

# Stocktake on Nature-related Risks

Supervisory and regulatory approaches and perspectives on financial risk

18 July 2024



The Financial Stability Board (FSB) coordinates at the international level the work of national financial authorities and international standard-setting bodies in order to develop and promote the implementation of effective regulatory, supervisory and other financial sector policies. Its mandate is set out in the FSB Charter, which governs the policymaking and related activities of the FSB. These activities, including any decisions reached in their context, shall not be binding or give rise to any legal rights or obligations.

---

Contact the Financial Stability Board

Sign up for e-mail alerts: [www.fsb.org/emailalert](http://www.fsb.org/emailalert)

Follow the FSB on X/Twitter: [@FinStbBoard](https://twitter.com/FinStbBoard)

E-mail the FSB at: [fsb@fsb.org](mailto:fsb@fsb.org)

# Table of Contents

Executive summary .....	1
Introduction .....	3
1. Perception of nature-related financial risks.....	4
1.1. Overview of authorities' initiatives.....	4
1.2. Financial risks from biodiversity loss and other nature-related risks .....	7
1.3. State of analytical work and selected case studies .....	13
2. Regulatory and supervisory initiatives on identifying, assessing and managing nature-related financial risks .....	17
2.1. Overview of authorities' initiatives.....	17
2.2. Guidance and requirements on nature-related risks.....	19
2.3. Selected case studies.....	27
3. Challenges and future developments .....	33
3.1. Challenges identified by authorities .....	33
3.2. Future developments .....	33
Annex: Regulatory and supervisory guidance and requirements on nature-related financial risks .....	35



## Executive summary

At the request of G20 Finance Ministers and Central Bank Governors, this report takes stock of regulatory and supervisory initiatives associated with the identification and assessment of nature-related financial risks. The stocktake also enquires about the perceptions of central banks and supervisors regarding whether nature degradation, such as biodiversity loss, is a relevant financial risk. It draws on a survey of participating FSB members and the work done by international organisations, including the conceptual framework developed by the Network for Greening the Financial System (NGFS) and work done by the Organisation for Economic Co-operation and Development (OECD), and funded by the European Union, on nature-related risks.

Financial authorities within FSB member jurisdictions are at varying stages of evaluating the relevance of biodiversity loss and other nature-related risks as a financial risk. Their approaches to the subject also differ according to their differing mandates. While some have conducted analytical work, which has led them to conclude that there is a material financial risk, others currently remain at the stage of broader monitoring of work on the topic internationally. A few authorities have decided not to work on this topic, due to data gaps and the need to give sufficient priority to climate risks (where analytical thinking and data are further progressed).

Financial authorities which are analysing the issue categorise nature-related risks into the same two types of risks typically used in climate-related financial risk analysis: physical risks and transition risks. In the case of nature, physical risks are those that may arise from the degradation of nature and affect economic activities that rely on a range of benefits provided by nature; and transition risks may arise from actions aimed at protecting, or reducing negative impacts on, nature. According to this analysis, such risks may have profound effects on both the real economy and, in turn, also on the financial system through the typical transmission channels for financial risks considered in prudential settings, e.g., credit risks, market risks and operational risks, and indeed with potential feedback to the real economy again. There is a growing focus on insurance underwriting risk if rising damages from deterioration of nature result in greater claims by policyholders, which could also potentially lead to an insurance gap if there is a reduction in the availability of insurance.

Those currently embarking on analytical work face major data and modelling challenges. Understanding of the data needs to conduct any empirical assessment is still at a formative stage and there is lack of reliable and consistent data on financial exposures to nature risks. Nonetheless, authorities' work to date indicates that financial institutions face large exposures to physical risk via their investments and financing activities. However, various authorities have noted that analytical work needs to be further developed to better translate those estimates of financial exposures into measures of risk. Meanwhile authorities recognise the strong connections between climate risk and nature, and that more needs to be done to develop a more holistic approach that considers interdependencies between climate- and nature-related financial risks.

Regulatory and supervisory work is also at an early stage globally, and approaches differ considerably across jurisdictions and institutions. That said, a number of authorities from both emerging markets and advanced economies already have regulatory and supervisory initiatives

underway. Supervisory guidance, where it exists, typically covers nature-related risks as part of an overall focus on environmental risks, including climate, and specific guidance on nature-related risks is often less detailed than on climate-related risks. And such supervisory guidance or requirements for financial institutions on the management of nature-related risks is typically integrated as one type of risk driver within the wider regulatory and supervisory framework.

As with climate-related risks, promotion of firm-level disclosures of nature-related risks typically forms an important component of regulatory and supervisory approaches for managing such risks. A number of financial authorities that have issued guidance or requirements on disclosures include nature-related risks as part of broader sustainability disclosures. They note that nature-related disclosure practices are generally at an earlier stage than for climate-related disclosures, and a number of authorities point to TNFD as playing a voluntary coordination role similar to that which TCFD did for climate.

There is a general recognition that more expertise is needed in the supervisory community, in central banks, and in the private sector to understand and, where needed, address nature-related risks. A number of capacity building initiatives are underway. International efforts include those of the NGFS to share among authorities, and develop, understanding of nature-related financial risks and of regulatory and supervisory approaches. Financial authorities also are conscious that this is not a subject on which they can act alone; it needs to be seen within a context of society's overall strategy, extending beyond the financial sector, to address nature degradation as a whole.

## Introduction

A growing number of financial authorities have been considering the potential implications of nature-related risk, including degradation of nature and biodiversity loss. The FSB, in its 2021 progress update to the roadmap to address climate-related financial risks, noted that, in addition to financial authorities' work on climate risks, understanding is also deepening of the implications of other sustainability topics, such as loss of biodiversity, for the financial system, albeit from a currently much less advanced knowledge base, and that the FSB would consider whether to include a broader range of sustainability topics in its financial stability agenda in future years.<sup>1</sup>

The G20 Finance Ministers and Central Bank Governors in February 2024<sup>2</sup> asked the FSB to conduct this stocktake of regulatory and supervisory initiatives associated with identification and assessment of nature-related financial risks, including to investigate the perception of central banks and supervisors regarding whether nature degradation, such as biodiversity loss, is a relevant financial risk.

International work on nature-related financial risks has been progressing. The Network for Greening the Financial System (NGFS) has developed a conceptual framework on nature-related risks for central banks and supervisors<sup>3</sup>, the Organisation for Economic Co-operation and Development (OECD), in cooperation with the European Commission, issued policy considerations on nature-related risks and opportunities and the interaction with climate-related risks<sup>4</sup>, and the World Bank has started to integrate nature-related risk analysis in their technical assistance.

To inform this stocktake, the FSB has surveyed financial authorities from participating FSB member jurisdictions and international organisations on their current and planned initiatives on nature-related risks.<sup>5</sup>

The report provides insights on authorities' approaches, recognising the early stage of work on nature-related financial risks and the diversity of authorities' mandates and approaches to date. First, the stocktake sets out authorities' perceptions of nature-related risks; it then delves into

---

<sup>1</sup> FSB (2021), *FSB Roadmap for Addressing Financial Risks from Climate Change*, July.

<sup>2</sup> Chair's Summary – 1st G20 Finance Ministers and Central Bank Governors Meeting, 28-29 February 2024

<sup>3</sup> NGFS (2024), *Nature-related financial risks: a conceptual framework to guide action by central banks and supervisors*, July.

<sup>4</sup> OECD (2023), *A supervisory framework for assessing nature-related financial risks*.

<sup>5</sup> Responses were received from the following authorities from FSB member jurisdictions: Australia (Australian Prudential Regulatory Authority (APRA), Australian Treasury, Reserve Bank of Australia (RBA)), Brazil (Banco Central do Brasil (BCB), Securities and Exchange Commission of Brazil (CVM)), Canada (Office of the Superintendent of Financial Institutions (OSFI)), China (National Financial Regulatory Administration (NFRA), People's Bank of China (PBC)), European Union (European Commission (EC), European Central Bank (ECB)), France (Autorité des Marchés Financiers (AMF), Banque de France (BdF) / Autorité de Contrôle Prudentiel et de Résolution (ACPR)), Germany (Federal Ministry of Finance, Federal Financial Supervisory Authority (BaFin), Deutsche Bundesbank), Hong Kong (Hong Kong Monetary Authority (HKMA)), India (Reserve Bank of India (RBI)), Indonesia (Ministry of Finance, Bank Indonesia), Italy (Banca d'Italia (BdI), Institute for the Supervision of Insurance (IVASS)), Japan (Bank of Japan (BoJ), Financial Services Authority (FSA)), Mexico (Banco de México (Banxico)), Netherlands (De Nederlandsche Bank (DNB)), Saudi Arabia (Saudi Central Bank (SAMA)), Singapore (Monetary Authority of Singapore (MAS)), South Africa (South African Reserve Bank (SARB)), Spain (Banco de España (BdE), Directorate General for Insurance and Pension Funds (DGSFP), Spanish Treasury), Switzerland (State Secretariat for International Finance (SIF) – Swiss Financial Market Supervisory Authority (FINMA), Swiss Federal Department of Finance (FDF), Swiss National Bank (SNB)), Türkiye (Central Bank of the Republic of Türkiye (CBRT)), United Kingdom (Bank of England (BoE), Financial Conduct Authority (FCA), HM Treasury), and United States (US Treasury Department). Responses were also received from two international organisations: OECD and World Bank. A number of FSB members did not participate in the survey (including US Federal Reserve Board and Securities and Exchange Commission).

current and planned regulatory and supervisory initiatives, and presents the key challenges for authorities in identifying, assessing and managing nature-related financial risks. The report also includes some case studies on authorities' and international organisations' existing analytical work and approaches.

## 1. Perception of nature-related financial risks

### 1.1. Overview of authorities' initiatives

Financial authorities within FSB member jurisdictions are in different stages of considering whether biodiversity loss or other nature-related risks should be included in their overall work on financial risks. Some authorities have already been conducting their own analytical work on the subject and concluded that it is a relevant financial risk for their jurisdictions. Other authorities currently remain at the stage of broader monitoring of work on the topic internationally. A number of other authorities have decided not to work on this topic, due to data gaps and the need to give sufficient priority to climate risks (where analytical thinking and data are further progressed).

Authorities that have already conducted exploratory analytical work have identified various potential channels through which financial risks from biodiversity loss could materialise for their jurisdictions. DNB has conducted the first comprehensive empirical assessment of the extent to which the Dutch financial sector (banks, insurance companies and pension funds) is exposed to risks resulting from the loss of biodiversity via their equity and bond investments.<sup>6</sup> The findings indicated that these exposures are material and the DNB recommended that financial institutions should understand how these risks contribute to their risk profile. Various other authorities have carried out similar work in their jurisdictions<sup>7</sup>. In January 2024, the ECB launched its climate and nature plan 2024-2025, which includes advancing analytical work on nature-related financial risks.<sup>8</sup> Outside the EU, the South African Reserve Bank (SARB) is conducting analytical work on the financial stability implications of nature-related shocks by assessing relevant transmission channels for the financial system and their macro-financial implications.

Some authorities consider nature risks as part of their broader domestic sustainability frameworks, which provides the institutional framework within which any future work may take place. For instance, the Australian Treasury considers nature-related risks as part of the government's Sustainable Finance strategy, which recognises the significance of nature-related issues for businesses and their supply chains. Other examples include SAMA's ongoing work on the Environmental Related Financial Risk Framework and the Green Finance Guidelines<sup>9</sup> being updated by China's NFRA to consider nature risks.

---

<sup>6</sup> DNB (2020), *Indebted to nature: Exploring biodiversity risks for the Dutch financial sector*

<sup>7</sup> See, for instance, Banque de France (2021), *A "Silent spring" for the financial system? Exploring biodiversity-related financial risks in France*; ECB-ESRB (2023), *Towards macroprudential frameworks for managing climate risk*

<sup>8</sup> ECB-ESRB (2023)

<sup>9</sup> China Banking and Insurance Regulatory Commission (2022), *Green Finance Guidelines for Banking and Insurance Sectors*



Authorities' engagement in international fora includes through the work done by the NGFS, the OECD and various G20 and G7 platforms.<sup>10</sup> In particular, the NGFS has developed a conceptual framework for nature-related financial risk (see Box 1) as a first step towards an integrated assessment of climate and broader nature-related risks.<sup>11</sup> In that framework, the NGFS has defined nature-related financial risks as “the risks of negative effects on economies, individual financial institutions and financial systems that result from i) the degradation of nature, including its biodiversity and the loss of ecosystem services that flow from it (i.e., physical risks); or ii) the misalignment of economic actors with actions aimed at protecting, restoring, and/or reducing negative impacts in nature (i.e., transition risks)”.

The OECD has also undertaken work on nature-related risks to provide technical guidance on assessing biodiversity-related financial risks (see Box 3).<sup>12</sup> The OECD's framework aligns closely with the NGFS's approach. Both involve: (i) risk identification and prioritisation, where potential risks are identified and ranked based on their potential impact and likelihood; (ii) economic risk assessment, which involves evaluating the potential macroeconomic consequences of these risks; (iii) financial risk assessment, where the potential impacts on financial stability and individual financial institutions are assessed. The OECD's framework also includes guidance on how supervisors can integrate these risks into their supervisory frameworks.

#### **Box 1: NGFS's conceptual framework on assessing nature-related financial risks<sup>13</sup>**

The NGFS's conceptual framework defines key concepts and their interrelationships. It contains a principle-based risk assessment framework to help operationalise that conceptual understanding, to help financial authorities consider the relevant elements of nature-related financial risks, and to develop policies and actions, while taking into consideration their jurisdictional context.

The NGFS' risk assessment framework consists of three phases (Figure 1). As a first phase, central banks and supervisors identify the sources of risk that are potentially material from a microprudential, macroprudential, or macroeconomic risk perspective. For physical risks, the source of risk can be an acute or chronic shock or hazard triggered by the degradation of one or more ecosystem services. For transition risks, existing and announced nature-related policies on a global, regional or national level could provide a starting point to develop scenarios. (NGFS mentions the example of the Global Biodiversity Framework, which defines 2030 targets to halt and reverse biodiversity, for instance by protecting 30% of land and water or the reduction of harmful subsidies.)

---

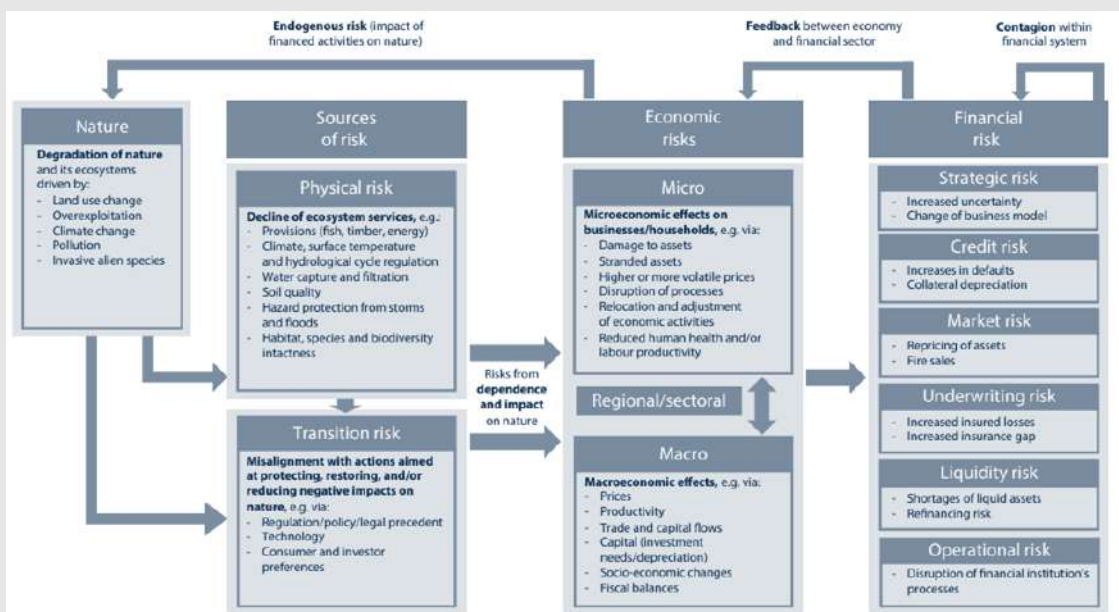
<sup>10</sup> For instance, the G20 Sustainable Finance Working Group introduced nature- and biodiversity-related risks as part of its 2023 work programme and the G7 Climate Change Mitigation working group will be discussing analysis of nature-related macro-financial risks as part of its 2024 work programme, and.

<sup>11</sup> NGFS (2024), *Nature-related financial risks: a conceptual framework to guide action by central banks and supervisors*, July.

<sup>12</sup> OECD (2023).

<sup>13</sup> NGFS (2023)

**Figure 1: Transmission channels set out in NGFS conceptual framework**



As a second phase, central banks and supervisors assess the potential economic effects and risks that can stem from these exposures. Risks may cascade through value chains - and between sectors - to other parts of the economy or across borders. Via direct and indirect transmission channels, physical and transition risks can have both microeconomic and macroeconomic effects. On a macro level, physical and transition risks may have implications for prices, productivity, investment, socio-economic changes, fiscal balances, and trade and capital flows (in particular affecting inflation and Gross Domestic Product (GDP)). The assessment of the existence and breadth of a risk will need to take account of the differing abilities of actors to adapt to shocks, either through geographical substitution (between ecosystem services) or technological substitution (between natural and manufactured/human capital).

As a third phase, central banks and supervisors may want to consider the financial risks stemming from the exposures to sources of physical and transition risks (directly or, more likely, via financed activities). The effect on individual financial institutions has the potential to spread throughout financial systems or to create feedback loops to the real economy. These dynamics may amplify shocks that are initially relatively mild but may have the potential to propagate across financial institutions and therefore merit consideration. Nature-related financial risks are also endogenous: the impacts that economic and financial actors have on nature affect the financial risks these actors need to manage.

The NGFS report includes two illustrative cases (the Amazon rainforest and the Colorado river basin). The NGFS plans to follow up on this framework by looking further at the practical steps for how authorities could implement it in practice. This includes bridging data and modelling gaps by working on recommendations for developing nature-related scenarios, and identifying how nature-related financial risks can be integrated in NGFS's ongoing climate work. The NGFS report highlights the potential use of the NGFS conceptual framework to facilitate a dialogue with the financial sector and inform efforts of stakeholders beyond the NGFS such as regional and global standard-setters. It also encourages central banks and supervisors to identify, assess and - where relevant - act on material economic and financial risks stemming from dependencies and impacts on nature and their nexus with climate change.

## 1.2. Financial risks from biodiversity loss and other nature-related risks

Biodiversity plays a fundamental role for economic activities that rely on a range of benefits provided by nature (also known as “ecosystem services”), including providing food and clean water, flood protection, nutrient cycling and pollination. Various financial authorities therefore note that biodiversity loss and other nature-related risks could represent a source of financial risk where the loss of ecosystem services can adversely affect a firm’s financial position if its production processes or supply chain disruptions result in reduced turnover or even inability to produce.<sup>14</sup> At the same time, efforts to prevent the loss of such ecosystem services could raise financial risks for firms that are forced to write-down assets that are no longer economically viable.

There is no commonly agreed international definition at present for defining or categorising nature-related financial risks; nevertheless, some common elements are emerging. Many authorities are using as a conceptual reference the definitions of nature-related financial risks proposed by the NGFS, which is explained further in Box 1. Other authorities also refer to other external work when defining nature-related risks, such as the Taskforce on Nature-related Financial Disclosures (TNFD). Some authorities also use definitions from their own environmental or sustainability risks framework. For instance, Brazilian regulation on risk management defines environmental risk as “the possibility of losses resulting from events related to environmental degradation, including the excessive consumption of natural resources”. The European Sustainability Reporting Standards (ESRS) include nature-related issues and risks under their definition of environmental risks.

Financial authorities frequently break down nature-related financial risks into the same broad categories (“physical risks” and “transition risks”) that are used to describe climate-related financial risks:

- **Physical risks:** Financial risks arising from activities with strong direct or indirect dependency on ecosystem services that could be disrupted due to biodiversity loss. These risks materialise in the form of acute hazards (e.g. the sudden disruption of an ecosystem service such as water provision) and chronic hazards (e.g. use of pesticides leading to gradual decline of pollinators) that result in damage to real assets, disruption of production processes, reduced productivity, and other such effects. For instance, the Banco Central do Brasil (BCB) points out that Brazil’s economy is highly dependent on nature services, and biodiversity loss (e.g. as a result of deforestation in the Amazon) could trigger system-wide imbalances.
- **Transition risks:** Financial risks arising from actions aimed at protecting, restoring or reducing negative impacts on nature. Transition risks may become particularly relevant as the global policy agenda on biodiversity loss progresses, for instance as jurisdictions take action to limit biodiversity loss by 30% by 2030 under the Kunming Montreal Global Biodiversity Framework.<sup>15</sup>

---

<sup>14</sup> ECB (2023a), *Living in a world of disappearing nature: physical risk and the implications for financial stability*.

<sup>15</sup> Convention on Biological Diversity (2022), *Kunming-Montreal global biodiversity framework*.

Economic costs from physical and transition nature-related risks could translate to financial risks by affecting different economic agents in the real economy. Some examples that have been noted by authorities in their work are:

- **Businesses** may be affected if shifting consumer demand and supply chain disruptions lower profits. A decrease in the quality of assets due to direct damage from physical risks or the risk of assets becoming stranded as transition risks materialise can further affect the financial position for businesses. Emerging work has started identifying that business activities in some sectors (e.g. water, agriculture and energy sectors) are highly dependent on nature services. For instance, an ECB report noted that the materialisation of physical risks from biodiversity loss could lead to lower profitability for individual firms due to direct impact of physical risks on firm production units (e.g. direct damages) as well as via supply chain interlinkages.<sup>16</sup> Business activities that harm nature (e.g. illegal deforestation) or extensive agriculture and other activities that require substantial land use<sup>17</sup> could be subject to transition risk from rapidly changing customer expectations or policy developments, which may require structural changes in business models.
- **Governments** could be affected due to declines in economic activity that are dependent on ecosystem services, decreased productivity, and depletion of capital stock. These macroeconomic impacts may further introduce an additional source of financial strain due to disruption of economy-wide value chains, raw material price volatility, and higher inflation.
- **Households** could be affected by direct damages suffered on real estate due to acute physical risks from nature, and reduced health and labour productivity. Such damages could come, for instance, from destruction of coral reefs that could lower coastal communities' protection against waves, storms and floods. However, existing work has focused less on transmission channels for households.

Macro-financial risks could also arise as global growth prospects decline, which could further deteriorate the financial position of real economy and financial sector. In particular, the World Bank has estimated that global GDP may be reduced by up to 2.3% compared to baseline (with low and lower middle-income countries experiencing -7.3% and -10%) in 2030 under a partial collapse scenario compared to the baseline where no tipping points are reached (see Box 2).<sup>18</sup> NGFS's work that reviewed nature models used by different stakeholders noted that some commonly-used model assumptions (e.g. ability of producers and consumers to instantaneously adapt to the effect of nature shocks via substitution and trade partners) may imply that the macroeconomic costs may be even greater than these initial estimates.<sup>19</sup>

---

<sup>16</sup> ECB-ESRB (2023)

<sup>17</sup> Banque de France (2024), *Who Takes the Land? Quantifying the Use of Built-Up Land by French Economic Sectors to Assess Their Vulnerability to the 'No Net Land Take' Policy*, April.

<sup>18</sup> World Bank (2021), *The economic case for nature*.

<sup>19</sup> NGFS (2023), *Recommendations toward the development of scenarios for assessing nature-related economic and financial risks*, December.

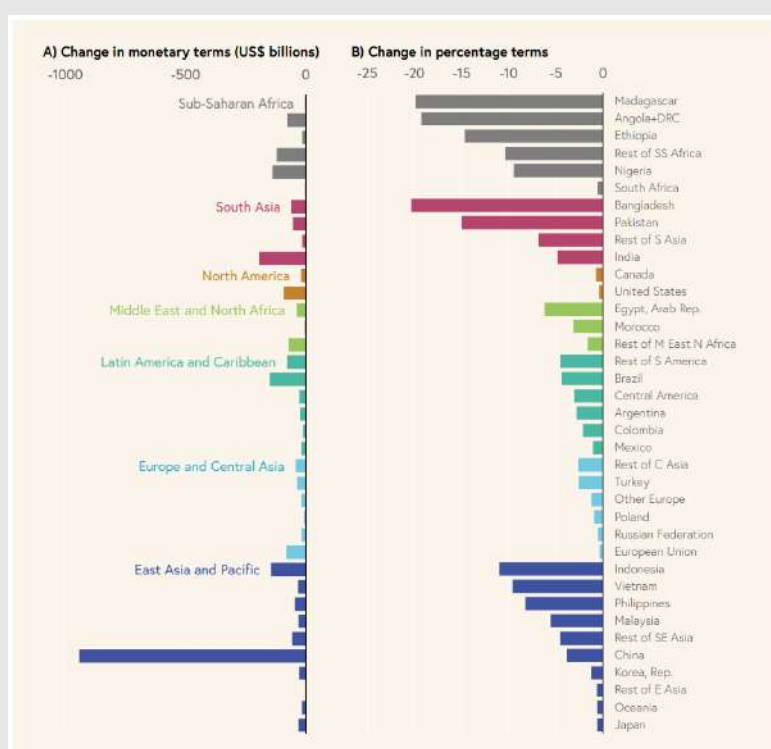
## Box 2: World Bank's estimates on GDP loss based on nature loss scenarios

The global decline of biodiversity and ecosystem services poses a significant development issue, and economies profoundly depend on the flow of goods and services it generates. The World Bank report highlights an alarming decline in ecosystem services, with 14 of the 18 assessed categories showing a decrease since 1970. These trends pose a significant threat to the economic prospects of different jurisdictions, particularly those that heavily rely on natural capital for growth and resilience against natural and economic shocks. However, existing economic models do not fully account for nature risks which can lead to overly optimistic scenarios of economic growth. It is crucial to consider these risks to develop resilient and inclusive growth strategies.

The World Bank developed a global integrated ecosystem-economy model to provide the range of macroeconomic impacts that could arise from biodiversity loss and inform economic policy responses. The report integrates economic and ecosystem services data using a Computable General Equilibrium (CGE) model combined with ecosystem service models. These models cover key ecosystem services such as pollination, timber provision, fisheries, and carbon sequestration. The model assesses how changes in these ecosystem services impact economic variables including GDP, economic welfare, returns on factors of production, and output of sectors such as agriculture, forestry and fisheries. The baseline scenario in the model does not consider ecosystem services explicitly. It represents a hypothetical economic situation where ecosystem services remain unchanged and continue to provide their current level of benefits. This is used as a point of comparison against scenarios where ecosystem services decline due to environmental degradation or collapse.

Under a business-as-usual scenario, the loss of ecosystem services could lead to a drop in global GDP. The report estimates that if no action is taken, 46 million hectares of natural land could be converted to cropland, pastureland and forest plantations by 2030, leading to a drop in GDP of up to \$225 billion. The sectors most affected would be agriculture, fisheries and industries dependent on timber.

**Figure 4. Change in 2030 GDP under the partial ecosystem collapse scenario compared with the no-tipping point scenario, by GTAP country unit, in (A) monetary terms and (B) percentage terms**



The report also explores a scenario where three essential ecosystem services - wild pollination, provision of food from marine fisheries, and timber from native forests – collapse (Table 1). In this

scenario, the model shows a drop of \$2.7 trillion (2.3% annually) in global real GDP in 2030, compared to the baseline scenario. This situation would disproportionately impact low-income and lower middle-income countries, where drops in 2030 GDP compared with baseline could reach 10%. Among the G20, the most impacted jurisdiction would be China with a projected loss of \$943 billion in GDP by 2030. China's non-extractive primary output, including agriculture and fisheries, could drop by 9%. India could face a 6% decline in the output of the agriculture, livestock, forestry production and fisheries sectors, with a projected loss of \$193 billion in GDP by 2030. In Indonesia, the country could face 33% reduction in forest productivity, with a projected loss of \$144 billion in GDP by 2030.

**Table 1: Overview of the three ecosystem services collapse scenarios**

Scenario	Overview of the methods used
Wild pollination collapse	The model looks at the effect of a 90% reduction in wild pollination sufficiency on agricultural yields, focusing on crops that are dependent on wild pollination. Crops that are only partially dependent on these services will not see yield reductions as large as the pollinator collapse. <sup>20</sup>
Marine fisheries collapse	To simulate the regime shift, the model assumes a severe climate change scenario (Representative Concentration Pathway (RCP) 8.5 instead of RCP4.5) and further takes the worst-case outcome in terms of climate change impact reported in the uncertainty bounds and sensitivity analysis. The model simulates severe disruptions of fish migration that lead to a reduced total catch biomass, which in turn impacts the economic model. <sup>21</sup>
Widespread conversion of tropical forests to savannah	The model simulates widespread collapse of tropical forests that results in forests converting into grasslands and shrubs: (i) assuming 88% less forest cover for all tropical regions; and (ii) lowering expansion suitability for forestry in the Amazon basin. <sup>22</sup> This scenario impacts the economy through reduced provision of timber from native forests in agro-ecological zones 5 and 6 by 90%.

### *Transmission and amplification channels within the financial system*

Authorities that have conducted analysis note that nature-related financial risks could materialise through typical channels for financial risks (e.g. via higher incidence of defaults in different economic sectors, declines in collateral value, and from investment losses as assets reflect potential nature-related physical and transition risks). Some common channels emerging from the stocktake are:

- **Credit risk:** In the face of rising physical risks due to biodiversity loss, borrowers may experience higher credit risk that may be particularly pronounced in certain sectors (e.g. real estate, agriculture and farming) dependent on ecosystem services either directly

<sup>20</sup> The model builds on making the scenarios spatially explicit through the Integrated Valuation of Ecosystem Services and Tradeoffs tool. Bauer and Wing (2016), *The macroeconomic cost of catastrophic pollinator declines*.

<sup>21</sup> The model relies on the Fisheries and Marine Ecosystem Model Intercomparison Project data. Lotze et al (2019), *Global ensemble projections reveal trophic amplification of ocean biomass declines with climate change*

<sup>22</sup> This model modifies two elements of the Spatial Economic Allocation Landscape Simulator model.

or via the supply chain.<sup>23</sup> Similarly, credit risks could also arise from financial portfolios that finance activities to firms that operate in protected areas, such as biodiversity hotspots, or result in nature degradation (e.g. deforestation).<sup>24</sup>

- **Market risk:** The market value of assets may not adequately price the risk that some specific sectors and firms may be impacted more strongly from biodiversity loss or from government policies. Different financial institutions may be affected by abrupt price corrections through their equity and bond holdings. For instance, the ECB-ESRB (2023) report noted market risks could arise from the EU's proposal to achieve a minimum 20% reduction in fertiliser use by 2030 that could reduce the profitability of chemical companies, resulting in repricing of their shares.<sup>25</sup>
- **Underwriting risk:** Insurance risks may rise as rising damages from deterioration of nature result in greater claims by policyholders, and this may in turn lead to changes in the provision of insurance services (premiums and availability). For instance, the destruction of coral reefs will significantly lower coastal communities' protection against waves, storms, and floods, posing danger to lives and properties, resulting in higher claims on insurers. Brazilian authorities note that adverse effects of nature-related risks have started materialising with persistent summer droughts in the southern region of Brazil resulting in potential insurance payments exceeding USD 1 billion in 2022. Other examples of increased insurance risk include rising crop insurance claims due to reduced soil productivity, and increased marine and business interruption from natural catastrophes.
- **Other types of risk:** Less attention at this stage is given to other risk types (e.g., liquidity risk, operational and liability risk), although some authorities draw on similar work done for climate risks. For instance, higher reputation or liability risk may stem from the financing of firms that are engaged in deforestation.

Although most authorities are still taking a microeconomic perspective in exploring the channels for financial risks, a few authorities noted that second-round effects may give rise to systemic risks. For instance, FINMA and HKMA noted that nature-related risks from other regions could transmit to their jurisdictions via global disruptions (e.g. from collapse of important ecosystems or from pandemics) as well as interconnectedness of the financial system. Similarly, work by the European Insurance and Occupational Pensions Authority (EIOPA) highlighted that those seeking insurance may be affected by the global impacts of nature shocks (e.g., risk concentrations rendering pooling ineffective, collapse of systemically important biomes like the Amazon rain forest resulting wider systemic impacts), which may affect the availability of risk mitigation tools such as insurance.<sup>26</sup> To capture system-wide effects that may arise from such interactions, BCB is developing a framework for monitoring social and environmental exposures of the entire financial system.

---

<sup>23</sup> See, for instance, ECB (2020), *Guide on climate-related and environmental risks*, November; ECB (2023a), *Living in a world of disappearing nature: physical risk and the implications for financial stability*.

<sup>24</sup> World Bank (2021), *Nature-related financial risks in Brazil*; Banque de France (2021)

<sup>25</sup> ECB-ESRB (2023)

<sup>26</sup> EIOPA (2023), *EIOPA Staff paper on nature-related risks and impacts for insurance*.

## *Relationship with climate-related financial risks*

Climate and nature-related financial risks could be compounded due to interdependencies and reinforcing mechanisms between climate change, environmental pressures and loss of biodiversity. The NGFS highlights four potential links: 1) climate change as a driver of nature degradation; 2) climate change mitigation policies as a potential driver of nature degradation; 3) nature degradation as a driver of climate change; and 4) nature restoration as a tool for climate change mitigation and adaptation. Some examples provided by authorities include how ecosystem destruction can intensify climate change by eliminating carbon sinks and disrupting temperature-regulation systems, leading to increased probability of extreme weather events or sea level rise.

Given such close interdependencies, various authorities recognise the advantages of an integrated approach to risk assessment that considers both climate and nature financial risks and the need to stay flexible in the approach to assessment. The ECB's work is amongst the first to show that the compound effect of increased flood risks and future nature degradation may amplify the impact on businesses.<sup>27</sup> Estimates of financial exposures of euro area banks to climate and nature risks are much higher when considering the potential compounding of physical risks (e.g. flood risks caused by climate change and the degradation of related ecosystem services of flood and storm protection) or transition risks (e.g. production processes where firms have higher Green House Gas (GHG) emissions and where these activities also result in greater degree of biodiversity loss directly or via supply chain) as compared to the baseline where non-financial companies are exposed to individual climate or nature risks.<sup>28</sup> Nor does action to achieve net zero address all types of nature or climate risk; DNB's TNFD pilot on two of the central bank's reserves portfolios suggested that nature-related risks are not diminished for a portfolio with a Paris-aligned mandate (in part due to the high impacts and dependencies of hydropower on water).<sup>29</sup> Early indications offered by these studies are that the downside tail risks from not taking an integrated approach to nature and climate policies shocks may be underestimated, given the potential for compound shocks to the financial system.

Recognising the intertwined nature of climate- and nature-related financial risks and their significant overlap in terms of impact and mitigation strategies, financial authorities conducting or considering work on nature risks seek to use synergies from the existing knowledge base (building on the work done on climate-related financial risks) and the expertise of their climate risks team as they organise their work to consider nature issues. In such cases, generally, the work is coordinated centrally by a sustainability or climate-specific unit that sits within the financial authority or, in some cases, functions as a cross-institutional unit across authorities.<sup>30</sup>

---

<sup>27</sup> ECB. (2023b). *The impact of the euro area economy and banks on biodiversity*.

<sup>28</sup> The study categorises non-financial firms into four categories based on their level of exposure (high/low) to both climate and nature-related risks. For transition risk classification, Non-Financial Corporations (NFCs) are classified on the climate side based on their Scope 1, 2, and 3 GHG emission intensities and the fraction of their energy mix that is based on coal, gas and oil, and on the nature side based on their impact on mean species abundance loss, which compares the current abundance of species to their estimated natural abundance in undisturbed ecosystems. For physical risk, the exposure is based on water stress levels and flooding risk (climate) and the degree of dependency on ecosystem service (nature). Each metric has its own threshold value to determine if exposure is high or low.

<sup>29</sup> DNB. 2024. *Nature-related financial risks in our own account investments: An exploratory case study and deep dive in electric utilities*.

<sup>30</sup> For instance, BdF and ACPR's work on nature-related risk is conducted within the same units and directorates working on climate-related risks, and Climate Change Centre coordinates BdF and ACPR's work on nature. Similarly, EC and ECB have



Some authorities' institutional framework consists of using separate teams to work on technical issues related to nature and climate risks, yet they all fall under the same broad management group to ensure a coordinated approach.<sup>31</sup>

### 1.3. State of analytical work and selected case studies

#### *Data and metrics used for risk identification and assessment*

Data and metrics are critical for financial authorities to be able to conduct nature-related financial risk assessments (in the same way that data and metrics are critical in all areas of risk assessment). Economic activities rely on a multitude of ecosystem services, and ecosystems are highly complex and unpredictable, with multiple interactions among the various natural processes and organisms. This multidimensionality implies that there is no single aggregate indicator for characterising the drivers or effects of nature loss, in the way that GHG emissions or temperature rise may be used as a summary statistic for climate change. Nevertheless, there is still scope for standardisation of data to assist users; an initial survey carried out by the TNFD identified over 3,000 unique metrics used by companies.<sup>32</sup> The multitude of metrics and underlying data points currently used makes it difficult to compare and aggregate values to the level of a financial portfolio.

Since the understanding of data needs is still at a formative stage (not only in terms of data for financial risks but data on nature risks more generally), most financial authorities have either not yet conducted work on data and metrics or are still at the stage of assessing their data needs to conduct risk assessments. The data gaps include a lack of granular and geospatial data on the regional dependency of economic activities on nature, and the lack of metrics to capture interdependencies between different ecosystems to account for potential amplification, cascading and spillover effects.

To gain better insights on the data needs and raise awareness of nature risks in the financial system, some authorities have started exploratory work to assess financial sector dependency and exposure to nature-related financial risks. This may involve assessing physical risks by calculating exposures of financial institutions via financing and investment activities to counterparties (firms, households, governments) and their dependence on ecosystem services. The magnitude of financial losses from such financial exposures would depend on the severity of the shock and the resilience of non-financial and financial firms. For transition risks, metrics for impact include calculating financing of activities that pose harm to nature and therefore reflect vulnerability to being affected by a biodiversity transition shock. One such metric is the

---

housed their experts on nature and climate risks within the Climate Change Centre at the ECB. Both HKMA and EC have created their cross-departmental group to coordinate work on nature and climate risks. Indonesia's Ministry of Finance and OJK have a centralised approach where a team is responsible for developing all policies related to sustainable finance, which covers both climate-related and nature-related risks. Bank Indonesia has several policies department that integrates climate-related risks into their policy framework.

<sup>31</sup> For instance, BCB's work on climate and nature is coordinated by the Deputy Governor for International Affairs and Corporate Risks at the board level, but work within different departments are internally coordinated by the teams that work on both nature and climate risks. Similarly, World Bank has dedicated departments that work at a more technical level on each focus area, but they are housed within the same overarching management group.

<sup>32</sup> TNFD (2023), *Recommendations of the Taskforce on Nature-related Financial Disclosures*, August.

biodiversity footprint, which is defined as the contribution of economic activities towards the loss of species and populations in ecosystems as compared with the “pristine” situation.

While the calculation of such metrics is complicated and requires granular data, there are some common tools and methodological approaches that have proved useful to help jurisdictions understand their exposure to nature-related risks. In particular, Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE) is the main dataset used by most of the financial authorities’ initial work; it provides various indicators for assessing how each economic sector depends on a multitude of ecosystem services. This data does not differentiate between jurisdictions, which has been noted as a critical limitation. Some authorities have used alternative datasets in their work, such as the Biodiversity Risk Filter developed by the World Wide Fund for Nature, and the Natural Capital Index Framework.<sup>33</sup> Some recent developments in the data landscape may start filling gaps, such as the ESRS, which could be a useful source of qualitative and quantitative data on nature-related risks, and the World Bank’s sovereign environmental, social and governance (ESG) data portal, which includes a variety of nature-related indicators. The TNFD’s resources on developing metrics and relevant datasets is another step in this direction.<sup>34</sup>

### *State of analytical work*

There is a growing body of member work that assess dependencies and exposures, although more risk-based evidence is needed (Table 1). The analyses show that financial institutions in some jurisdictions appear to have sizeable exposures to physical risk via their investments and other financing. Most work has focused on bank credit exposures to non-financial companies, although other work has explored exposures within the investment portfolios of various types of financial institution.

Many authorities note that analytical work needs to move from exposure analysis to risk metrics that quantify the magnitude of financial losses. These metrics could be more closely linked to the various prudential risk categories (e.g. credit risk, market risk) identified by authorities in section 1.2. The ECB has conducted work on this topic by showing that expected losses on bank loan portfolios may be up to 2.5-2.7 times higher in the adverse scenario where nature and climate change impacts are self-reinforcing, as compared to a baseline where nature is conserved with low levels of climate change.<sup>35</sup> More generally, the World Bank’s analysis estimates that GDP declines associated with ecosystem collapse may result in a cumulative increase in corporate non-performing loans for the Brazilian banking system on the order of 9 percentage points.<sup>36</sup> The ECB and World Bank analyses are described further in the case studies below.

---

<sup>33</sup> ECB (2023a), *Living in a world of disappearing nature: physical risk and the implications for financial stability*; Banco de Mexico. 2023, *Dependencies and impacts of the Mexican banking sector on ecosystem services*

<sup>34</sup> TNFD (2023), *Guidance on the identification and assessment of nature-related issues: the LEAP approach*; TNFD (2024), *Biodiversity footprinting approaches for financial institutions*.

<sup>35</sup> ECB-ESRB, 2023. *Towards macroprudential frameworks for managing climate risk*, December.

<sup>36</sup> World Bank (2021), *Nature-related financial risks in Brazil*, August.

## *Selected case studies*

### *World Bank's analysis of nature-related financial risks in Brazil<sup>37</sup>*

Brazil has the highest biological diversity worldwide, hosting an estimated 15-20% of the planet's biological diversity, and is vulnerable to factors such as deforestation and climate change with potential significant influence on the global climate, scenario, the World Bank projects that Brazil's GDP growth will be cumulatively 20% lower from 2021 to 2030 under a partial ecosystem collapse scenario compared with a business-as-usual scenario, due to biodiversity loss and collapse of ecosystem services, such as wild pollination and marine fisheries food provision. To assess the potential financial risks from biodiversity loss, the World Bank calculated the exposures of Brazilian banks to both transition and physical nature-related financial risks when they finance companies operating in protected or valuable areas and examined the potential impact of biodiversity loss on banks' loan quality.

For physical risks, the study followed the methodology laid out in DNB (2020) to link data on banks' credit portfolio by economic sectors with their associated production processes. 46% of corporate credit portfolios in the Brazilian banking sector are to firms whose business processes are highly or very highly dependent on one or more ecosystem services, in particular ecosystem services that provide climate regulation, surface water and groundwater. Based on the historical sensitivity of non-performing loans to GDP growth in Brazil, the study estimated that under a low probability, high impact scenario where ecosystem services collapse, the banking system could experience a long-term increase in corporate non-performing loans on the order of 9 percentage points.

For transition risks, the study identified protected areas and areas that could become protected in the future and mapped it to firms' operations. The study also estimated firms' indebtedness and geographic location by combining granular information of credit outstanding, by federal unit and economic sector, with detailed non-financial information of all formal Brazilian firms. The study found that 15% of corporate loans in Brazilian banks are allocated to firms that could be operating in protected areas, which increases to 38% should all priority areas become protected. Moreover, a higher share of banks' non-performing loan portfolio involves business processes vulnerable to ecosystem services disruption (47.8%) than for their performing portfolio (45.9%).

### *ECB's analysis of nature-related financial risks in the euro area<sup>38</sup>*

To better understand the financial implications of nature and ecosystem service degradation, the ECB has conducted quantitative assessments of physical risks arising from the dependencies of EU banks on ecosystem services and transition risks arising from financing of activities that contribute to nature degradation.

---

<sup>37</sup> World Bank (2021), *Biodiversity and Finance: A Preliminary Assessment of Physical Risks for the Banking Sector in Emerging Markets*, May

<sup>38</sup> ECB-ESRB (2023)

On physical risks, the ECB<sup>39</sup> found that 72% of euro area NFCs are highly dependent on ecosystem services, making them vulnerable to ecosystem degradation, and these companies account for 75% of all corporate loans in the euro area. The study also evaluated potential losses in banks' credit portfolios due to possible biodiversity losses. If current emission pathways and pressures on biodiversity continue, euro area banks' losses could be almost three times higher than under a Paris-aligned future scenario. The most significant losses would be felt in countries such as Belgium, Germany, Ireland, and Lithuania. While this quantification exercise shed light on the order of magnitude of potential financial risks for banks, it made some simplifying assumptions, such as a direct increase in probability of default of firms and skipping the intermediate steps on how biodiversity shocks could affect the balance sheet and revenue deterioration and did not consider transmission via repricing of investment portfolios as well as other intra-financial sector amplification channels.

For transition risks, the ECB<sup>40</sup> (2023b) quantified the biodiversity footprint of the euro area economy and financial sector, revealing that their combined impact on nature is equivalent to the loss of 60% of the European land area. German firms have the largest impact, while French banks finance the largest share of the total biodiversity footprint. The study also marks the first assessment of the combined effect of climate change and nature loss on financial risks. It showed that higher dependency of an economic sector on surface water provision can compound with high drought risk, which may result in an amplified impact on NFCs in those sectors and on the banks who lend to them. Similarly, agriculture and electricity production are the two key sectors in the Euro area that are most exposed to transition risks from limiting GHG emissions (climate change) and nitrogen use (policies to halt biodiversity loss).

In conclusion, the ECB's studies illustrate that exploratory analytical work on nature-related financial risks can be a tool to heighten awareness of nature risks and lay the foundation for future analytical work. The ECB sees the need for further research and collaboration among policymakers, financial institutions, and corporations to understand, quantify, and address these risks effectively.

### *Other analytical work*

**Table 1: Summary of findings from other analytical work by financial authorities**

<b>Paper</b>	<b>Jurisdiction</b>	<b>Key insights</b>
<u>DNB</u> (2020)	Netherlands	<p><b>Physical risks:</b> 36% of financial sector exposures (via equity and bond investments and bank loans) are to firms with high or very high dependency on at least one ecosystem service.</p> <p><b>Transition risks:</b> Biodiversity footprint of equity investments by Dutch financial institutions at a given point in time contributes to the financing of activities that is comparable to the loss of over 58,000 km<sup>2</sup> of pristine nature, representing 1.7 times land surface of Netherlands.</p>

<sup>39</sup> ECB (2023a)

<sup>40</sup> ECB (2023b) *The impact of the euro area economy and banks on biodiversity*, December

<u>Banque de France (2021)</u>	France	<p><b>Physical risks:</b> 42% of equity and debt securities held by French financial institutions are to firms with high or very high dependency on at least one ecosystem service.</p> <p><b>Transition risks:</b> Biodiversity footprint of French securities alone is comparable to a loss of 130,000 km<sup>2</sup> of “pristine” nature corresponding to 24% of the area of metropolitan France.</p>
<u>World Bank (2023)<sup>41</sup></u>	Emerging markets	<p><b>Physical risks:</b> On average 55% of bank loan exposures in a sample of 20 emerging markets are exposed to activities that are highly or very highly dependent on at least one ecosystem service.</p>

## 2. Regulatory and supervisory initiatives on identifying, assessing and managing nature-related financial risks

### 2.1. Overview of authorities’ initiatives

Section 2 of this stocktake provides an overview of the regulatory and supervisory initiatives being conducted or planned for identifying, assessing and managing nature-related financial risks. A number of authorities from emerging markets (Brazil’s BCB and CVM, China’s NFRA and PBC) as well as advanced economies (EU’s ECB and EC, France’s ACPR, Germany’s BaFin and Bundesbank, Italy’s Bdl and IVASS, Netherlands’ DNB, Singapore’s MAS, Spain’s BdE, DGSFP and MoF, and Switzerland’s SIF) are conducting regulatory and supervisory initiatives of varying objectives and scope. Such initiatives are generally part of broader work on ESG risks. Some examples of initiatives include the development of supervisory frameworks for identifying nature-related risks and the assessment of financial institutions’ risk management practices during on-site inspections or as part of thematic reviews or deep dives. In addition, some authorities have developed supervisory guidance or requirements for financial institutions and a subset of these have conducted reviews to assess institutions’ progress against such guidance or requirements. These reviews, which tend to be conducted on a sample of institutions, have typically been followed by the publication of good practices and sometimes have required action plans from institutions for which gaps had been identified.

Several authorities are building on the progress made on climate-related risks by incorporating nature-related risk elements into their climate-related regulatory and supervisory initiatives. For example, the HKMA asked banks in 2020 to assess their readiness in climate risk as well as environmental risk management, covering risks from environmental degradation such as air pollution, water pollution and scarcity of fresh water, land contamination, reduced biodiversity and deforestation.<sup>42</sup> Its 2021 supervisory guidance, while focusing mainly on the management of climate-related risks, asks banks not to overlook the risks arising from other environmental issues and highlights the risk from biodiversity loss.<sup>43</sup> In Türkiye, the BRSA mainly focuses on climate-related risks but also has two initiatives aimed at ESG risks in general. In 2021, it issued

<sup>41</sup> World Bank (2023), *Biodiversity and Finance: A Preliminary Assessment of Physical Risks for the Banking Sector in Emerging Markets*, May

<sup>42</sup> The results of the “greenness baseline assessment” can be found here: <https://www.hkma.gov.hk/media/eng/publication-and-research/quarterly-bulletin/qb202009/fa1.pdf>

<sup>43</sup> HKMA (2021), *Supervisory Policy Manual: Climate Risk Management*, December.

guidelines requiring banks to account for ESG factors in their loan-related processes. In 2022, it added ESG risk-related control points to the on-site financial audit guidelines for banks.

Many authorities that have no current plans note that they have focused resources instead on climate-related risk initiatives. In Australia, APRA has future plans to understand how such risks will fit into its broader prudential and supervision frameworks. In Japan, the FSA has yet to conclude that nature-related risks are sufficiently relevant to financial stability that they need to be managed by financial firms as such or that a specific regulatory and supervisory framework needs to be in place for nature-related financial risks. In the UK, the BoE will consider specific guidance or requirements on nature-related risks if it determines that nature-related risks are material in the appropriate time horizon and if these risks are not already being captured by ongoing climate work and by the existing prudential regimes.

International organisations are also involved in cross-border regulatory and supervisory initiatives. The NGFS's conceptual framework provides a principle-based risk assessment approach for central banks and supervisors to assess the interactions between nature, the macroeconomy and the financial system (as described in Box 1 above). In addition, the OECD supervisory framework, carried out with funding by the European Union and developed in cooperation with the European Commission (described in Box 3 below) provides short, medium, and long-term supervisory considerations for central banks and supervisors on the assessment of nature-related financial risks. The World Bank is also actively involved in supporting client countries in identifying, assessing and managing nature-related financial risks. For example, it jointly published a report with Malaysia's Bank Negara assessing the exposure of Malaysian banks to sectors and regions that are highly vulnerable to nature-related financial risks and recommending potential actions to effectively manage such risks.<sup>44</sup> The recommendations spanned from capacity building to enhancing regulatory and supervisory guidance on nature-related risks in line with evolving good practices. The World Bank has also been providing capacity building in multiple other countries (e.g. Tanzania, Nigeria, Philippines).

### **Box 3: OECD's supervisory framework for assessing nature-related financial risks<sup>45</sup>**

The OECD's supervisory framework report has been developed as a deliverable of the project on "Developing a Supervisory Framework for Financial Risks Stemming from Biodiversity Loss", launched by the European Commission, together with the OECD as the implementing partner, to help the Hungarian central bank, Magyar Nemzeti Bank and banks with retail activities in Hungary become more informed about their exposures, impacts and dependencies to biodiversity-related financial risks, to improve biodiversity-related risk management. The framework, while recognising that national circumstances and mandates differ, is designed to be applicable broadly for central banks, supervisors and commercial banks across different countries.

The framework suggests a number of considerations for financial supervisors to incorporate these risks into financial risk management are provided in a fourth step. These suggestions outline possible avenues for financial authorities to consider these risks in their operations but are not recommending any single approach to be undertaken by financial regulators and supervisors.

According to the report, in the short term, financial authorities can usefully identify the key nature-related risks their financial system is exposed to and the relevant key metrics. Financial authorities can already

---

<sup>44</sup> World Bank, Bank Negara Malaysia (2022), *An Exploration of Nature-Related Financial Risks in Malaysia*.

<sup>45</sup> OECD (2023), *A supervisory framework for assessing nature-related financial risks*, September.

start to establish common definitions related to nature-related risks, both in their home jurisdictions and cross jurisdictions. The report notes that global coordination and cooperation towards regulatory reporting frameworks could accelerate the mitigation of nature-related risks. However, financial authorities may additionally need to understand, assess, and monitor priorities and risks at the domestic level, depending on the identified material issues, especially given the localised nature of biodiversity and broader nature-related risks. Financial authorities may already use prudential approaches to assess risks across the financial system and assess tools and/or monitoring measures that might be relevant in this context.

In the medium term, financial authorities may start to develop supervisory expectations on financial institutions' governance, processes, and controls on relevant data. The current limited scope of corporate reporting and gaps in data which is 'fit-for-purpose' places limitations on the current use of quantitative assessments. Currently, initiatives on reporting frameworks, such as TNFD and the Corporate Sustainability Reporting Directive (CSRD), are attempting to help respond to this challenge. However, in the short-term, financial authorities may require qualitative information and the use of estimates to supplement current gaps. Due to the emerging nature of these risks, in the short term, flexibility in reporting of these risks may be beneficial. Over time, as methods to capture these risks and understanding improves, authorities may want to move towards more quantitative methods and greater standardisation in the reporting requirements for financial institutions. Financial authorities may consider credit and market risk channels to understand how these risks may impact the financial system. However, equal consideration can be given to financial risks beyond credit and market risk, to the extent they pose material risks as identified depending on the specific risk and business model of national financial institutions.

In the medium to longer term, the design of nature scenario analysis and stress tests may need to be informed by global reference scenarios. Financial authorities may consider their domestic contexts in tailoring scenarios, in anticipation of future global scenario development. Domestic risks stemming from nature loss may be a priority for financial authorities to understand the risks to the financial sector, although this is dependent on the specific country-context. Cross-border risks are an important aspect, but the possibility of joint scenario exercises will require most authorities to first understand the risks in their domestic jurisdictions.

## 2.2. Guidance and requirements on nature-related risks

### *General guidance and requirements*

A number of authorities have issued supervisory guidance for financial institutions on the management of nature-related risks. Such guidance sometimes covers banks only, banks and insurers (e.g. DNB, CBIRC, ECB) or banks, insurers and other non-bank financial institutions such as asset managers or pension funds (e.g. BaFin, MAS). Guidance typically covers nature-related risks together with other environmental risks and specific guidance on nature-related risks is often less detailed than on climate-related risks. This is the case for DNB's non-binding guidance on the management of climate and environmental risks covering insurers, pension funds, premium pension institutions, investment firms and institutions, and electronic money and payment institutions.<sup>46</sup> The guide explicitly covers nature-related financial risks, but in a more limited way compared to climate-specific examples. DNB is currently updating the guide,

---

<sup>46</sup> DNB (2023), *Guide for managing climate and environmental risks*, March.

including to provide more information and good practices on nature-related financial risks, for publication by the end of 2024.

Industry practices to address such risks are less advanced than for climate-related risks. Following the publication of its supervisory expectations in 2020 on risk management relating to climate and environmental risks,<sup>47</sup> the ECB conducted several supervisory exercises to assess firms' approaches and found in 2022 that the maturity of practices adopted by the banks to address nature-related risks generally lag behind climate-related risks. It also found that several banks have at least a high-level qualitative approach and a few have quantitative approaches<sup>48</sup> and published a compendium of good practices.<sup>49</sup>

A few authorities have also issued requirements on the management of environmental risks. For instance, in Brazil, regulation on risk management and ESG responsibility was amended in 2021.<sup>50</sup> The EC has included nature-related risks in the review of the Capital Requirements Directive (CRD6) and of the Solvency II Directive for banks and insurers respectively.<sup>51</sup> More specifically, the review of CRD6 includes in the recitals a clear reference to biodiversity loss as an aspect that banks and supervisory authorities should consider in the overall assessment of ESG risks for microprudential purposes, including risks from climate change and biodiversity, and related mitigation or adaptation policies. It states that supervisory authorities should assess the risks from biodiversity loss in the context of broader ESG risks and act in cases where banks manage risks stemming from environmental degradation and biodiversity loss in a way that endangers the stability of the individual institutions, or financial stability overall. Moreover, the review of the Solvency II Directive mandates EIOPA to evaluate whether and to what extent insurance and reinsurance undertakings assess their material exposure to risk from biodiversity loss as part of their own risk and solvency assessment. EIOPA will determine any follow-up actions and submit its findings to the European Commission by 30 June 2025.

In Switzerland, FINMA is in the process of developing requirements for banks and insurers. It has issued a draft circular setting out mandatory supervisory expectations on the management of nature-related financial risks, which include climate-related risks as well as the interlinked risks from biodiversity loss, and other risks from degradation of ecosystem services.<sup>52</sup> It does so based on the *Principles for the effective management and supervision of climate-related financial risks*<sup>53</sup> published by the Basel Committee on Banking Supervision (BCBS), and on the recommendations of the International Association of Insurance Supervisors (IAIS), as well as of NGFS on the integrated view on nature-related risks. The circular will apply to banks and insurers in a proportionate manner, likely from 2025 with a transition period.

---

<sup>47</sup> ECB (2020), *Guide on climate-related and environmental risks (supervisory expectations relating to risk management and disclosures)*

<sup>48</sup> ECB (2022), *Results of the 2022 thematic review on climate-related and environmental risks*

<sup>49</sup> ECB (2022), *Good practices for climate-related and environmental risk management*

<sup>50</sup> BCB (2017), *Integrated Risk Management (Resolution CMN 4,557, of 2017)*; BCB (2021), *Social, Environmental and Climate Responsibility (Resolution CMN 4,945, of 2021)*

<sup>51</sup> EBA (2024), *Draft guidelines on the management of ESG risks*, January; European Parliament (2024), *Review of the Capital Requirements Directive (Directive 2013/36/EU)*; European Commission (2021), *Solvency II delegated regulation as amended in 2021*

<sup>52</sup> FINMA (2024), *Circular on nature-related financial risks, Key Points*, February.

<sup>53</sup> BCBS (2022), *Principles for the effective management and supervision of climate-related financial risks*



## *Guidance and requirements on firm-level disclosures*

As for climate-related risks, firm-level disclosures of nature-related risks are considered an important component of regulatory and supervisory approaches for managing such risks. The TNFD has been a major actor promoting firm-level disclosures on nature-related risks (see box 4 below). Drawing on the work of the FSB's Taskforce on Climate-related Financial Disclosures (TCFD), which published recommendations on climate-related disclosures in 2017, the TNFD published its disclosure recommendations in 2023. It has also issued sectoral guidance, including for financial institutions, on how to apply its recommendations, which is an important step to enhance disclosure practices.<sup>54</sup>

In 2023, the International Sustainability Standards Board (ISSB) published its standards on general sustainability-related disclosures (IFRS S1) and on climate-related disclosures (IFRS S2), which build on the TCFD recommendations and serve as a global framework for sustainability disclosures. In December 2023, as part of efforts to support application of IFRS S1 and IFRS S2, the IFRS Foundation published educational material to ensure companies consider 'nature and social aspects' of climate-related risks and opportunities when applying IFRS S2.<sup>55</sup>

The ISSB published in June 2024 its 2024-2026 work plan, which adds a project to research disclosure about risks and opportunities associated with biodiversity, ecosystems, and ecosystem services.<sup>56</sup> The ISSB agreed that in undertaking this research, it will consider how to build upon the recommendations of the TNFD published in September 2023.<sup>57</sup>

Several authorities are promoting firms' use of the TNFD recommendations. For example, SIF is engaging with financial institutions to encourage them to voluntarily adopt the TNFD framework for their nature-related disclosures and has supported the establishment of a Swiss TNFD National Consultation Group and the TNFD Early Adopters. The Swiss TNFD National Consultation Group aims to engage with national financial institutions, companies, civil society organisations, local communities, and public sector institutions to understand national concerns around nature-related risks and opportunities and socialise the TNFD framework domestically.

Financial authorities that have issued guidance or requirements on disclosures include nature-related risks as part of broader sustainability disclosures. For example, in the EU, the ESRS includes five environment-related standards on: (1) climate change, (2) pollution, (3) water and marine resources, (4) biodiversity and ecosystems, and (5) resources and circular economy.<sup>58</sup> In Brazil, the CVM requires clear and comprehensive disclosure of ESG factors for publicly listed companies.<sup>59</sup> Annex 1 provides a list of disclosure requirements issued by authorities. And in China, PBC's Guidelines for Financial Institutions Environmental Information Disclosure require financial institutions, bond issuers, and listed companies to expand the coverage of information

---

<sup>54</sup> TNFD (2023), *Sectoral guidance – Additional guidance for financial institutions*, September.

<sup>55</sup> ISSB (2023), *IFRS Foundation education material*, December.

<sup>56</sup> ISSB (2024), *ISSB Feedback Statement on the Consultation on Agenda Priorities*, June.

<sup>57</sup> ISSB (2024), *ISSB delivers further harmonisation of the sustainability disclosure landscape as it embarks on new work plan*, June.

<sup>58</sup> European Financial Reporting Advisory Group (EFRAG) (2023), *European Sustainability Reporting Standards*

<sup>59</sup> CVM (2021), *Resolution 59*

disclosure and improve the quality of disclosure.<sup>60</sup> In addition, the NFRA requires banks and insurers to publicise their green finance strategies and policies and to fully disclose the development of green finance.<sup>61</sup>

While disclosure practices on climate-related risks are more advanced, those on nature-related risks are at an early stage. In Singapore, MAS reviewed banks, insurers and asset managers' disclosures for environmental risks beyond climate.<sup>62</sup> Across all three sectors, it found that few financial institutions had made disclosures around environmental risks beyond climate change and in cases where information was disclosed, it was qualitative in nature.<sup>63</sup> For all three sectors, MAS concluded that further work was required to stay abreast of ongoing developments of disclosures on environmental risks beyond climate, particularly around nature-related risks such as loss of biodiversity, and consider augmenting disclosures on nature-related risks over time. Similarly, when assessing progress of banks' implementation of its disclosure expectations, the ECB found that only 25% of the banks made any reference to environmental risks other than climate in 2021, although it observed a progression in 2022, when a higher percentage (35%) disclosed information about their portfolio's exposure to at least one other environmental risk. When disclosing other environmental risks, 80% of these banks included more than one environmental risk (e.g. the pollution of water due to fracking and the safeguarding of forests), while 20% of the banks included only one environmental risk (most often biodiversity risk).

#### **Box 4: TNFD disclosure recommendations**

The TNFD has developed a set of disclosure recommendations and guidance that encourage and enable businesses and finances to assess, report and act on their nature-related dependencies, impacts, risks and opportunities. The recommendations and guidance include a disclosure framework, structured around the pillars of governance, strategy, risk and impact management, and metrics and targets. The guidance includes the TNFD's LEAP (Locate, Evaluate, Assess, and Prepare) approach for businesses and financial institutions to assess, monitor, disclose and report on nature-related risks, dependencies, impacts and opportunities. It may enable business, financial institutions and other investors to integrate nature into their financial and business decisions. The four phases are broken down into sub-steps to enable organisations to answer critical questions that emerge from the assessment and disclosure process. The recommendations from the TNFD are designed to mirror and complement the TCFD, so that firms that are already using the TCFD approach can more easily integrate the TNFD approach.

---

<sup>60</sup> PBC (2021), *Guidelines for Financial Institutions Environmental Information Disclosure*, July.

<sup>61</sup> CBIRC (2022), *Green Finance Guidelines for Banking and Insurance Sectors.*, Article 28

<sup>62</sup> MAS (2022), *Information Papers on Environmental Risk Management*

<sup>63</sup> Examples of disclosed information included commitments to preserve biodiversity (banks and insurers), considerations of the impact of environmental degradation on business strategies and risk profile, sector-specific underwriting or investment policies for sectors exposed to environmental risk beyond climate change (insurers), or commitments to invest in projects aimed at preservation of natural resources and prevention/management of pollution (asset managers).

**Figure 5. TNFD’s recommended disclosures**

Governance	Strategy	Risk & impact management	Metrics & targets
<p>Disclose the organisation’s governance of nature-related dependencies, impacts, risks and opportunities.</p>	<p>Disclose the effects of nature-related dependencies, impacts, risks and opportunities on the organisation’s business model, strategy and financial planning where such information is material.</p>	<p>Describe the processes used by the organisation to identify, assess, prioritise and monitor nature-related dependencies, impacts, risks and opportunities.</p>	<p>Disclose the metrics and targets used to assess and manage material nature-related dependencies, impacts, risks and opportunities.</p>
<p><b>Recommended disclosures</b></p>	<p><b>Recommended disclosures</b></p>	<p><b>Recommended disclosures</b></p>	<p><b>Recommended disclosures</b></p>
<p><b>A.</b> Describe the board’s oversight of nature-related dependencies, impacts, risks and opportunities.</p> <p><b>B.</b> Describe management’s role in assessing and managing nature-related dependencies, impacts, risks and opportunities.</p> <p><b>C.</b> Describe the organisation’s human rights policies and engagement activities, and oversight by the board and management, with respect to Indigenous Peoples, Local Communities, affected and other stakeholders, in the organisation’s assessment of, and response to, nature-related dependencies, impacts, risks and opportunities.</p>	<p><b>A.</b> Describe the nature-related dependencies, impacts, risks and opportunities the organisation has identified over the short, medium and long term.</p> <p><b>B.</b> Describe the effect nature-related dependencies, impacts, risks and opportunities have had on the organisation’s business model, value chain, strategy and financial planning, as well as any transition plans or analysis in place.</p> <p><b>C.</b> Describe the resilience of the organisation’s strategy to nature-related risks and opportunities, taking into consideration different scenarios.</p> <p><b>D.</b> Disclose the locations of assets and/or activities in the organisation’s direct operations and, where possible, upstream and downstream value chain(s) that meet the criteria for priority locations.</p>	<p><b>A(i)</b> Describe the organisation’s processes for identifying, assessing and prioritising nature-related dependencies, impacts, risks and opportunities in its direct operations.</p> <p><b>A(ii)</b> Describe the organisation’s processes for identifying, assessing and prioritising nature-related dependencies, impacts, risks and opportunities in its upstream and downstream value chain(s).</p> <p><b>B.</b> Describe the organisation’s processes for managing nature-related dependencies, impacts, risks and opportunities.</p> <p><b>C.</b> Describe how processes for identifying, assessing, prioritising and monitoring nature-related risks are integrated into and inform the organisation’s overall risk management processes.</p>	<p><b>A.</b> Disclose the metrics used by the organisation to assess and manage material nature-related risks and opportunities in line with its strategy and risk management process.</p> <p><b>B.</b> Disclose the metrics used by the organisation to assess and manage dependencies and impacts on nature.</p> <p><b>C.</b> Describe the targets and goals used by the organisation to manage nature-related dependencies, impacts, risks and opportunities and its performance against these.</p>

TNFD’s recommendations include six general requirements: the application of materiality; the scope of disclosures; the location of nature-related issues; integration with other sustainability-related disclosures; the time horizons considered; and the engagement of Indigenous Peoples, Local Communities and affected stakeholders in the identification and assessment of the organisation’s nature-related issues. The ISSB notes that these requirements are complementary to and may be considered alongside the general requirements and other provisions of the ISSB’s IFRS S1 standard which requires reporting beyond climate-related risks and opportunities when that results in material information from a company.

The TNFD metrics include a small set of core metrics – ‘core global metrics’ that apply to all sectors and ‘core sector metrics’ for each sector – to be disclosed on a comply or explain basis, and a larger set of additional disclosure and assessment metrics, which report preparers may wish to use for their assessment. The recommendations cover immediate and material financial risks, as well as nature dependencies and their organisational and societal risks.

### *Data collection initiatives*

In some cases, guidance or requirements are complemented with data collection initiatives to inform authorities on financial institutions’ progress against supervisory expectations. The methods and scope of data collection vary; some authorities are collecting information through questionnaires of qualitative and quantitative information, either on an ad hoc basis or on a regular basis. For example, the BCB has collected qualitative and quantitative data since 2021 on exposures to counterparties whose practices, projects, or economic activities present

potential for losses due to environmental degradation, including excessive use of natural resources. In France, the ACPR collects data on nature-related risks in relation to requirements for the insurance sector, with biodiversity being explicitly mentioned by the French law in addition to broader sustainability considerations.<sup>64</sup> It gathers this data on a yearly basis and through a survey to evaluate the integration of sustainability-related risks within the risk management system and assist insurers in improving their future reporting. In addition, Italy's IVASS runs since 2022 an annual qualitative and quantitative survey on insurers and aimed at monitoring risks from natural catastrophes and sustainability risks. From 2024, the survey will include qualitative questions on the risk of biodiversity loss or other nature-related risks. In the EU as a whole, as part of the CRD6 review<sup>65</sup>, banking and insurance supervisors are empowered to gather specific information on these exposures for supervisory reporting of banks. The ECB also plans to collect and assess supervised entities' Pillar 3 data on ESG risks by the end of 2024. Such data comprises, among others, qualitative statements of banks on the integration of environmental risks into their governance, strategy and risk management. Finally, several authorities that are conducting initiatives on nature-related risks do not collect or plan to collect data on nature-related risks.

### *Integration in wider regulatory and supervisory framework*

Nature-related risks are generally integrated in the wider regulatory and supervisory framework in a similar way to climate-related risks, even though nature-related risks have some specificities, as set out in section 1.2. Nature-related risks, similar to climate ones, are considered risk drivers of existing prudential risk categories and divided into similar risk types (physical and transition risks). For instance, in the EU, CRD6 mentions that supervisory authorities should assess the risks from biodiversity loss in the context of the broader assessment of ESG risks and act in cases where banks manage risks stemming from environmental degradation and biodiversity loss in a way that endangers the stability of the individual institutions or of financial stability overall. This also applies to insurers based on the reviewed Solvency II Directive, considering that risks of biodiversity loss are part of the broader environmental risk category. Nature-related risks are subject to regular supervisory assessments by the ECB, both ad hoc (dedicated to such topics) and integrated in "regular and traditional" frameworks, as the Supervisory Review and Evaluation Process (SREP) and on-site inspections. A similar approach is taken by some EU national authorities, including the ACPR and DNB, which have started to integrate nature-related risks in their regular prudential supervision, such as risk assessments. Bdl is incorporating nature-related financial risks into its supervisory framework using a proportionate, risk-based approach. Banks are expected to conduct a self-assessment of their exposure to these risks and implement measures accordingly. They must also explain to the supervisor how their actions align with their risk exposure.

---

<sup>64</sup> The [French law on energy and climate](#) mentions biodiversity in addition to broader sustainability considerations. See Ministère de l'Économie, des Finances et de la Relance (2021), [Décret no 2021-663 du 27 mai 2021 pris en application de l'article L. 533-22-1 du code monétaire et financier](#), May.

<sup>65</sup> European Parliament (2024), [Review of the Capital Requirements Directive \(Directive 2013/36/EU\)](#)

## Scenario analysis

At an international level, the NGFS issued recommendations in December 2023 on the development of scenarios for assessing nature-related economic and financial risks.<sup>66</sup> These include (i) envisioning consistent narratives through which different hazards can be identified; and (ii) exploring methods and tools (e.g. models) through which the economic (and ultimately financial) impacts of these hazards and the ability to mitigate them can be assessed. The NGFS report highlights a number of challenges in developing nature scenarios (such as the difficulty in capturing risks in a single metric, complexity and non-linearity of natural processes), and the greater importance of granularity in assessment due to specific biomes, regions and sectors. The report notes that firm-level risk analysis even has to take into account intra-sectoral specificities. These identified challenges point to an inherent “local-global trade-off” between capturing locally specific environmental changes and maintaining global relevance, which is a major hurdle for the development of nature scenarios. According to the NGFS, models currently used for climate scenarios are likely not well-suited to capture all nature-related issues, so additional or improved models and approaches are needed. To fully appreciate nature-related risks, it is necessary to understand the potential indirect (or cascading) impacts throughout value chains of nature-related risks. However, it remains to be seen whether existing models and tools can be used to achieve this. The NGFS provides a list of options for central banks and supervisors to move forward with the development of nature-related scenarios, both in the short and longer term.

In the short term, central banks could use input-output tables and models, biophysical models, or a combination of the two to become more familiar with the identification of nature-related risks while they work on more complex models and assessing how they could be used jointly with multi-regional input output tables and models. For the longer-term, the report highlighted that it is important to develop modelling frameworks that better account for interlinkages between nature and the economy to assess nature-related financial risks more effectively. In this aspect, the report also highlighted that the modelling frameworks should also incorporate certain crucial characteristics of nature loss, such as tipping points to develop more comprehensive, methodologically diversified and transparent approach to modelling the complex interplay between biophysical and economic system.

At a national level, few authorities conduct or have plans to conduct scenario analysis or stress testing to assess the potential impact of nature-related financial risks, reflecting the very early stage of overall development in regulatory and supervisory practices. In the Netherlands, DNB conducted an exploratory scenario analysis exercise and issued a report on the economic and financial stability risks associated with nature scenarios in December 2023 (see Box 5).<sup>67</sup> In France, the ACPR indicated its intention to include the risk of biodiversity loss in its own climate stress tests in the medium term. And in the EU as a whole, the CRD6 review mentions in its recitals that environment-related risks (including both climate-related risks and risks stemming from environmental degradation and biodiversity loss) should be prioritised for stress testing requirements on individual firms, and the EBA (European Banking Authority), EIOPA and

---

<sup>66</sup> NGFS (2023), *Recommendations toward the development of scenarios for assessing nature-related economic and financial risks*, December.

<sup>67</sup> DNB (2023), *The economic and financial stability repercussions of nature degradation for the Netherlands: Exploring scenarios with transition shocks. A first exploration*, December.

European Securities and Market Authority (ESMA) will be mandated to issue guidelines respectively for banks, insurers and investment funds to ensure consistent considerations and common methodologies for stress testing ESG risks, including nature-related risks. The ECB also assessed the possible sensitivity of banks' credit portfolios to changes in biodiversity levels and the related financial viability of their borrowers, using various scenarios of future biodiversity loss caused by climate change and land use change.<sup>68</sup> Its Climate Change Centre is also involved in a project with the Potsdam Climate Impact Research and with NatureFinance to develop integrated nature-climate scenarios and effects on the macroeconomy and financial stability.

#### **Box 5: DNB's scenario analysis exercise on nature-related risks**

DNB conducted a scenario analysis exercise in 2023 to explore the potential economic and financial stability impacts of a set of tail-event scenarios that reflect strong measures taken suddenly in response to nature degradation. Five nature scenarios were analysed:

- (1) a global scenario whereby 50% of the Earth is categorised as a protected area,
- (2) an EU scenario aimed at disincentivising the import into the EU of products with a high deforestation footprint,
- (3) a global and EU scenario eliminating subsidies harmful to biodiversity,
- (4) a Dutch scenario in which government measures to reduce nitrogen pollution directly impact the agricultural sector or the lack of such measures directly impacts the construction sector, and
- (5) a global physical risk scenario of a decline in wild pollinators.

According to DNB, the uncertainty associated with nature-related risks and the exploratory methodologies applied in the study made it challenging to provide a concrete estimate of the economic and financial stability impacts. Limitations include the fact that:

- all scenarios only consider one transition measure while more realistic scenarios would account for multiple shocks at the same time;
- the use of a computable general equilibrium model likely underestimates short-term stresses because the results are only based on an equilibrium situation;
- many interdependencies and cascading effects are not yet captured, including interactions between climate and broader elements of nature; and
- differences in the effects between sectors is not always captured.

The study concluded that, although an initial assessment of financial risks for Dutch financial institutions points to limited impact (suggesting that it should be possible to take transition measures without causing a substantial impact on the Dutch economy and financial stability), the limitations identified likely point to an underestimation of the real economic and financial stability impact of the considered nature scenarios.

### *Capacity building*

There is a general recognition that more expertise is needed in the supervisory community and private sector to address nature-related risks. As an early step, some authorities are organising industry roundtables or conferences to promote the sharing of practices and stress the

---

<sup>68</sup> ECB (2023a), *Living in a world of disappearing nature: physical risk and the implications for financial stability*.

importance of nature-related financial risks for central banks and the financial system. In China, the CBIRC organised a symposium on green financial services to promote communication and exchanges among major banking institutions on green financial services, and the PBC organises pilot programs for green finance reform and innovations, to explore standard-setting on financial support for biodiversity conservation and new financial instruments for this purpose. The Australian government is also engaging with the private sector and TNFD to support Australian businesses and financial institutions to build market readiness for nature-related financial disclosures. This has included commissioning pilot testing of the draft TNFD framework with Australian businesses and financial institutions and publishing several reports to share learnings from the pilots with the broader public. In Japan, the FSA is an observer to a project led by the Japanese Ministry of the Environment aiming to build capacity among small and medium-sized financial institutions, which includes the measurement of dependencies on nature capital. Another example is MAS that is working to facilitate research collaborations between financial institutions and academia to build knowledge and capacity in this area. One key effort is a research project that seeks to shed insights into the nature-related financial risks facing financial institutions in Southeast Asia, which will be undertaken by the Singapore Green Finance Centre, a Centre of Excellence co-managed by Imperial College Business School and Singapore Management University and supported by MAS and nine financial institutions, in partnership with the University of Cambridge Institute for Sustainability Leadership (CISL).

A few other authorities have capacity building initiatives for supervisors. For example, the ECB and the BCB co-led work for the creation of a Sustainability Training Reference Guide (NGFS STaR Guide) encompassing nature-related risks. They also collaborated to establish a Sustainability Knowledge and Information Learning Library (SKILL) to provide and share resources on sustainability within the NGFS regulatory and supervisory community. In 2022, the EC and OECD launched together technical support on developing a supervisory framework for financial risks stemming from biodiversity-related losses.

At a cross-border level, the NGFS Task Force on Nature-related Risks provides a forum for authorities to share their work and learn from peers. The World Bank supports global capacity building efforts in identifying, assessing, and managing nature-related financial risks. It has conducted a series of workshops and seminars focused on nature-related risk assessments for client countries across Sub-Saharan Africa, East Asia and the Pacific, and Latin America and the Caribbean.

## 2.3. Selected case studies

### *Banco Central do Brasil (BCB)*

In Brazil, BCB has been integrating nature-related financial risks into its supervisory framework for several years. It has been assessing the adequacy of financial institutions' environmental risk management through onsite examinations and self-assessment questionnaires since 2017. In 2019, socio-environmental risks became one of the top five priorities for BCB's supervisory function and a framework was developed for monitoring social and environmental exposures of the entire financial system. The framework consolidates credit exposures to social, environmental and climate risks for every financial institution, and applies weights to inform supervisory planning and prioritisation. Also in 2019, BCB started using thematic horizontal

analyses to perform deep dives and assess the adequacy of risk management of selected financial institutions on special topics of concern, such as credit operations with entities connected with illegal deforestation and unsafe mining dams. In 2020, BCB included broad environmental and social risks in the scope of the routine of its Supervision's assessments of Brazilian banks. It has also been working on a methodological framework to improve current processes to identify specific nature-related risks.

BCB also collects data from financial institutions on nature-related risks. In 2021, BCB established the Social, Environmental and Climate Risk Document (DRSAC) to collect information related to the risk assessment from financial institutions.<sup>69</sup> This includes both qualitative and quantitative data on exposures to counterparties whose practices, projects or economic activities present the potential to generate losses for financial institutions caused by events associated with environmental degradation, including the excessive use of natural resources.

In terms of requirements for financial institutions, in 2021 regulation on Integrated Risk Management<sup>70</sup> was amended, improving the definition of environmental risk to “the possibility of losses resulting from events related to environment degradation, including the excessive consumption of natural resources”. In addition, the regulation on Social, Environmental and Climate Responsibility<sup>71</sup> establishes a set of principles and guidelines on social, environmental, and climate-related issues to be observed by financial institutions in their business, activities, processes and relationship with stakeholders. BCB also sets supervisory expectations on environmental risks in its Guide to Supervisory Practices<sup>72</sup> when carrying out its supervisory review. The Guide is divided into two documents for each risk: the intrinsic risk incurred by the financial institution and the associated controls.

In rural credit lending, measures have also been taken to reduce nature-related financial risks, with several resolutions issued.<sup>73</sup> These include prohibitions on rural credit operations in indigenous lands, natural preservation areas, rural properties with embargos due to illegal deforestation, public forests. The Sustainable Rural Credit Bureau facilitates the identification of rural credit operations that have social or environmental benefits so that banks can offer more favourable credit conditions to businesses that are deemed more sustainable.

Finally, BCB engages periodically with national bodies and banking and other financial institution associations to discuss the management of environmental-related financial risks, as well as to understand how nature-related risks could affect the financial system. It is working with other regulators and government bodies in Brazil to address issues that hamper the increase in issuance of green and sustainability-linked bonds, such as the lack of a national taxonomy.

---

<sup>69</sup> More information on DRSAC can be found [here](#).

<sup>70</sup> BCB (2017), *Integrated Risk Management, Resolution CMN 4,557*

<sup>71</sup> BCB (2021), *Social, Environmental and Climate Responsibility, Resolution CNM 4,945*

<sup>72</sup> BCB (2022), *Guide to Supervisory Practices – Intrinsic Risk and Associated Controls*.

<sup>73</sup> For example, BCB (2023), *Resolution CMN 5,081*.



## *China Banking and Insurance Regulatory Commission (CBIRC)*

In China, relevant guidelines on the management of nature-related risks are set in the broader context of green finance policies. In 2016, the PBC and former CBIRC, jointly with other government agencies, issued Guidelines for Establishing the Green Financial System<sup>74</sup>, which define green finance as “financial services provided for economic activities that are supportive of environment improvement, climate change mitigation and more efficient resource utilisation. These economic activities include the financing, operation and risk management for projects in areas such as environmental protection, energy savings, clean energy, green transportation, and green buildings.” The 2016 guidelines proposed specific measures such as environmental risk management and financial risks prevention.

In 2022, the former CBIRC issued Green Finance Guidelines for the Banking and Insurance Industry, which build on previous guidelines on green credit and require banks and insurers to effectively identify, monitor, prevent and control ESG risks in their business activities.<sup>75</sup> The guidelines cover risk management expectations related to energy consumption, pollution and environment protection, in addition to climate change. Among others:

- Banks and insurers are required to focus on the hazards and risks that may be brought to the environment and society by their customers, main contractors and suppliers in their construction, production and operation activities due to deficiencies in corporate governance and inadequate management.
- They are also asked to incorporate ESG requirements into their management processes and comprehensive risk management systems, strengthen information disclosure and communication and interaction with stakeholders, and improve relevant policies, systems and process management.
- Banks and insurers should seek progress while maintaining stability, adjust and improve credit policies and investment policies, and actively support the building of a clean and low-carbon energy system.

The former CBIRC also established key evaluation indicators for the implementation of green credit in 2014 and made biodiversity conservation and sustainable nature resource management an important element of banks’ due diligence on ESG risks of clients. The authority has regularly asked the 21 largest banks in China to carry out self-assessments of green credit and urged them to examine their green credit performance against relevant regulatory systems and standards and take timely remediation actions. In 2024, CBIRC’s successor, the NFRA, is revising these key indicators, in which biodiversity conservation will remain an important element.

---

<sup>74</sup> PBOC (2016), *Guidelines for Establishing the Green Financial System*, August.

<sup>75</sup> CBIRC (2022), *Green Finance Guidelines for Banking and Insurance Sectors*.

## *European Banking Authority (EBA)*

In the EU, guidance, regulations and supervisory practices on the management of nature-related risks are incorporated in a broader approach for managing climate and environmental financial risks.

In 2024, the EBA issued draft guidelines on minimum standards and reference methodologies for the identification, measurement, management and monitoring of ESG risks by banks.<sup>76</sup> The draft guidelines ask banks to progressively develop tools and practices to assess and manage the impact of environmental risks beyond climate-related risks, such as risks stemming from degradation of ecosystems and biodiversity loss. Among others:

- Banks are expected to have internal procedures for gathering necessary information to assess the current and forward-looking ESG risk profile of counterparties. Environmental risk assessment should cover the material impacts of counterparties on the environment (“double materiality”), including biodiversity, and related mitigation or adaptation policies.
- Banks should conduct the assessment of environmental risks at exposure level, which shall include the assessment of the likelihood of critical disruptions to the business model and/or supply chain of their counterparties due to environmental factors such as the impact of biodiversity loss, water stress or pollution.
- Large banks should develop methods to identify natural capital dependencies, as part of analyses of nature-related or biodiversity risks.
- Banks should assess which additional risk-based and forward-looking metrics and targets to include in their (transition) plans, including with a view to support risk assessment and strategic steering related to their management of environmental risks other than climate related, in particular nature and biodiversity related risks.

## *Autorité de contrôle prudentiel et de résolution (ACPR)*

In addition to the wider EU approach, EU FSB member jurisdictions have taken domestic initiatives covering financial institutions that are under their direct supervision, i.e. not supervised at EU level (“less significant institutions”). Although there are more detailed references to climate-related risks, authorities’ guidance explicitly covers other sustainability risks, such as those related to biodiversity loss and ecosystem degradation, and there is a general trend to focus more specifically on nature-related risks.

The ACPR has not yet issued any supervisory guidance or requirements on nature-related financial risks but ran a thematic review in 2023 on climate-related and environmental risk management practices of a sample of 60 banks and specialised entities, based on the ECB Guide published in 2020. The exercise will be conducted again in 2024 with a broader sample. In March 2024, the ACPR also launched a thematic review on 90% of the French insurance

---

<sup>76</sup> EBA (2024) *Draft guidelines on the management of ESG risks*, January.

market to evaluate the integration of sustainability related risks within the risk management system as required by Solvency II.

In addition, French insurers are required to disclose nature-related risks and a strategy related to nature under Article 29 of the French law on energy and climate (so called “29LEC”), which goes beyond EU requirements under the Sustainable Finance Disclosure Regulation. In 2023, 113 insurers published their “29LEC reports” and the ACPR conducted two assessments of these reports.<sup>77</sup> It found that the reports’ content is very heterogeneous and none of them fully complies with regulatory requirements, in terms of either completeness, accuracy or precision of the information published. There was an improvement in 2023 compared with 2022, but heterogeneity also increased. The ACPR included best practices and areas of attention, providing additional clarity on its expectations for 29LEC reports. Best practices on disclosing information on the strategy for alignment with long-term biodiversity objectives included having concise and quantitative information, a brief description of the methodologies and the indicators, databases or providers used by the entity, a definition of the terms used, and the internal resources deployed to meet these objectives (particularly in terms of governance). The report should also explain the way in which indicators allow the measurement of biodiversity-related objectives.

### *Banca d’Italia*

In 2022, Bdl published non-binding supervisory expectations for integrating climate-related and environmental risks into corporate strategies, governance, risk management frameworks and disclosures for banks and financial intermediaries.<sup>78</sup> It then undertook two thematic reviews against the supervisory expectations on a sample of 21 banks (“less significant institutions”) and 86 non-bank financial institutions (NBFIs) and published some preliminary best practices.<sup>79</sup> The survey on banks, apart from a few positive exceptions, showed a low degree of alignment with expectations; however, it revealed a widespread and growing awareness of the importance of the issue. The main concern is related to the difficulty in obtaining robust and reliable data. The survey on NBFIs found widespread shortcomings and delays in implementing expectations. The report urged institutions to continue assessing their ESG risk exposure and adopt action plans for integrating climate and environmental risks into their corporate strategies and risk management frameworks. Three main issues were identified, although not specifically on nature-related risks: (1) Most intermediaries had limited their actions towards sustainability to adding ‘green’ or ‘socially responsible’ products to their offer; (2) some institutions reported their governance bodies being only partially involved or not at all in sustainability matters; and (3) many intermediaries lacked reliable data to measure risks. Both banks and NBFIs were asked to prepare an ‘Action Plan’ outlining specific actions to address the identified gaps.

---

<sup>77</sup> ACPR (2024), *Energy and Climate Law: Insurers shall carry on making progress*.

<sup>78</sup> Bdl (2022), *Supervisory expectations for climate-related and environmental risks*

<sup>79</sup> Bdl (2022), *Survey on the extent of integration of climate and environmental risks into the organizational system of Less Significant Institutions (LSIs)* and Bdl (2023), *Climate and environmental risks - Survey on a sample of non-bank financial intermediaries*

## *Monetary Authority of Singapore (MAS)*

MAS issued guidelines in December 2020, setting out supervisory expectations for financial institutions on sound environmental risk management practices, covering climate change, loss of biodiversity, pollution, and changes in land use.<sup>80</sup> These environmental challenges, alongside climate change, are identified as posing potential financial and reputational risks to banks. The guidelines encourage banks to consider these environmental risks in their risk management strategies and business plans.

MAS also published three Information Papers in 2022 to share good practices areas for improvement following a thematic review of selected financial institutions.<sup>81</sup> It highlighted that:

- Apart from climate-related risks, banks and insurers had yet to make meaningful progress to address other environmental risk factors, such as biodiversity loss.
- While banks have typically focused on the impact of customers on the environment and the corresponding reputational risk, environmental degradation may also pose other risks to the customer beyond reputational risks and would hence need to be accounted for.
- Further work is required for banks to adequately consider financial impact from environmental risks beyond those explicitly linked to climate change (e.g. biodiversity loss).
- A few asset managers take into account other factors, beyond climate-related risk factors, in determining their sector policies and identification of high-risk sectors, such as looking to cover risks arising from degradation of biodiversity.
- The impact of asset managers' investment activities on biodiversity preservation is a less well-studied area, with data gaps further inhibiting the broader integration of such considerations within asset managers' investment approaches.
- Further work is required for asset managers to enhance respective environmental risk assessment frameworks to take into account specific characteristics of various asset classes and investment strategies and should go beyond climate-related risks to include natural capital and biodiversity.

In 2023, MAS issued a set of three consultation papers on supervisory expectations for financial institutions' transition planning.<sup>82</sup> The proposed guidelines highlight that environmental risk beyond climate-related risks should be proactively and holistically considered as part of financial institutions' transition planning process given the inter-dependencies between climate and nature.

---

<sup>80</sup> MAS (2020), *Guidelines on environmental risk management (banks)*; similar guidelines for *insurers* and *asset managers*.

<sup>81</sup> MAS (2022), *Information Papers on Environmental Risk Management*

<sup>82</sup> MAS (2023), *Consultation papers on Guidelines for Financial Institutions on Transition Planning for a Net Zero Economy*.

## 3. Challenges and future developments

### 3.1. Challenges identified by authorities

The main challenges identified by authorities are the limited availability of data, challenges in developing analytical approaches and quantitative assessments, lack of resources, and competing priorities.

For example, one of the challenges in developing the methodologies is the lack of publicly available nature scenarios useful for the financial sector, where work substantially lags availability of climate scenarios. Authorities also point to the complexity in understanding the potential hazards and transmission channels to financial risks. This is because nature-related risks cover a multitude of causes and impacts in both global and highly localised scale and with highly uncertain time horizons. They also involve extreme risks with associated non-linearities.

Nature-related risks are an emerging area for which understanding of concepts and definitions are still in infancy. Challenges include modelling capabilities to assess the highly localised impact of nature loss on regional and global scale and development of quantitative risk assessment frameworks, such as integrated climate and nature stress tests as well as developing integrated climate and nature scenarios that would facilitate forward-looking risk assessment. Other challenges include gaps in capacity and resourcing and competing policy priorities, with work on climate-related risk prioritised as more urgent in a number of cases.

Nature protection can involve a trade-off between policy objectives aiming at protecting or restoring nature and (short-medium term) economic and financial health. Balancing the management of nature-related financial risks with other policy objectives is a fundamental challenge. Some central banks also emphasise monetary policy does not pursue structural, climate or nature-related policy objectives and will only take account of natural risks if they have a significant impact on key macroeconomic variables or pose a risk to financial stability.

### 3.2. Future developments

Regulatory and supervisory approaches to nature-related financial risks are at an early stage, and many authorities are conducting or planning to conduct further work to improve their understanding of those risks and address the challenges identified above. For example, Banque de France is carrying out a detailed assessment of the impact on biodiversity of the equity and corporate bond components of its non-monetary policy-related portfolios. DNB is exploring instruments to scale up finance for nature-related solutions.

Authorities that aim to manage nature-related financial risks stress that it needs to be set within a context of an overall strategy, extending beyond the financial sector, to manage nature degradation as a whole. For instance, the Australian government is taking actions to protect and restore nature including by developing national targets in line with the Global Biodiversity Framework. Australian government agencies are leading work to manage and mitigate nature-related risks, while financial regulators are building their capacity to understand how these risks may impact financial stability, including through monitoring international trends and developments on this topic.

The ongoing work of the TNFD in providing guidance on nature-related disclosures, the ISSB's planned work to research disclosure about risks and opportunities associated with biodiversity, ecosystems, and ecosystem services, and the continued work of international organisations, including the NGFS, will contribute to further developing authorities and firms' understanding of nature-related financial risks and of regulatory and supervisory approaches in the coming years.

## Annex: Regulatory and supervisory guidance and requirements on nature-related financial risks

Jurisdiction	Authority	Guidance, requirements (general)	Guidance, requirements (disclosures)
Brazil	BCB	<p>Requirements:</p> <ul style="list-style-type: none"> <li>- Integrated Risk Management (<a href="#">Resolution CMN 4,557, of 2017</a>)</li> <li>- Social, Environmental and Climate Responsibility (<a href="#">Resolution CMN 4,945, of 2021</a>)</li> </ul> <p>Guidance: Guide to Supervisory Practices (GPS) includes nature-related risk</p>	<p>Requirements on qualitative disclosures: <a href="#">GRSAC</a></p> <p><a href="#">Public Consultation on quantitative disclosure</a></p>
China	NFRA / former CBIRC	<p><a href="#">CBIRC Green Finance Guidelines for the Banking and Insurance Industry</a> (2022).</p> <p>CBIRC Key evaluation indicators for the implementation of green finance in banking institutions, with revised version due in 2024. Biodiversity protection" is an important part of the indicators.</p>	<p>Article 28 of the Guidelines requires banking and insurance institutions to publicize their green finance strategies and policies and to fully disclose the development of green finance</p>
	PBoC	-	<p>Guidelines for Financial Institutions Environmental Information Disclosure (2021)</p>
EU	ECB	<p><a href="#">Guide on climate-related and environmental risks (supervisory expectations relating to risk management and disclosures)</a> (2020)</p> <p>Good practices for climate-related and environmental risk management, 2022</p>	<p>Section 7, pages 45-50, of Guide on climate-related and environmental risks.</p>
	EC	<p>CRD6 review and future EBA guidelines (<a href="#">Draft guidelines on the management of ESG risks, 2024</a>)</p> <p>Solvency II review and future EIOPA guidelines</p>	<p>Corporate Sustainability Reporting Directive (CSRD) and its implementation via European Sustainability Reporting Standards (ESRS) (2023)</p> <p>Sustainable Finance Disclosure Regulation (SFDR)</p> <p>EBA ITS on Pillar 3 disclosures on ESG risks</p>

France	ACPR	-	French Article 29 LEC sets out a number of obligations relating to the sustainability reporting framework for asset managers and insurers. ACPR <a href="#">Guidance on firm level disclosures on nature related risk</a> for insurers (2024) through the study on Article 29 LEC.
Germany	BaFin	<a href="#">Guidance Notice on Dealing with Sustainability Risks</a> (2019)	-
Italy	BdI	<a href="#">Supervisory expectations for climate-related and environmental risks</a> (2022)	The 2022 supervisory expectations contain a specific section related to disclosure.
Netherlands	DNB	<a href="#">Guide to managing climate and environmental risks</a> (2023)	-
Spain	BdE	<a href="#">Supervisory expectations relating to the risks posed by climate change and environmental degradation</a> (2020)	-
	DGSFP	Supervisory Priorities	
Switzerland	FINMA	Consultation on <a href="#">new circular on nature-related financial risks</a>	Subject to the review of FINMA's current disclosure requirements on climate-related risks. See <a href="#">Climate risks: FINMA is reviewing the existing disclosure requirements (2024)</a>
	SIF	-	SIF is engaging with financial institutions to encourage them to voluntarily adopt the TNFD framework for their nature-related disclosures and has supported the establishment of a TNFD National Consultation Group and the TNFD Early Adopters.
Türkiye	CMB		Sustainability principles for publicly listed companies including voluntary reporting; ISSB implementation ongoing
International	NGFS	<a href="#">Nature-related financial risks: a conceptual framework to guide action by central banks and supervisors</a> (2024) <a href="#">Recommendations toward the development of scenarios for assessing nature-related economic and financial risks</a> (2023)	



International	OECD/EC	<u>A supervisory framework for assessing nature-related financial risks (2023)</u>	-
International	World Bank		Plans to develop supervisory guidelines fitted to the EMDE context that align with evolving standards such as those proposed by the TNFD, thereby improving the clarity and transparency of nature-related risk disclosures.