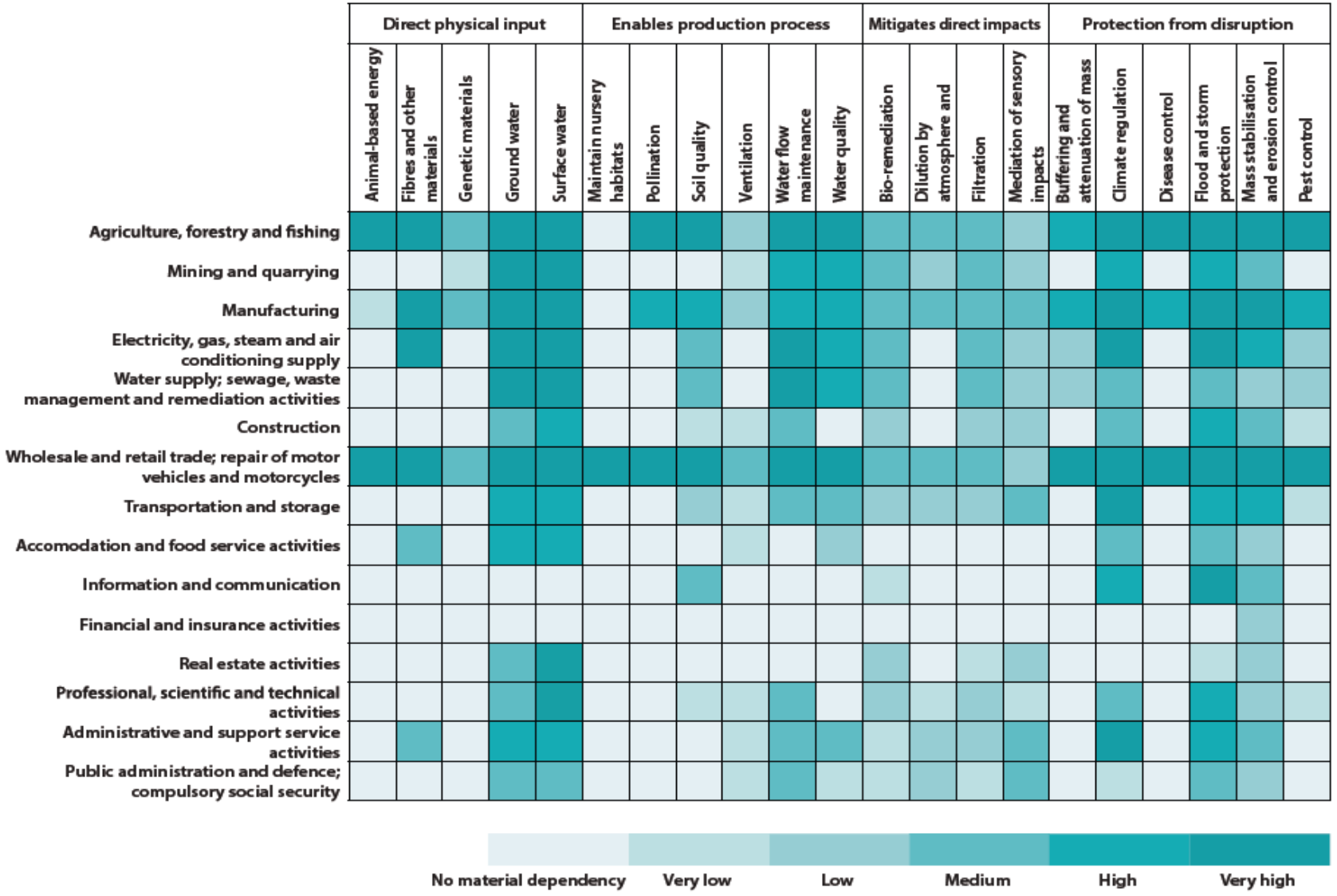
Macro-level
Supervisory practices

- Macroeconomic analysis (global cost of nature risks for the financial sector)
- Benchmarking of institution's good practice
- Development of nature stress-tests and scenario analysis

An anchor: the NGFS conceptual framework



An illustration: EIOPA-ECB mapping of insurers' ecosystem dependencies



Key messages

Section 2: Guidelines for supervisory action

Supervisory challenges (Examples)

Challenges for supervisors	Possible approaches
Complexity of climate and social nexus	Development of integrated risk assessment model to maximize synergies and minimize trade-offs
Incomplete data and non-standardized methodologies	Identification of substitution proxies
Applicability of proportionality	Consideration of materiality assessment and adoption of flexible approaches
Interactions with climate-related supervisory frameworks	Scale-up and adapt existing capacities and tools on climate (e.g. transition plans)

Supervisory Tools: 4-phase approach

1. **Enhance the understanding of nature-related supervisory mandate and financial risks**
2. **Define supervisory expectations**
3. **Enhance micro-supervision through supervisory dialogue**
4. **Integrate nature risks in traditional supervisory tools**

A **practical tool** for supervisors to evaluate the level of advancement of an institution in tackling nature-related risks

Box 12

Questions for supervisors to consider when assessing financial institutions' practices

1) Materiality and risk assessment

- What is the financial institution's risk and materiality assessment methodology?
- Does the financial institution distinguish between physical and transition risks in its analysis, as well as between impacts and dependencies? Does it assess material risk drivers separately? Does it assess concentration risk across risk drivers?
- Does the financial institution identify material exposures to nature-related risks?
- If so, over which time horizons, and what level of risk? What are the most sensitive economic sectors, risk drivers and geographies for the financial institution in terms of nature-related risks?

2) Governance and strategy

- Have responsibilities been assigned within the financial institution to assess, monitor, and manage nature-related risks? Are the associated processes defined for the three lines of defence?
- Do training policies and remuneration policies include nature-related considerations?

3) Risk management framework

- Which risk metrics does the financial institution use to assess and monitor its exposure to nature-related risks? Does the financial institution use forward-looking tools such as scenario analysis or stress testing?
- Has it defined its nature risk appetite? Has it consequently adapted its risk policies and processes, notably through sectoral policies, and/or risk-driver-level policies to ensure that its strategic and risk objectives are met over time?
- How does the nature risk assessment impact decision-making by the financial institution?
- What mitigation strategies are implemented to address material impacts from nature-related risks to institutions' financial performance?

4) Engagement

- Does the financial institution participate in market initiatives to develop methodologies for nature risk assessment and management?
- Does the financial institution have client- or investee-level policies to engage with them on considerations of nature-related risk and impacts on nature, and ensure their alignment with group policies over time?

5) Data and disclosure

- Has the financial institution defined a data policy on nature-related risks and impacts on nature? Which data gaps does it face, and what are its policies in place to address these gaps?
- Does it disclose information on its exposure to nature-related risks and its impacts on nature? Does this disclosure accurately reflect the institution's practices?

6) Transition plans and transition planning

- Does the financial institution integrate nature-related risks into its transition planning processes, including the development of a transition plan? If so, what are the quantitative or qualitative objectives set in terms of transition risk and physical risk mitigation? If not, has the financial institution set out timelines for establishing these processes and plans?
- Does the financial institution allocate sufficient budget and capital to potential disaster events?
- Does the financial institution evaluate its nature-related footprint considering the negative impacts, avoided negative impacts, and positive impacts on nature resulting from its activities?
- Does the financial institution integrate policy scenarios in line with international conventions (e.g., the Kunming-Montreal Global Biodiversity Framework) or local regulatory objectives to determine its transition risk?
- Does the transition plan acknowledge trade-offs between climate and nature objectives considering their interconnectedness? If so, how does it address them and aim to mitigate negative impacts?

Main takeaway: 10 recommendations for supervisors

1. Clarify how nature-related risks are part of the supervisor's **mandate**
2. Integrate nature-related risks **with climate** risks in the supervisory approach
3. Strengthen knowledge of **indicators** and frameworks to **quantify** nature risks
4. Implement nature **stress-testing**, scenario analysis, system **risk mapping**

Understanding

5. Define supervisory **expectations** for financial institutions on nature risks
6. Apply expectations proportionately in line with **materiality** assessment (≠size)

Supervisory expectations

7. Engage with institutions to assess their level of nature **risk management**
8. Analyse in a critical manner institutions' techniques for **mitigating** nature risks

Supervisory dialogue

9. Implement supervisory **measures** from qualitative to quantitative tools
10. Extend **transition plan** supervision to nature risks

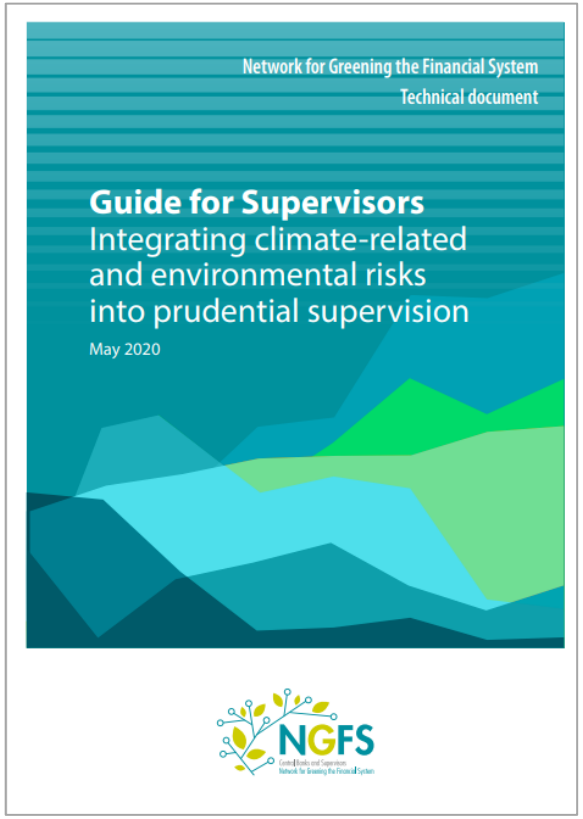
Supervisory tools

Conclusion

The note will be also used as input for the update of the 2026 Guide for Supervisors

The note has 3 main benefits:

1. Promote supervisory best practices and existing tools
2. Recognise concrete challenges and suggest ways of addressing them
3. Propose a 4-phase approach, allowing any supervisor to progress



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Q&A

Moderated by Yann Marin (Head of the NGFS Secretariat)

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Thank you!

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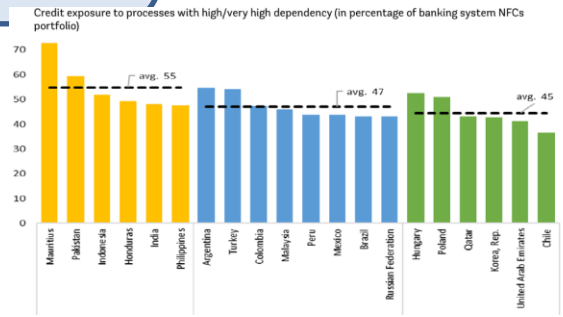
Annex

Sources of inspiration: presentations by leading authorities (1/2)

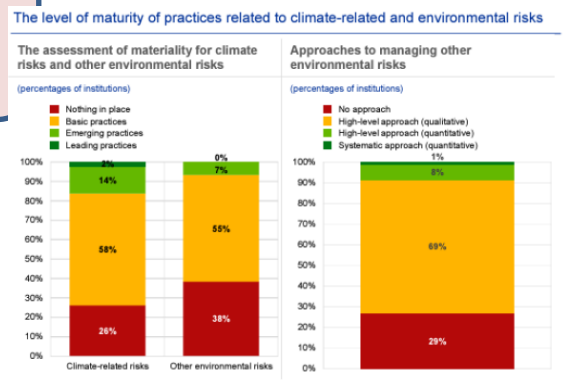
World Bank

Perspective on EMDEs' institutions specific exposure to nature risks



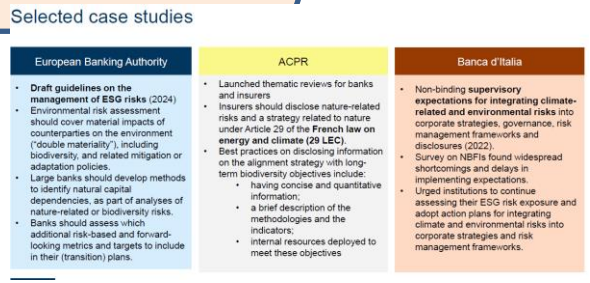
ECB

Insight on driving change/enforcement of supervisory measures



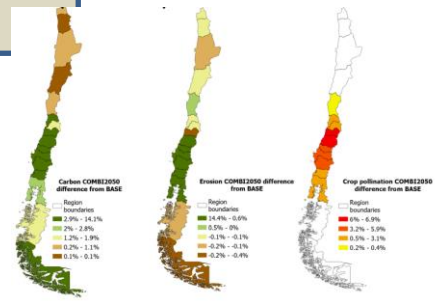
FSB

Notable practices of several supervisors



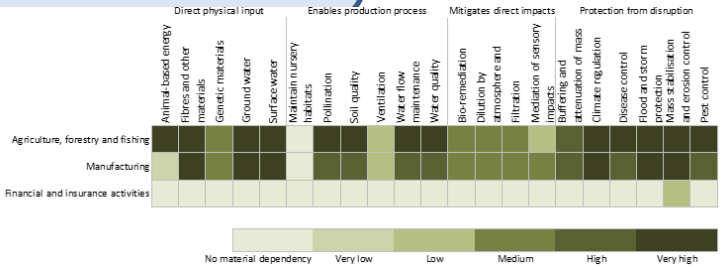
Banco Central Chile

Model for calculating economic benefits of nature protection



Sources of inspiration: presentations by leading authorities (2/2)

EIOPA
Biodiversity risks for insurers (esp. underwriting)



Banco Central do Brasil
Supervisory model for measuring transition risks

FINMA
Circular on nature-related financial risks

finma

WWF
SUSREG report