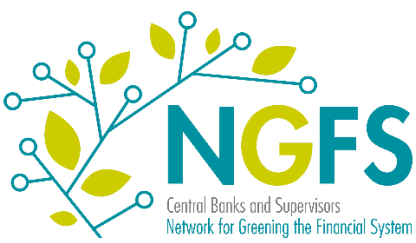
NGFS Occasional Paper

Biodiversity and financial stability: exploring the case for action

INSPIRE



About the NGFS
The Network for Greening the Financial System (NGFS), launched at the Paris One Planet Summit on 12 December 2017, is a group of central banks and supervisors, which on a voluntary basis are willing to share best practices and contribute to the development of environment and climate risk management in the financial sector, and to mobilise mainstream finance to support the transition towards a sustainable economy. The NGFS brings together 92 central banks and supervisors and 14 observers. Together, they represent five continents and countries which produce around 85% of global greenhouse gas emissions and are responsible for the supervision of all of the global systemically important banks and two thirds of global systemically important insurers. The NGFS is chaired by Frank Elderson, member of the European Central Bank's Executive Board. The Secretariat, headed by Jean Boissinot, is provided by Banque de France.

About INSPIRE
The International Network for Sustainable Financial Policy Insights, Research, and Exchange (INSPIRE) is an independent research network built to support the central banks and supervisors of the NGFS in its work to manage climate and environmental risks and mobilise finance to support the transition to a sustainable economy. The INSPIRE secretariat is co-hosted by the Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science and the ClimateWorks Foundation. It is guided by an Advisory Committee and has commissioned over 30 research projects across a range of critical themes.

About the Joint NGFS-INSPIRE Study Group on Biodiversity and Financial Stability
The study group was established in April 2021 to establish a research-based approach to how central banks and supervisory authorities can fulfil their mandates in the context of biodiversity loss. It is co-chaired by Dr MA Jun (Chairman of the Green Finance Committee of the China Society for Finance and Banking and chair of the NGFS Workstream on Research) and Professor in Practice Nick Robins (London School of Economics and INSPIRE).

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Key messages

NGFS and INSPIRE have established a joint Study Group on Biodiversity and Financial Stability, with the aim to understand the potential implications of biodiversity loss for financial stability.

Biodiversity is declining faster than at any time in human history. Policy efforts have been unable to slow the global loss of biodiversity, while the pressures driving this decline continue to intensify. In addition to increasing awareness of the impacts of economic activities on biodiversity, some central banks and financial supervisors are starting to recognise the potential of biodiversity loss as a threat to their core mandates for financial and monetary stability.

Biodiversity loss could pose risks to the financial system through complex feedback loops, externalities and tipping points, including **transition risks** (e.g. incompatibility between financial institutions' exposures and government measures) and **physical risks** (e.g. declining performance of assets or economic activities that depend upon biodiversity).

The global economy and financial system are embedded in the biosphere. Companies both depend on ecosystem services such as clean air and fresh water, and impact on the natural systems that provide those services. A range of market and institutional drivers explains the continued failure to value biodiversity but efforts to quantify the economic dependence on nature – as one aspect of addressing this failure – are growing. The financial system can both contribute to the depletion of biodiversity and promote its conservation and sustainable use.

The study group will explore whether and how central banks and supervisors can, within the remit of their mandates, play a role in addressing the challenge of biodiversity loss itself and the knowledge gaps around it, from assessment and monitoring of the relationship between biodiversity loss and financial stability to considering if central bank portfolios should include conservation goals.

Applying a 'double materiality' approach to biodiversity loss could be particularly insightful. Nature-related hazards can affect companies and financial institutions, but companies and financial institutions can also affect biodiversity and the climate. This suggests that a comprehensive approach to risk management should account for how financial institutions are exposed to biodiversity-related financial risks, but also how they contribute to such risks.

1. The need

The debate that climate change presents financial risks for banks, insurers and the wider financial system is now largely settled (NGFS, 2019). But it is being increasingly recognised that climate change is not the only significant, non-linear and potentially existential environmental risk facing societies (Steffen et al., 2015), including non-financial and financial firms (Bolton et al., 2020a), nor the only environmental impact facilitated by financial activities.

Biodiversity is declining faster than at any time in human history and the pressures driving this decline are intensifying. One-quarter of species are threatened, and around 1 million species face extinction, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) has found, with the majority of ecosystem and biodiversity indicators in decline (IPBES, 2019). According to the UK government's Dasgupta Review of the Economics of Biodiversity, "such declines are undermining nature's productivity, resilience and adaptability, and are in turn fuelling extreme risk and uncertainty for our economies and well-being" (Dasgupta, 2021).

The destruction of natural habitats, most notably through deforestation and land-use change, is also believed to have played a role in the COVID-19 pandemic (Platto et al., 2021). Many recent infectious diseases have animal origins (zoonotic) linked to unsustainable patterns of development, including deforestation, mining, urban expansion and intensive agriculture (Dobson et al., 2020), which also exacerbate biodiversity loss (IPBES, 2019) and climate change (IPCC, 2018). COVID-19, biodiversity loss and climate change can potentially have common origins: the broad-based degradation of nature.

More specifically, five direct drivers are responsible for biodiversity loss, according to IPBES. In descending order of importance these are: land and sea use change; direct exploitation; climate change; pollution; and invasive alien species. These direct drivers emerge from indirect drivers such as demographic, sociocultural, economic, technological and institutional factors (IPBES, 2019). Deterioration is not uniform across geographical regions, as the underlying drivers of change vary in intensity (Ichii et al., 2019; IPBES, 2019; WWF, 2020).

The international Convention on Biological Diversity (CBD) was agreed in 1992 at the same time as the Framework Convention on Climate Change. So far, however, policy efforts have been unable to slow the global loss of biodiversity: none of the 20 biodiversity targets agreed by governments in a 10-year plan in 2010 had been fully achieved by 2020 (CBD, 2020a). This failure to recognise that "we are embedded in Nature" (Dasgupta, 2021) threatens the achievement of the Sustainable Development Goals (SDGs) as well as undermining efforts to tackle climate change (see Figure 1).

Policymakers, civil society, business and finance are now placing increasing focus on halting these losses and starting to restore biodiversity. In October 2021, the 15th Conference of the Parties (COP) to the CBD will be held in Kunming, China, where governments will adopt a new global biodiversity policy framework that provisionally aims "to take urgent action across society to put biodiversity on a path to recovery for the benefit of the planet and people" (CBD, 2020b). At the G7 meeting in June 2021, leaders agreed a G7 Nature Compact, making commitments to halt biodiversity loss by 2030, and tackle deforestation, marine litter and the illegal wildlife trade (G7, 2021). More than 500 companies have made a commitment to reverse nature loss,

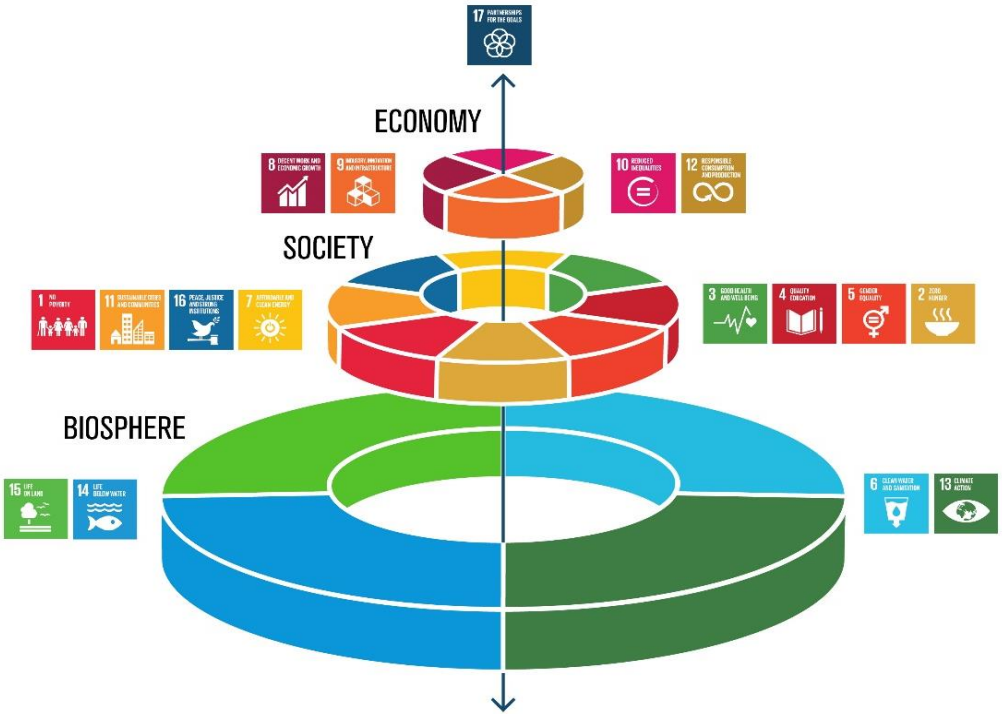
according to the Business for Nature coalition (Business for Nature, 2021). Thirty-seven financial institutions, managing €9 trillion in assets, have signed the Finance for Biodiversity Pledge, committing to set targets and disclose their annual progress on increasing significant positive and reducing significant negative impacts on biodiversity (Finance for Biodiversity, 2021). The Taskforce for Nature-Related Financial Disclosures (TFND), which was launched in June 2021 and should become operational in 2023, seeks to provide a framework for corporates and financial institutions to assess, manage and report on their dependencies and impacts on nature (TNFD, 2021).

In addition to the increasing awareness of the significant impacts of economic activities on biodiversity, some central banks and financial supervisors, including the European Central Bank (ECB, 2020), have also started to recognise the potential threat from the decline in biodiversity to their core mandates for financial stability. The Network for Greening the Financial System explicitly acknowledges the existence of environmental risks beyond climate change (NGFS, 2019), and De Nederlandsche Bank (DNB) is the first central bank to have examined the impacts and dependencies of its financial system on biodiversity (van Toor et al., 2020). To date, most of the work by central banks and supervisors to address environmental challenges has focused on climate change, and the potential risks posed by biodiversity loss have remained largely unexplored.

It is against this backdrop that the NGFS and the International Network for Sustainable Financial Policy Insights, Research, and Exchange (INSPIRE) have established a Joint NGFS-INSPIRE Study Group on Biodiversity and Financial Stability, with the aim to understand the potential implications of biodiversity loss for financial stability, with a potential initial focus (to be confirmed) on land-use change and deforestation. The goal of the Study Group is to establish an evidence-based approach to how central banks and supervisory authorities may need to consider biodiversity loss in the context of their mandates.

This document sets out the rationale for the Study Group's work, its initial agenda and its research focus.

Figure 1: **Achieving the Sustainable Development Goals will depend upon a healthy biosphere**



Source: Azote Images for Stockholm Resilience Centre, Stockholm University

2. Biodiversity and the macroeconomy

The global economy and financial system are embedded in the biosphere, as illustrated by Figure 1. All companies depend on ecosystem services, such as clean air, fresh water, fertile soils and a stable climate, to varying degrees. At the same time, all companies have impacts on the natural systems that provide those services. Ultimately, the fate of humanity is dependent on the biosphere: if we were to destroy the biosphere, life would cease to exist (Dasgupta, 2021).

Short of such a cataclysm, the degradation of nature can result in potentially severe losses and disruption to economic activity. This has consequences for growth, prices and employment, as well as the performance of financial institutions.

A growing number of studies have sought to quantify our economic dependence on nature. For example:

- US$44 trillion of GDP, or more than half of global economic value generation, is dependent on nature and its ecosystem services (Herweijer et al., 2020).
- Swiss Re's Biodiversity and Ecosystem Services assessment reaches a similar conclusion, estimating that 55% of global GDP depends on "high-functioning biodiversity and ecosystem services" (Swiss Re Institute, 2020).
- The value of ecosystem services such as climate regulation, water purification and pollination, is estimated to be US$125–140 trillion per year (OECD, 2019).
- Between 1 billion and 1.5 billion people derive benefits from forests in the form of food and livelihoods (Agrawal et al., 2013).
- Between 58 million and 120 million livelihoods are supported by fisheries and aquaculture (UN Environment, 2019).

A range of market and institutional shortcomings explains the continuing failure to value, conserve, restore and sustainably use biodiversity, including inadequate or incomplete measures of economic performance (such as GDP), incentive structures that externalise negative costs onto natural systems, and financial market short-termism (Dasgupta, 2021).

Climate change and biodiversity loss are closely interconnected. The loss of biodiversity (for example, through deforestation or forest degradation) is a major source of greenhouse gas emissions. Oceans are also significant stores of carbon dioxide and their thermohaline circulation plays a crucial role in regulating the climate. Anthropogenic climate disruption is also one of the main causes of biodiversity loss, alongside land-use change, pollution, overexploitation and invasive species introduction (IPBES, 2019). As IPBES stresses, the impacts of a changing climate on nature are likely to increase over the coming decades.

Given that both biodiversity loss and climate change drive economic loss, an integrated approach to climate and biodiversity loss is needed that reflects the role of biodiversity in underpinning ecosystem health and in providing the preconditions for economic activity (Pörtner et al., 2021). However, biodiversity loss is sufficiently problematic in itself also to be assessed without its interactions with climate change.

Some biodiversity-related economic impacts are characterised by deep uncertainty and non-

linearity. Ecosystems are subject to tipping points and regime shifts, posing potential systemic risks through complex transmission channels (Bolton et al., 2020b). While biodiversity loss is often highly localised, it has the potential to generate cross-country impacts. For example, it could affect global value chains, international trade and migration patterns. The COVID-19 pandemic has vividly demonstrated the global macroeconomic impacts that zoonotic diseases can have.

This suggests that biodiversity-related financial risks can lead, therefore, to potentially far-reaching impacts on economic agents, who face significant uncertainty over when biodiversity-related risks might materialise (Dasgupta, 2021).

The Study Group will assess impact channels by which biodiversity loss affects the macroeconomy, and how the macroeconomy could be impacted by the need to reverse biodiversity loss. It will consider the modelling of these impacts, and the limits of meaningful quantification given the uncertainty at stake, the heterogenous impacts between industry sectors, and the need for detailed, highly localised analysis. Such an assessment will be critical to understand how financial stability could be threatened by biodiversity loss.

What is biodiversity and why is it important?

Biodiversity is defined in the Convention on Biological Diversity as the "variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems" (CBD, 1992).

UN Environment defines biodiversity as including the diversity of living things at the genetic level, as well as at the levels of species and ecosystems. It also states that diversity includes abundance, distribution and behaviour, and interaction with socio-ecological systems (UN Environment, 2019).

Biodiversity has value deriving from the uniqueness and irreplaceability of individual species and ecosystems that means its worth cannot be expressed solely in monetary terms. As former Bank of England Governor Mark Carney notes: "So much of what climate change destroys – species, habitats, ways of life, natural beauty – is not formally valued" (Carney, 2021).

Biodiversity provides various ecosystem services to humans, including the provision of food, fibre, environmental regulation and leisure opportunities, as well as offering cultural and religious significance, to which monetary values can be carefully ascribed and which have macroeconomic significance.

3. Biodiversity and financial linkages

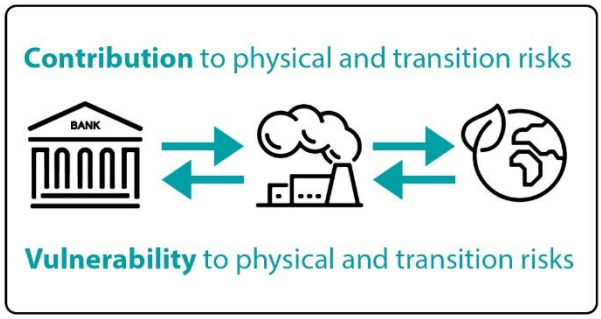
The Study Group will assess how the macroeconomic impacts of biodiversity loss and the measures considered or taken to reverse it could affect financial stability. Biodiversity loss may pose financial risks to individual financial institutions as well as to the financial system as a whole. As mentioned above, DNB was the first central bank to evaluate the extent to which the financial institutions it supervises are exposed to risks related to biodiversity loss.

Double materiality and biodiversity loss

Given the extent of uncertainty, the insufficient ambition of current policies aimed at addressing biodiversity loss and the endogeneity of environmental risks (i.e. the fact that financial institutions contribute to them through the projects they finance or support), applying a double materiality approach to biodiversity loss could be particularly insightful.

Double materiality (see Figure 2) means that it is not only nature-related (e.g. climate or biodiversity) impacts that are material to companies and financial institutions, but also financial institutions and companies that are material to biodiversity or climate (Täger, 2021). This emphasises that a comprehensive approach to risk management should account for how financial institutions are exposed to biodiversity-related financial risks (corresponding to the vulnerability to risks in Figure 2) but also how they contribute to such risks (corresponding to the contribution to risks in Figure 2).

Figure 2: **Double materiality**



Source: Adapted from Oman & Svartzman (2021)

The dependency of the financial sector on biodiversity

Building on the analytical framework developed to illustrate climate-related financial risks, Figure 3 (on p10) shows that biodiversity loss can affect financial assets, institutions and systems through diverse impact channels. It is noteworthy that these risks go beyond the risks faced by companies to also include those faced by households as well as the public sector. These would include sovereign-level risks that could impair the ability of countries to manage their fiscal operations, including the long-term servicing of debt, and operate the monetary system.

Physical risks

Financial institutions are exposed to losses resulting from the declining performance of assets or economic activities that depend upon biodiversity. Physical risks are likely to result from the five direct drivers of biodiversity loss identified on page 4. They can be chronic (e.g. gradual decline of numbers and species diversity of pollinators resulting in reducing crop yields, or increasing costs of manual pollination) or acute (e.g. pests wiping out significant parts of a harvest because of the disappearance of natural predators, or disease spreading as a

consequence of reduced natural resistance), or both (disruption to the water cycle caused by deforestation). They are often operational, relating to resource dependency, scarcity and quality, and tend to be local, although they can quickly spread to multiple sectors and activities and therefore become global. As a first step towards the identification of physical risks, DNB found that 36 per cent of investments by Dutch financial institutions are highly or very highly dependent on one or more ecosystem service (van Toor et al., 2020). Biodiversity loss could, at scale, influence human migration patterns and generate geopolitical instability and conflict, in addition to interacting with climate change.

Transition risks

Government measures, technological developments, litigation and changing consumer preferences aimed at reducing the damage to biodiversity and ecosystems – caused by economic agents that create these impacts – can translate into transition risks if financial institutions are exposed to these agents directly or indirectly. These measures and developments are likely to target the five direct drivers of biodiversity loss listed above, which could affect a great variety of economic agents and sectors (e.g. in the agricultural and manufacturing sectors) and geographical areas (along with potential impacts on global trade). For instance, DNB (2020) found that the Dutch financial system could be vulnerable to policies aimed at increasing protected areas or at reducing nitrogen-emitting activities.

The emergence of physical and transition risks is becoming increasingly apparent given the current situation, although their timing and distribution and the impacts on individual financial institutions and the financial system remain subject to considerable uncertainty. More research is therefore needed both to measure and assess those risks, and to better assess the implications for financial system stability from biodiversity loss. There is a need to better understand the impact of worst-case scenarios, and the effects of low-probability but high-impact biodiversity-related tail-risks on the financial sector. Financial regulators and supervisors could have a role to play in better assessing, managing and reporting on biodiversity-related financial risks as part of their supervisory duties.

The Study Group will aim to contribute to addressing these uncertainties by commissioning research that evaluates the risks facing particular countries (for example, by applying the DNB approach to other jurisdictions). It will also identify and collect case studies that provide detailed analysis of impacts in particular sectors and regions. In addition, the Study Group will draw together the best understanding of how to project these risks into the future to address the profound 'tragedy of the horizon' in terms of irreversibility of impacts (e.g. through species extinction and/or ecosystem collapse).

In a similar way to climate change, biodiversity loss could pose risks to the financial system in terms of complex feedback loops, externalities and tipping points. This puts a premium on complementing the macroeconomic and the microprudential analyses with a macrofinancial analysis of the interlinkages and the risk of spillovers/contagion within the financial system as a whole. The Study Group will therefore examine the potential need and scope for adding a macroprudential perspective on top of the microprudential approaches to cover system-wide vulnerabilities related to biodiversity loss. Figure 3 below depicts the transmission channels of biodiversity risk into the economy, financial institutions and central banks and regulators, and the potential role of the latter in responding to these risks.

The impact of finance on biodiversity

By facilitating economic activity, the financial system can both contribute to the depletion of biodiversity and promote its conservation and sustainable use. The macrofinancial importance of biodiversity means that it could be strategically important for central banks and supervisors to understand these impacts, following the logic of double materiality.

Negative impacts of finance

The financing of activities that lead to biodiversity loss is likely to contribute to both physical and transition risks. It may therefore be more explicitly and systematically considered by micro- and macroprudential supervision as well as in the conduct of monetary policy.

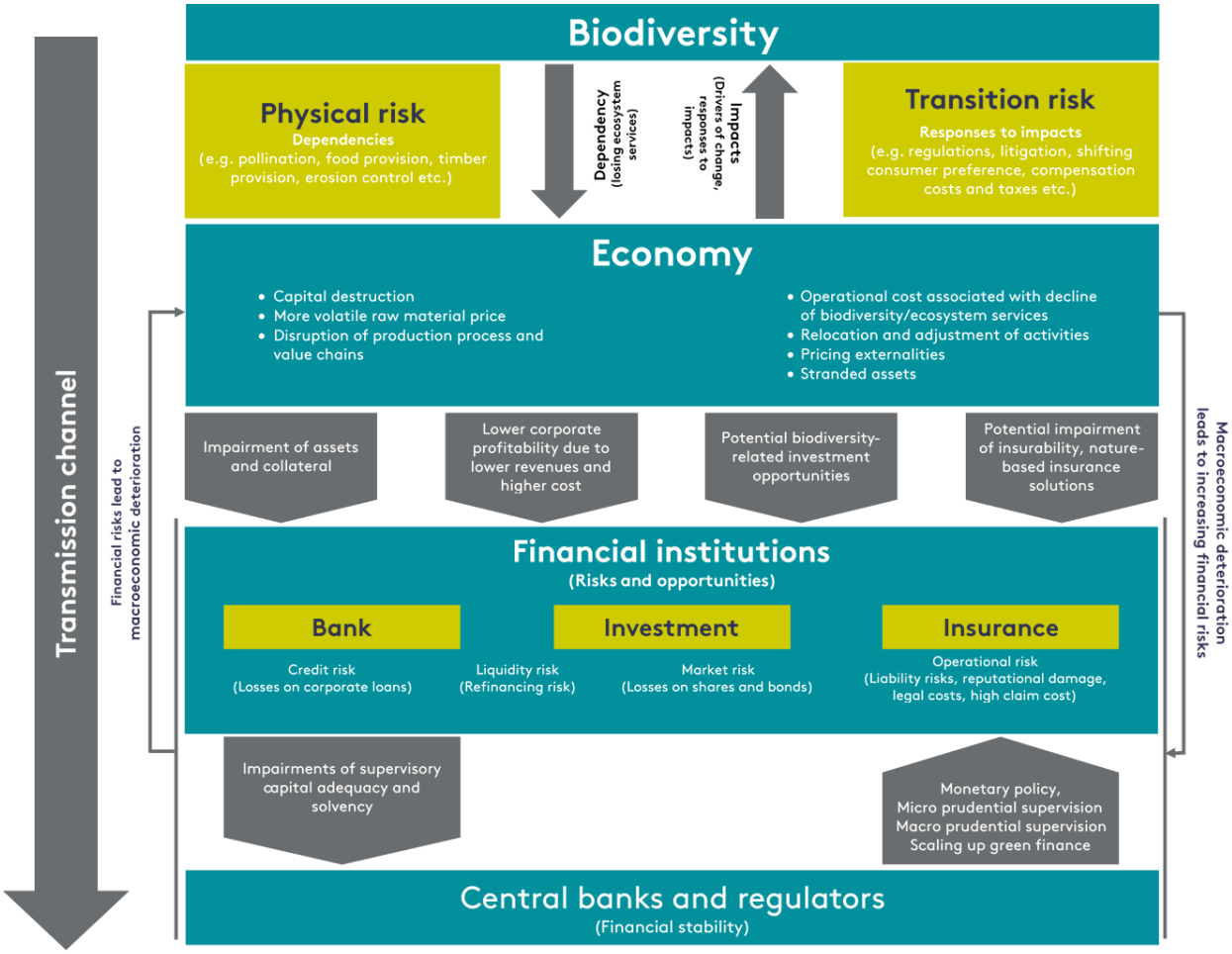
Positive impacts of finance

Enabling the financial system to facilitate positive biodiversity impacts could be within the realm of financial policies, including those to which central banks can contribute. Estimates suggest a biodiversity finance gap of around US$598–824 billion annually (Deutz et al., 2020).

As the Dasgupta Review of the Economics of Biodiversity notes, "a significant portion of the responsibility for helping us to shift course will fall on the global financial system" (Dasgupta, 2021). The latter does not imply that financial players can reverse biodiversity loss on their own, but rather that they have a role to play along with other agents, including policymakers and specialised agencies.

In this regard, it will be important to discuss whether central banks and supervisors could encourage, in line with their core mandates, the financial innovation needed to mobilise capital into nature conservation and restoration. This could involve investigating which legal or other barriers in regional or national financial systems are currently inhibiting the development and scaling of biodiversity funding.

Figure 3: **The relationship between biodiversity and financial stability**



The illustration shows where and how central bank responsibilities are affected by the dynamics between biodiversity loss, financial stability, price stability, and the stability of individual financial institutions.
Source: NGFS-INSPIRE

Strengthening the financial system architecture on biodiversity

To be effective, central banks and supervisors will need to identify the role they can play in developing and supporting the financial system architecture that effectively addresses the two-way interplay between the impacts of biodiversity on the financial sector and the impacts of finance on biodiversity.

Numerous relevant tools, databases, policies and collaborative initiatives are under development. Central banks and supervisors may wish to support and promote some of these listed below. Please note that this list is indicative rather than exhaustive.

Risk management tools include the International Biodiversity Assessment Tool (IBAT), the Natural Capital Finance Alliance's Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE) tool and the Trase forest-risk commodity supply chain database.

The International Finance Corporation's Performance Standard 6 addresses biodiversity conservation and the sustainable management of living natural resources. In December 2020, the Monetary Authority of Singapore issued its Guidelines on Environmental Risk Management, which address biodiversity loss.

Impact measurement tools include the Biodiversity Footprint Financial Institutions method developed by ASN Bank, a Biodiversity Impact Metric developed by the Natural Capital Impact Group, and a biodiversity impact tool commissioned by a group of four French investment managers, to be developed by two advisory firms.

Disclosure tools and policies include the Taskforce on Nature-related Financial Disclosures (TNFD, 2021), the EU Sustainable Finance Taxonomy, which will be extended to address biodiversity, and Article 173-vi of France's Energy Transition Law, which has been recently amended to include biodiversity impacts.

Collaboration and coordination initiatives include the Partnership for Biodiversity Accounting Financials, networks such as the Natural Capital Finance Alliance, the Coalition for Private Investment in Conservation, and EU Business @ Biodiversity.

The Finance for Biodiversity Pledge secretariat has published an overview of finance sector biodiversity initiatives, available at:

www.financeforbiodiversity.org/overview-of-biodiversity-initiatives-for-finance →

4. The role of central banks and financial supervisors

Given the scale of both the challenge of biodiversity loss itself and the knowledge gaps around it, a strategic and structured approach by central banks and financial supervisors is needed.

The Study Group will explore the potential role of central banks and supervisors across a range of functions, including:

i. **Assessment and monitoring:** What is the role for financial authorities in assessing the relationship between biodiversity and financial stability? Are traditional methods adequate (e.g. stress testing)? What key biodiversity indicators should central banks and supervisors be monitoring, evaluating and reporting on? What disclosure should they require from regulated entities?

ii. **Microprudential:** Should (and if so, how) biodiversity factors be included in routine activities to assess the safety and soundness of financial firms? What role might scenario-based tools play in analysing and stress-testing biodiversity risk exposures?

iii. **Macroprudential:** Should (and if so, how) biodiversity risks be incorporated into macroprudential policy frameworks and instruments?

iv. **Monetary:** Should (and if so, how) biodiversity factors be incorporated into price stability policies as well as monetary operations?

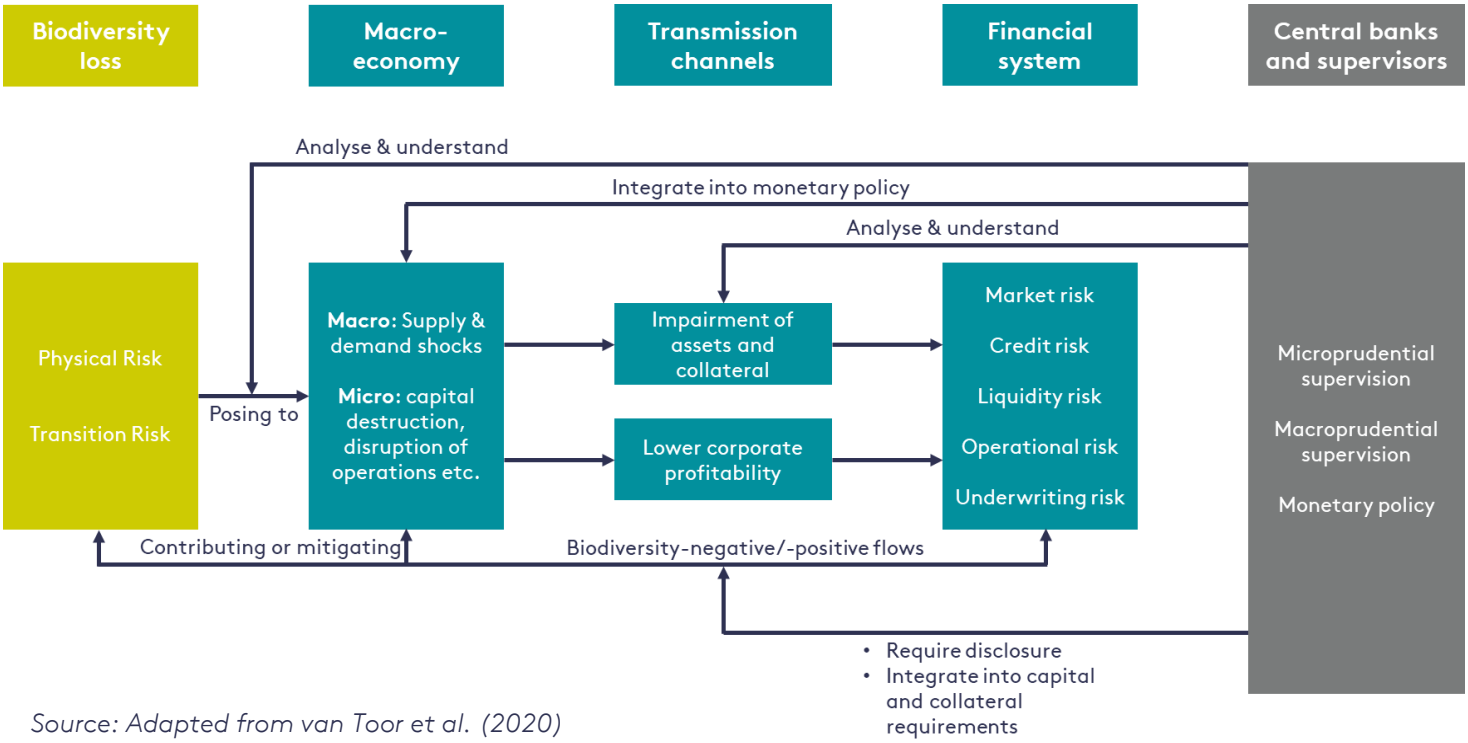
v. **Portfolios:** Should (and if so, how) the conservation of biodiversity be included in the management of central bank portfolios?

vi. **Policy:** How can central banks and supervisors provide independent assessment of the biodiversity challenge to governments, identifying real economy and financial system reforms that could be needed, independently and in collaboration?

vii. **Scaling up:** Should (and if so, how) central banks and supervisors support the scaling up of innovative financial tools to help support biodiversity and strengthen financial stability?

This is an extensive agenda, and it will be important to prioritise subsequent research and enquiry. Clearly, meanwhile, the roles that central banks and supervisors can take are determined by their specific legal and operational mandates. The Study Group will thus seek to identify generic steps that can be taken as well as profiling specific examples through the use of case studies.

Figure 4: **Biodiversity and the role of central banks**



Source: Adapted from van Toor et al. (2020)

5. Next steps

The Study Group would welcome feedback on the initial approach set out in this Vision document, particularly in response to the questions included in Section 4. We would also welcome suggestions or examples of research and analysis that can help to deepen our thinking. Based on this as well as our own research, the Study Group will publish an interim report ahead of COP15 of the Convention on Biological Diversity. That report will be open for further feedback. The final report of the Study Group will be published in early 2022, along with an agenda for further research.

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