



Nature's next stewards

Why central bankers need to take action on biodiversity risk

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Foreword

Change happens gradually, and it happens suddenly. Major events, argued political economist Orit Gal, "are the manifestation of maturing and converging underlying trends: they reflect the change that has already occurred within the system".¹ The authors of this report argue that central banking and financial supervision is about to be subject to sudden change, resulting from maturing and converging trends. Central bankers and financial supervisors are recognizing that the economy and the financial sector are deeply embedded in the biosphere and hence that environmental degradation can be financially material.

At least three events have contributed to this sudden change. The first was the financial crisis of 2008-09. This forced central banks to innovate to tackle new risks, using novel monetary policy or instruments of financial regulation. They played a key role in saving the global financial system and the world economy from collapse, as epitomized by the pledge from Mario Draghi – then the President of the European Central Bank – in 2012 that the ECB was "ready to do whatever it takes" to save the euro.

From this financial, economic and political crisis, a new school of thought emerged. Its arrival was marked by the second event: then-Bank of England Governor Mark Carney's "Tragedy of the Horizon" speech, in 2015. That set out the importance of climate change and nature for the economy as a whole, for financial system stability, and therefore also for central banks and financial supervisors. This led to the creation of the Network for Greening the Financial System (NGFS) in 2017, and an explosion of thinking, dialogue and innovation designed to address what the Bank for International Settlements (BIS) described as "green swans" – environmental events with unexpected consequences, analogous to the 'black swan' events popularized by Nassim Nicholas Taleb (BIS, 2020).

The lack of historical precedent for such green swans has necessitated what the BIS talks about as a moment of rupture – an epistemological break. To be able to deliver on their mandates of financial and price stability, central banks and financial supervisors must now address forward-looking risks.

Since the publication of the BIS paper in early 2020, the focus of central banks and financial supervisors on environmental issues has increased further. Christine Lagarde, the new ECB President, stated that central banks cannot "simply ignore climate change or ... not play a role in combatting it" (Lagarde, 2021). Jens Weidmann, president of the Deutsche Bundesbank, agreed that climate change can affect the traditional mandates of central banks and financial regulators, a view shared by Janet Yellen, the new US Secretary of the Treasury (Weidmann, 2021; Sorokin, 2021).

The third event is the COVID pandemic. It has shown both that humanity is not hopeless in the face of global crises – and also what is at stake if we fail to respond to their causes. Climate change and the degradation of nature increase the probability of future zoonotic spill-over events, with potentially catastrophic effects on human health and economic stability.

These converging trends mean that financial supervisors must invert the burden of proof they face: they must demonstrate that environmental degradation *does not* threaten financial and/or price stability. Central bankers and financial supervisors need to adopt 'precautionary financial policy,' and actively integrate environmental risks and impacts into their activities (Chenet et al., 2021). They need to act urgently and innovate to tackle these new threats to the economy and financial stability, to ensure the robustness and sustainability of our financial system.

This report sets out to support this effort and provides central bankers and financial supervisors with case studies, academic insights, new ways of thinking and, lastly, a list of recommendations to help them embrace this new paradigm. They require central bankers to extend conventional risk management and use existing regulatory powers and tools to take preventative action to mitigate risk. Ultimately, these recommendations also help central bankers to recognize their role within existing national and international policy efforts to protect biodiversity.



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¹ Cited in Doughnut Economics (Raworth, 2017).

Foreword

This year could well mark a breakthrough for sustainable finance. Financial policymakers and institutions are gearing up for the COP26 climate summit, focusing on how to expand investment for net-zero emissions and climate resilience. In addition, the wider degradation of nature is also gaining increased attention ahead of the UN Biodiversity Conference, COP15 in Kunming, China.

Central banks and supervisory authorities are increasingly recognizing the potential for biodiversity loss to threaten macroeconomy stability as well as the stability of the financial systems that they oversee. But the complexity of the issue, the lack of regulations and policy guidance, and limited tools to measure, disclose and manage nature-related financial risks create a range of challenges.

To respond to this emerging agenda, the Network for Greening the Financial System and the International Network for Sustainable Financial Policy Insights, Research, and Exchange (INSPIRE) established a joint Study Group in April 2021. This will conduct a programme of research and dialogue to address these challenges and propose recommendations for action and further inquiry. The goal of the Study Group is to establish an evidence-based approach to how central banks and supervisory authorities could fulfil their mandates in the context of biodiversity loss. The Study Group has published its first output setting out the rationale for its work, with an initial agenda and research focus.

Against this backdrop, this new report from WWF is very timely and a welcome addition to the growing literature on the links between biodiversity loss, the financial system and the role of central banks and supervisors in managing a new generation of environmental risks.

I am heartened by the energy and dedication of the central bank and research members of the Study Group – a number of whom were involved in the preparation of this report and the case studies it contains. The Study Group's next output will be published ahead of the Kunming COP and its final report will be released in early 2022.



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Executive summary

The unprecedented rate of biodiversity loss – exacerbated by and contributing to climate change – is undermining key ecosystem services and natural resources on which the economic system depends, fueling economic vulnerabilities and risks. Just as central banks have begun to consider climate change risks as falling within their mandates, the transmission of nature-related risks from the real economy to the financial sector should be a major concern for central banks and financial supervisors.

Similarly to climate-related risks, nature-related risks can be characterized as comprising:

- Physical risks, from the potential for reductions in the quantity and quality of services provided by natural systems;
- Transition risk, arising from actions or changes which occur to combat or reduce nature and biodiversity loss; and
- Liability risks, from litigation against entities held responsible for biodiversity loss and resulting damages.

Biodiversity loss also poses systemic environmental risks, with non-linear consequences and tipping points. These risks flow through from the macro-economy to the financial sector – this report offers seven case studies setting out how biodiversity loss creates or contributes to economic impacts that have the potential for financial sector implications.

As well as facing risks from biodiversity loss, the finance sector impacts biodiversity through its lending and investments. The sector generally fails to measure, manage and reduce these impacts. Moreover, as central banks increasingly participate in financial markets through their adoption of unconventional monetary policies, they risk adding to these negative impacts.

Making the case for action

This report sets out the case for central banks to consider these risks and impacts. Critically, they need to assume that environmental degradation (including biodiversity loss) poses financial risk unless it can be shown not to be the case.

They also need to be proactive, forward-looking and take preventative measures to mitigate nature related-financial risk.

The Convention on Biological Diversity already calls for signatories to integrate conservation and the sustainable use of biological diversity into their policies. Their efforts, here, are supported by internationally agreed financial standards, such as the Basel III capital adequacy rules for banks and the Insurance Capital Standard, which could be applied to biodiversity-related financial risk.

In addition, central banks are building the expertise and capacity to manage nature-related financial risk. Four pillars are important in this endeavour. Central banks and financial supervisors must not wait but immediately act to:

- Integrate environmental risk into macro- and micro-prudential supervision;
- Address environmental risk on their own balance sheets,
- Require enhanced disclosure from the financial sector, as is envisaged by the work of the Taskforce on Nature-related Financial Disclosures; and
- Prepare the adaptation of international financial standard to properly take into account those new cross cutting dimensions into traditional financial risks management, ensuring the necessary coordination and convergence of practices.

WWF's recommendations

This report concludes with a series of recommendations. These are provided in detail on pages 39-42. In summary, they fall under three headings:

The burden of proof should be reversed. Central bankers should anticipate, assess and mitigate risks to the financial system. They must assume that environmental degradation, including biodiversity loss, poses macroeconomic and financial risks in their jurisdictions unless it can be shown otherwise.

Preventive measures should be taken to mitigate *ex ante* the risks deriving from biodiversity loss alongside climate change-related risks. The current regulatory framework provides the tools to do so, across microprudential supervision, macroprudential supervision and monetary policy. Central bankers should address environmental risks in their own portfolios and should promote the necessary research.

Central banks and financial supervisors should act consistently with our stated environmental objectives. They should advocate for common international financial regulation that includes environmental dimensions.



1. Introduction

Biodiversity is the richness and variety of all life on earth, including the diversity of species, the variation of genes and diversity of ecosystems that comprise the earth (CBD, 1992). According to the latest assessment from the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), human activity is responsible for the alteration of 75% of the Earth's land surface, and the deterioration of 66% of oceans, threatening in turn 25% of known plants and animals (IPBES, 2019). Over the last 50 years, global wildlife populations have declined by 60%. Over one million species are facing extinction. The current rate of biodiversity loss is unprecedented in human history.

While the human-induced alteration of ecosystems and habitats is the major driver of biodiversity loss, the latter is in turn reducing the resilience of ecosystems to shocks in a self-reinforcing vicious loop. This is further accentuated by climate change, as increases in temperatures and shifts in precipitation are fundamentally affecting both ecosystems and species. This creates another vicious circle, as it reduces the capacity of nature to sequester carbon, hence accelerating climate change (IPBES, 2019; Intergovernmental Panel on Climate Change, 2018). In short, biodiversity loss and climate change are inextricably tied (Pörtner et al., 2021; Finance for Biodiversity Initiative, 2021).

Meanwhile, biodiversity loss is increasingly fueling economic vulnerabilities and risks by undermining key ecosystem services and natural resources on which the economic system depends (Dempsey, 2013). Indicatively, a 2020 World Economic Forum report estimates that over 50% of the Gross Value Added of six key global industries depend on nature to varying degrees (WEF, 2020). Likewise, the Natural Capital Finance Alliance estimates that more than 60% of market capitalization in the FTSE 100 is highly dependent on nature (Natural Capital Finance Alliance, 2018). The economic cost of nature degradation is already significant (see, for example, ELD, 2015 and UNDP, 2012), and is expected to increase if no decisive action is taken to curb current trends (TEEB, 2008; Trucost, 2012). Indeed, recent research suggests that, under a business-as-usual scenario, biodiversity loss could cost up to \$9.8 trillion of global GDP by 2020 (Johnson et al, 2020).

Biodiversity risk on the rise

Beyond the specific numbers of these global cost estimates, the key point is that biodiversity loss is undeniably becoming a major source of economic risk and vulnerability at both the industry level and the macroeconomic scale; and that, in turn, the transmission of nature-related risks from the real economy to the financial sector, potentially affecting financial stability, is inevitable. This should be a major concern

for central banks and supervisors, particularly given the evidence that those risks are mispriced by financial actors (Dasgupta, 2021).

However, unlike the important advances in the integration of climate-related risks in financial regulation (see, for example, BIS, 2020 and NGFS, 2020), the understanding and integration of nature-related risks into the policies and practices of central banks and financial supervisors remains embryonic at best (PwC & WWF, 2020; Finance Watch, 2019). Further, existing frameworks and tools that aim to incorporate climate-related risks into financial decisions, regulations and supervision, often fail to capture the negative feedbacks that exist between climate change and biodiversity loss and are consequently undervaluing the economic and financial implications of climate change.

This report aims to address this gap by arguing that, like climate-related financial risks, biodiversity loss should also be within the scope of central banks' mandates as a consequence of its impacts on financial stability. To demonstrate why this is the case, the report includes concrete case studies that illustrate the transmission channels from biodiversity loss to financial risk, before proposing a roadmap to tackle biodiversity loss via financial regulation tools and monetary policy incentives.

In line with the recently published Dasgupta review on the economics of biodiversity (Dasgupta, 2021), among other analyses, the report argues that financial risks arising from biodiversity loss can be classified in a similar way to climate-related financial risks, including: physical risks (e.g. ecosystem services changes due to biodiversity loss and ecosystem degradation), transition risks (e.g. regulatory changes aiming to reverse biodiversity loss, or reducing natural resources use) and litigation risks (e.g. breaches of legal frameworks related to biodiversity protection). To this taxonomy, we would add systemic risks whereby, due to economy-wide compounded effects, biodiversity-related risks eventually affect all financial actors (PwC & WWF, 2020).

An inverted burden of proof

Central banks need to invert the burden of proof and assume that environmental degradation, including biodiversity loss, poses financial risk unless it can be shown not to be the case. They therefore need to be proactive and forward-looking and take preventative measures to mitigate biodiversity-related financial risks, using the existing regulatory framework.

Finally, by integrating biodiversity-related financial risks into financial regulation tools and monetary policy, central banks and financial supervisors can contribute to incentivizing a redirection of financial flows from activities that are harmful to biodiversity towards those that contribute to reversing biodiversity loss. Indeed, although central banks and supervisors are primarily guided by the concept of "financial materiality" (defined, in this case, as a measure of financial risks stemming from biodiversity loss), policies aiming to stem biodiversity-related financial risks (e.g. via prudential standards) can also incentivize "environmental materiality", defined as the impacts of the financial system on biodiversity.

Since the beginning of the pandemic, calls for a green recovery have been commonplace among global institutions, notably as the links between biodiversity loss, land-use change, wildlife exploitation, and the spread of zoonotic diseases have been brought to the forefront of policy debates (OECD, 2020). Beyond the greening of economic stimulus packages, a genuine nature-positive recovery requires a structural reform of the financial system: the integration of biodiversity-related risks into financial regulation policies is a key precondition for halting the dramatic collapse of biodiversity and addressing the financial risks that it triggers. Central bankers and financial supervisors need to demonstrate policy coherence between financial supervision and macroeconomic stability and the global policy objectives of protecting the natural environment and supporting sustainable development.

With the UN Biodiversity Conference in Kunming, China coming up in autumn 2021, we urge central banks and financial supervisors to improve their understanding and management of biodiversity degradation and the consequences of the latter for financial stability.



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2. Why biodiversity loss means financial risk

The financial sector is exposed to financial risks arising from this loss of biodiversity. Assessing such risks is a complex undertaking. The first step is to identify the transmission channels between biodiversity loss and the traditional categories of financial risks to which financial institutions are exposed.

Biodiversity risks

Environmental degradation creates risks for economic and financial actors. As with climate-related financial risks, these can be divided into three categories.

The first, physical risk, is the potential for reductions in the quantity and quality of services provided by natural systems. These 'ecosystem services' are usually divided into four categories: provisioning (e.g. food production), regulating (e.g. surface water purification), cultural (e.g. tourism); and supporting services (e.g. nutrient cycling) (OECD, 2019).

However, five major direct drivers of biodiversity loss (changes in land and sea use, direct exploitation and overexploitation of organisms, climate change, pollution and invasion of alien species) reduce in turn the availability of these services (IPBES, 2019). For example, the reduction in animal pollination can reduce the yields of food crops; the reduction in mangroves alters marine food chains; and the pollution and degradation of natural sites such as coral reefs reduce tourism revenues.

These deteriorating ecosystems can have negative economic impacts. A few sectors are directly dependent on ecosystem services: agriculture and forestry, clothing, brewers, electric utilities and other power producers and, to a lesser extent, tourism and consumer goods (UNEP Finance Initiative, 2020). These dependencies can be material: for instance, a study by the Dutch central bank found an average of 36% of the portfolios of Dutch financial institutions are highly or very highly dependent on one or more ecosystem services (De Nederlandsche Bank, 2020).

The second category, transition risk, arises from actions or changes which occur to combat or reduce nature and biodiversity loss. Indeed, the economy will require deep transformation to put it on a sustainable path. This will primarily hit companies having strong negative impacts on biodiversity and ecosystems (agriculture, forestry, fishery, distribution, mining, energy, transport and infrastructure) (WWF & AXA, 2019).

The transition risk is generated by:

- Policy measures, such as restrictions on access to land and resources, disclosure requirements, taxes or prohibitions;
- Technology changes, for example innovations enabling more sustainable processes in agriculture or industry;
- Market changes, such as long-term price increases resulting from reduced availability of timber or fibers;
- Changes to consumer preferences, with customers favoring products with low impacts on biodiversity.

For both physical and transition risks, the extent of the impact is dictated partly by the economic activity involved and, in some cases, by its location. Nature loss tends to be very location specific, so an economic activity that degrades nature, or is highly dependent on nature, in one part of the world can have minimal impacts and dependencies in another. Understanding the impact of an economic activity on biodiversity and the consequences of biodiversity loss on business activity require an understanding of the location of the entire business chain.

There is a third category of risk which the Network for Greening the Financial System (NGFS) treats as a subset of transition and physical risks. Liability risks result from litigation actions undertaken against entities held responsible for the occurrence of physical or transition risks (e.g. a company whose activity has negative impacts on biodiversity) (PwC & WWF, 2020).

These three categories of biodiversity risk have the potential to create negative financial impacts for economic and financial entities.

The Institute for Climate Economics (I4CE) is a non-profit organisation founded in 2015 by the French national promotional bank (Caisse des Dépôts) and the French Development Agency (AFD). I4CE is a Paris-based think tank whose mission is to support action against climate change. Through its applied research, the Institute contributes to the debate on climate-related policies and provides support to financial institutions, businesses and territories in the fight against climate change.

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Transmission channels between biodiversity risks and nature-related financial risks

At the micro-level, biodiversity risks threaten to impact the economic performance of companies throughout the whole value chain (notably through property damage, business disruption or loss of productivity) and cause financial losses (through stranded assets, new capital expenditures required due to transition, and changes in costs and revenues) (NGFS, 2020b).

At the macro-level, biodiversity risks have economic consequences (capital depreciation, price shifts, productivity changes, labor market frictions, socioeconomic changes, etc.) which impact economic agents, notably companies (NGFS, 2020b). They may be compounded by impacts on public health and water security.

These negative impacts result in financial consequences for companies, households and governments which feed in turn traditional risks faced by financial institutions (credit risk, market risk, liquidity risk, reputation risk and operational risk). The financial impacts of biodiversity risk for financial institutions are the nature-related financial risks.

Biodiversity loss and climate change

There is a negative feedback loop between biodiversity and climate change, which risks exacerbating the losses faced from each of them. Climate change is one of the drivers of biodiversity loss. When assessing the financial impact of climate risks, we should factor in the consequences of biodiversity loss. Failing to do so leads to the underestimation of climate risks.

Similarly, biodiversity loss has negative impacts on climate change. The loss of natural systems such as forests reduces the ability of the biosphere to sequester carbon, and reduces overall climate resilience, for example protection against flooding. Climate and biodiversity risks should therefore be analyzed together.

Biodiversity loss and systemic risk

Furthermore, the dynamic interactions between biodiversity and climate change contribute to systemic environmental risk, with non-linear consequences and tipping points. Such environmental systemic risk poses, in turn, systemic financial risk.

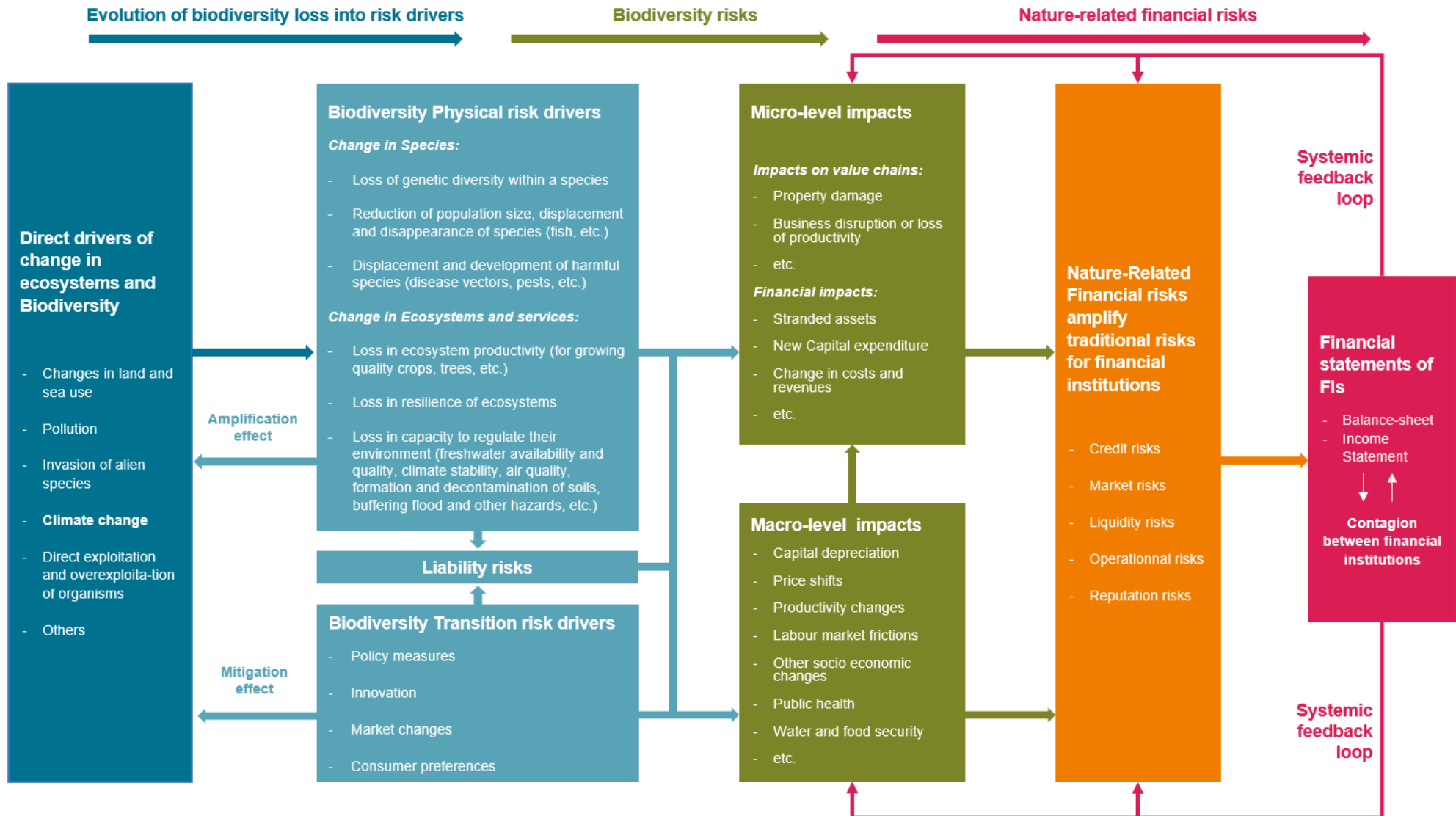
The financial system is vulnerable to both external and endogenous shocks. As the COVID-19 pandemic demonstrated, such external shocks can disrupt the whole production and supply chain and potentially trigger a systemic financial crisis. Equally, individual financial players hit at

the same time by nature-related financial losses could be the trigger for an endogenous systemic crisis through the failure of market mechanisms.

Lessons learnt from the climate debate

Given the lack of data and consensus on biodiversity metrics, quantifying the financial impacts of biodiversity risks will be a challenging task. But it should not be considered as a prerequisite for action. Understanding transmission channels will allow the use of qualitative approaches which can offer useful risk management tools. Finally, it is key to have an integrated approach that combines risks and impacts, because managing biodiversity risks may not be enough to result in positive impacts on biodiversity. Indeed, in the case of climate change, when financial institutions manage transition risks in their portfolios, there is no guarantee that it results in an active contribution to the low-carbon transition in the real economy (Hilke et al., 2021). Complementary policies are needed to help financial institutions make a positive contribution to climate action in the real economy, for example through requiring disclosure on impacts; clarifying the implications of long-term climate objectives for fiduciary duty; or setting standards for financial products to retail investors that claim to make a positive environmental impact (Cardona & Evain, 2021).

Transmission channels from biodiversity loss to nature-related financial risks



*Biodiversity loss translates
into nature related
financial risks at micro
and macro level.*



3. Finance as a driver of biodiversity loss

The finance sector not only faces risks from biodiversity loss; through its lending and investments, it enables economic activity that causes damage to natural systems. Yet without clear direction from financial regulators, it has little incentive to manage and reduce this damage. Meanwhile, with central bankers becoming increasingly active participants in financial markets through their adoption of unconventional monetary policies, they risk adding to these negative impacts.

In 2019, the world's largest banks invested more than \$2.6 trillion in sectors which are the primary drivers of biodiversity loss, with neither sufficient processes to monitor their biodiversity impacts nor adequate policies to prevent harm (Portfolio Earth, 2021a).

The financing arrangements underpinning the world's most visible biodiversity harms are becoming more transparent. New methods of data analysis have identified the institutions financing the soft commodity export markets that drive a large share of global tropical deforestation. The Vanguard Group, BlackRock and Morgan Stanley are among those closely linked to soy and beef in Brazil and palm oil in Indonesia (Trase Finance, 2021). Together, these export markets are estimated to account for 350,000 hectares of deforestation each year. Between 2015 and 2019, the global banking industry provided more than \$1.7 trillion to 40 key companies along the plastic supply chain, including seven out of 10 of the worst plastic polluters in 2020 (Eonnet, 2020). None of the top 20 banks involved have developed due diligence criteria, contingent loan criteria or financing exclusions for plastic (Portfolio Earth, 2021b). Marine plastic pollution is already shown to be harming more than 800 marine species through ingestion, entanglement and habitat change (Sweet et al., 2019).

Outside the private sector, it is estimated that the assets held by development finance institutions (DFIs) globally could be placing \$1.1 trillion of nature at risk annually without sufficient measures to mitigate harm (Finance for Biodiversity Initiative, 2020).

The damage is not always obvious; the financial system is also supporting chronic nature loss in many more subtle ways. This can be cumulative, such as the chemical run-off from the use of fertilizers and pesticides leading to habitat loss over time, or indirect, such as the expansion of transport infrastructure introducing disruptive non-native species into vulnerable remote ecosystems. By not accounting for biodiversity impacts themselves, financial institutions are signaling to their corporate clients that biodiversity is not a factor they need to consider. This allows for smaller scale but

cumulatively significant damages across a much broader set of sectors than land use and plastics.

The financial sector perceives as low the risk that it is penalized based on the biodiversity impacts of the activities that it finances. There is a lack of information and consensus around how and when global policy will tackle biodiversity loss. This creates little incentive to act. Without clear regulatory direction, private financial institutions have little impetus to manage their biodiversity impacts and will continue to finance activities that cause significant harm to biodiversity.

Central banks as part of the problem

Central banks, meanwhile, are becoming increasingly important investors in their own right. The size of central bank balance sheets globally has doubled since 2010 to reach over \$30 trillion in 2020 (Statista, 2020). The US Federal Reserve, the European Central Bank, the Bank of Japan and the Bank of England have added another \$4 trillion since the coronavirus pandemic began (Wilkes & Carvalho, 2020). Central bank balance sheets now collectively account for roughly a third of global assets under management (Boston Consulting Group, 2020).

In most cases, central bank asset purchase programs seek to passively track the market to avoid introducing structural biases. Yet due to the substantial size of their purchases, central banks have become significant active market players with considerable influence on the risk profile of different assets. This leads to a damaging chain of events.

The **Finance for Biodiversity (F4B)** initiative was established in October 2019 to increase the materiality of biodiversity in financial decision-making and so better align global finance with nature conservation and restoration. It focuses on five strategic areas:

- Market efficiency and innovation;
- Biodiversity-related liability;
- Catalyzing nature markets;
- Citizen engagement and public campaigns; and
- Responses to the COVID crisis.

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Currently, the market does not perceive biodiversity impact as a material risk and, as a result, market players hold assets with high biodiversity impacts in their portfolios. When a central bank purchases assets, it mirrors this behavior. This disproportionately increases demand for assets with high biodiversity impact, improving their liquidity. In turn, this lowers the risk associated with holding them and the cost of capital for the issuers. In other words, by copying the investment choices of the market, the central bank turns the market's perception of low biodiversity risk into a reality.

Since the coronavirus pandemic, roughly 10% of the Federal Reserve's corporate bond purchases were issued by companies at high risk of adversely affecting biodiversity (Vivid Economics & Finance for Biodiversity Initiative, 2021). To the end of 2020, the Federal Reserve had purchased \$590 million worth of corporate bonds from companies identified as at highest risk of tropical deforestation, the largest global emitters of greenhouse gas emissions, and the largest sources of plastic pollution. Separate evidence has demonstrated a carbon bias within the corporate bond purchase programs of the European Central Bank and the Bank of England, as well as the Federal Reserve (Natter, 2020).

Governance by default

Financial supervisors determine the rules governing private finance and, in doing so, decide which issues do and do not deserve scrutiny under risk management and compliance procedures. This position of influence means that without explicit measures to safeguard against systemic impacts such as biodiversity harms, financial regulators implicitly condone them. Financial governance by default will support the status quo and, in this case, the continued financing of widespread destruction of biodiversity.

The continued financing of global biodiversity harms will not change until there are structural adjustments to risk management and asset allocation, which must be driven by financial governance. Financial institutions will not act until they are given clear incentives to do so, and those incentives must include financial governance. For climate, a combination of the Paris Agreement, the TCFD and a host of central banks examining climate risk is bringing about substantive change in private sector practice. With biodiversity, the risk is just as significant as in climate and the need for incentives in the financial system just as great, but the pace of irreversible damage is more rapid. The need for central bank and financial regulatory action is urgent.



*The finance sector
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4. Nature-related risk in practice: real-world case studies

The pressures on the Earth's natural systems are unprecedented, as is their rate of change. There is a growing realization that backward-looking measures of risk will prove inadequate to capture exposures to, for example, the impacts of a changing climate. The past is unlikely to provide a guide to the future. So too with biodiversity risk.

This can make it challenging to construct an evidence base to make the case that central banks and financial supervisors should dedicate resources to addressing nature-related financial risks. However, there is a growing number of examples and case studies that illustrate the potential for biodiversity risk to result in nature-related financial risk at both the micro- and macroeconomic levels. The seven case studies presented here offer real-world examples that help underpin the case that central banks should begin monitoring and managing biodiversity risk.

Tropical deforestation, biodiversity loss and financial risk

While net global forests loss has slowed down in the last two decades, biodiversity-rich tropical forests continue shrinking. The tropics have lost 273 million hectares of forests since 1990 (FAO, 2020) and only a 40% of the world remaining forests have a high ecosystem integrity (Grantham et al., 2020). About 51% of total forest loss between 2001-2015 was driven by commercial agriculture due in part to a growth in global demand for forest-risk crop commodities (e.g. soy, palm oil, beef, cacao) and expansion of transport infrastructure (Pacheco et al., 2021).

Deforestation driven by agriculture generates income for farmers and economic earnings for producing countries. But it also leads to changes in climate and biodiversity loss (Daskalova et al. 2020) and ultimately undermines producing countries' natural capital, which will likely lead to growing economic and financial impacts in the near future. For example, deforestation erodes the pollination services that forests provide for food crops which depend on animal pollination. (Krishnan et al. 2020).

In addition to the effects of forests on carbon cycles, deforestation also alters water cycles (OECD, 2019), with potentially material impacts on water-exposed businesses. Besides biodiversity impacts, deforestation triggers land conflicts and threaten local communities' livelihoods and social rights (Colchester, 2019).

A growing recognition of climate, biodiversity and social impacts is driving consumers, largely in major consuming countries, to increasingly demand deforestation-free commodities.

Growing deforestation leading to disruption of forest natural habitats and ecosystems has translated into financial risks for financial institutions that are directly or indirectly exposed to deforestation by their financing of forest risk commodities (Global Canopy, 2020). The beef and soy sectors in the Brazilian Amazon and Cerrado are good examples. Total finance to these sectors in Brazil equated \$100 billion between 2013-2020. Of this, 74% originated from domestic banks and 26% from foreign financial institutions including Santander, Rabobank, HSBC, and JPMorgan Chase, among others, which have also adopted deforestation policies (Chain Action Research 2020). Due to the expansion of soy and beef linked to deforestation, the reputational risk of financial institutions is affected and, along with expected changes in import countries regulations, it will translate into regulatory and financial risks since the pressures to financial institutions for increasing disclosure of deforestation exposure will continue to grow.

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Joining the dots: nature loss, zoonotic disease and economic costs

With the world still reeling from the devastating toll of COVID-19, the World Economic Forum's 2021 Global Risks report listed infectious diseases as the top risk in terms of impact, and fourth most likely to occur (World Economic Forum, 2021). The destruction of nature, particularly deforestation, increases the risk of the emergence of novel zoonotic pathogens, such as the virus causing COVID-19.

The economic costs of COVID-19 have been enormous, with one estimate putting the figure for 2020 and 2021 at around \$10 trillion in forgone output (What is the economic cost of covid-19?, 2021). Indeed, the costs would likely have been greater without enormous government spending and supportive action from central banks, including interest rate measures, lending operations, asset purchase programmes and foreign exchange interventions.

But the COVID-19 pandemic could have had a much greater impact. The Ebola virus, another zoonotic disease, has an average fatality rate of 50% (although fatality rates can be as high as 90%) and outbreaks occur when the virus jumps from wildlife hosts to humans (World Health Organization, 2021). Modelling of 27 Ebola outbreaks with 280 comparable control sites revealed that there is increased probability of an Ebola outbreak occurring in a site with recent deforestation (Olivero et al., 2017). Thus, corporate activities that cause deforestation – particularly deforestation that fragments previously intact forest blocks – risk paving the way for the next disease spillover. The economic and human toll a novel virus with the fatality rates of Ebola and the transmissibility of COVID-19 would be catastrophic.

Analyses reveal that the costs of preventing deforestation and regulating wildlife trade in order to prevent a future pandemic are dwarfed by the economic and mortality costs of responding to disease outbreaks once they have emerged (Dobson et al., 2020).

Wendy Elliott, Deputy Practice Leader, Wildlife Practice



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Monocultures and disease: a perfect storm for global banana production

Bananas are a significant global commodity, key to economies throughout Latin America, Africa, and Asia. Annual global banana production is around \$31 billion (FAO, 2020). This important crop provides a livelihood for thousands of smallholder farmers throughout the world, and in many regions is a culturally significant food and key contributor to local food security. For some producer countries, banana production accounts for a material share of GDP; for example, around 2.5% for Ecuador.

That's why, in August 2019, Colombia declared a state of emergency after detecting the deadly TR4 form of Fusarium Wilt Disease (also known as Panama Disease) in some of its northern banana plantations. This strain of the fungal disease was first discovered in the 1970s and has subsequently caused multiple epidemics amongst banana crops throughout the Asia Pacific, causing hundreds of millions of dollars in damage annually in the affected regions (Aquino et al., 2013). The emergence of TR4 in Latin America and its spread through other regions could have similarly devastating effects.

But Panama Disease now poses an increasingly high risk to banana producers and the economies that depend on them because of the lack of diversity within banana crops themselves. Roughly half of the bananas grown around the world are the Cavendish variety, largely grown in monocultures (FAO, 2020). Moreover, these plants are usually propagated by clones, meaning there is no genetic variation to foster resilience to disease (Ordóñez et al., 2015). In some regions, climate change may also be enhancing favourable conditions for the proliferation of Fusarium Wild (Salvacion et al., 2018).

If this threat is not addressed, potentially through fostering greater crop diversity, the economies and livelihoods of major banana producers will likely be facing major challenges in the years to come. Moreover, trading relationships could be disrupted – the EU alone accounts for over 32% of global banana imports (FAO, 2019).

Rebekah Church, Global Lead Biodiversity Stewardship



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Overfishing and shattered livelihoods: the lasting legacy of the Canadian cod moratorium

For hundreds of years, the economy of Atlantic Canada has been highly dependent upon marine resources, with cod a key species for local fisheries. In the early 1990s, cod harvests directly contributed roughly \$700 million per year to the Canadian economy and employed tens of thousands throughout eastern Canada (Emery, 1992). All of this changed in the early 1990s, when a collapse of Atlantic cod stock sparked what would become decades of economic turmoil.

After many years of pressure from overfishing, the increasing use of trawling and more efficient fishing technology decimated Atlantic cod stocks. High levels of by-catch also depleted other key species, disrupting the food chain, and ultimately resulting in severely compromised ecosystem function (Hutchings & Meyers, 1994). By 1992, Atlantic Canada's cod stocks had finally reached levels that could no longer sustain any level of harvesting. In response, the Canadian government declared a moratorium on the cod fishery, sending shockwaves throughout Atlantic communities.

This closure resulted in more than 30,000 job losses in the province of Newfoundland and Labrador as fisheries and fish plants closed – the single largest job loss event in Canadian history (Steele et al., 1992). In an attempt to manage the damage, the Canadian government invested more than C\$3 billion in financial aid and retraining programs (OECD, 2006). But with few new opportunities, the affected communities faced irreparable economic and social damage. In the years that followed the moratorium, Newfoundland and Labrador experienced high levels of out-migration, particularly among young people (Hamilton & Butler, 2001)

To date, the cod stocks have never returned to previous levels in Atlantic Canada. But have the lessons of Canada's cod collapse acted as a warning for the rest of the world? Many European cod stocks have been undergoing steady declines over the past two decades (Grafton et al., 2009), and without effective management action, ecosystems and communities face severe risk in the years to come.

At the global level, overfishing can lead to the build-up of substantial financial vulnerabilities. To give one example, a report from the Fish Tracker Initiative identified 228 companies listed on the world's stock markets with exposure to seafood production, representing seafood revenues of \$70.6 billion: a number of those listed companies have links to stocks where overfishing is occurring (McCarron, 2017).

However, these listed companies represent only 8-23% of reported global production volumes and, particularly regarding small scale fisheries, it is likely that the majority of financial risks are channeled through the domestic banking systems of respective countries. Indeed, evidence from the Baltic region, for instance, suggests that most fishing companies are small and medium-sized enterprises which depend on bank financing (WWF & Metabolic, 2019). Finally, accounting for financial risks from overfishing need to be linked to wider pressures on marine ecosystems and their impacts on fish stocks.

Rebekah Church



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How the Cerrado's degradation threatens Brazil's economy

The Cerrado, which lies primarily in central and north-eastern Brazil, is an area of forest, savanna and grassland that once covered two million square kilometres. It is home to about 5% of the world's biodiversity (Asher, 2019). Half of Brazil's watersheds originate there, including the Pantanal, the world's largest wetland.

About 50% of the Cerrado has been converted to agricultural use, particularly soy production. The removal of native vegetation has been linked to changes in precipitation patterns and regional climate change, with negative impacts on agriculture and hydropower production capacity (Nóbrega et al., 2017; Prager & Milhorange, 2018).

Seventy percent of Brazil's electricity comes from hydropower generated from watersheds originating in the Cerrado, which is also a source of water for millions of people. In the 2014-17 drought, power utilities reported a loss of 15.8 bn reais (£4.3 bn) as they were forced to buy oil and other fossil fuels to make up for the lack of hydropower (Watts, 2014). Production of soy, one of the country's largest export crops, fell 17% (Glickhouse, 2015). Meanwhile, a study of the effects on rainfall of deforestation and agricultural expansion in the southern Amazon Region (which includes the major soy growing area of Mato Grosso), suggested that rainfall would decline dramatically once forest loss exceeds 55-60%, potentially leading to agricultural losses of up to \$1 billion annually, and risking the creation of stranded agricultural and energy assets (Leite-Filho et al., 2021; Fair, 2019).

The Cerrado is vital to the sustainability of the Brazilian economy. There are ways to manage it sustainably while generating economic growth for the people who live there, strengthening the case for positive engagement with the Brazilian authorities. For instance, soy production could be tripled without converting any more land to agriculture (Filho et al., 2014; Strassburg et al., 2014). Efforts in this direction have received backing from investors and food-industry companies, 135 of whom had signed the Cerrado Manifesto's Statement of Support by April 2019, which calls for zero-deforestation soy (Murray, 2018).

The economic threats posed by the Cerrado's degradation are indicative of the wider exposure of Brazil's financial system to nature-related risks. A 2015 Trucost report analyzed the exposure of Brazil's banks and financial institutions to natural capital risks, concluding that these are substantial (Carreira et al., 2015). Indicatively, Brazilian banks had, on average, a natural capital exposure ratio of 2.25 (ratio of natural capital costs in relation to the financial value of investments), suggesting that any internalization of these externalities could significantly affect the performance and stability of the banking sector and the wider financial system.

Susanne Schmitt, Nature and Spatial Finance Lead, WWF-UK



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Invasive species can bring economic devastation in their wake

Invasive species can have devastating impacts on both nature and the economy. The costs attributed to invasive species average around \$27 billion each year and have been tripling each decade since the 1970s (Diagne, 2021).

Invasive species can lower crop productivity, harm livestock, degrade soil quality, and decrease the value of land or property. The spread of invasive species can be caused by corporate activities, particularly those involving transport.

For example, the emerald ash borer (see picture), a beetle, was likely introduced into the United States from its native Asia on solid wood packing material carried either in cargo ships or airplanes. First seen in the US in 2002, by 2018 it had spread to 35 US states and five Canadian provinces. Whilst the adult beetle consumption of ash foliage causes little damage, the larval stage feeds on the inner bark of ash trees, disrupting the tree's ability to transport water and nutrients. This beetle has killed hundreds of millions of ash trees in North America, costing forest product industries, nursery operators, property owners, and municipalities hundreds of millions of dollars. It has also arrived as an invasive species in Russia.

Other examples of invasive species causing significant economic damage include the Fall armyworm (*Spodoptera frugiperda*), native to the Americas, but which in Africa has the potential to cause maize yield losses estimated at between \$2.5 and \$6.2 billion a year across just 12 countries (Rangi, 2018).

Zebra mussels, one of the aggressive freshwater invaders worldwide, significantly increase operating costs to facilities such as electric power and water purification plants by clogging water intake pipes (Transport Canada, 2010).

The sea lamprey *Petromyzon marinus* attaches on to fish and feed on their body fluids. While this does not normally kill fish in their native North Atlantic, due to co-evolution, in the Great Lakes where they are invasive, sea lampreys kill trout, sturgeon catfish, salmonids and other species. Sea lamprey's have devastated the great lakes fisheries, at one point reducing catches to around 2% of previous levels (Great Lakes Fisheries Commission, 2021).

Meanwhile, the presence of harmful invasive species can be a barrier to overseas trade due to quarantine regulations: for example, some countries have already banned the import of fruits from Africa due to the fruit fly *Bactrocera dorsalis* (Rangi, 2018).

It is difficult to accurately cost the impacts of invasive species, but one macro study found estimates of up to 12% of GDP (in the case of India) and 4.5% of GDP for Brazil. In the US, estimates of costs ranged from \$131 billion to \$220 billion/year, or 0.9-1.7% of GDP (Marbuah et al., 2014).

Wendy Elliott



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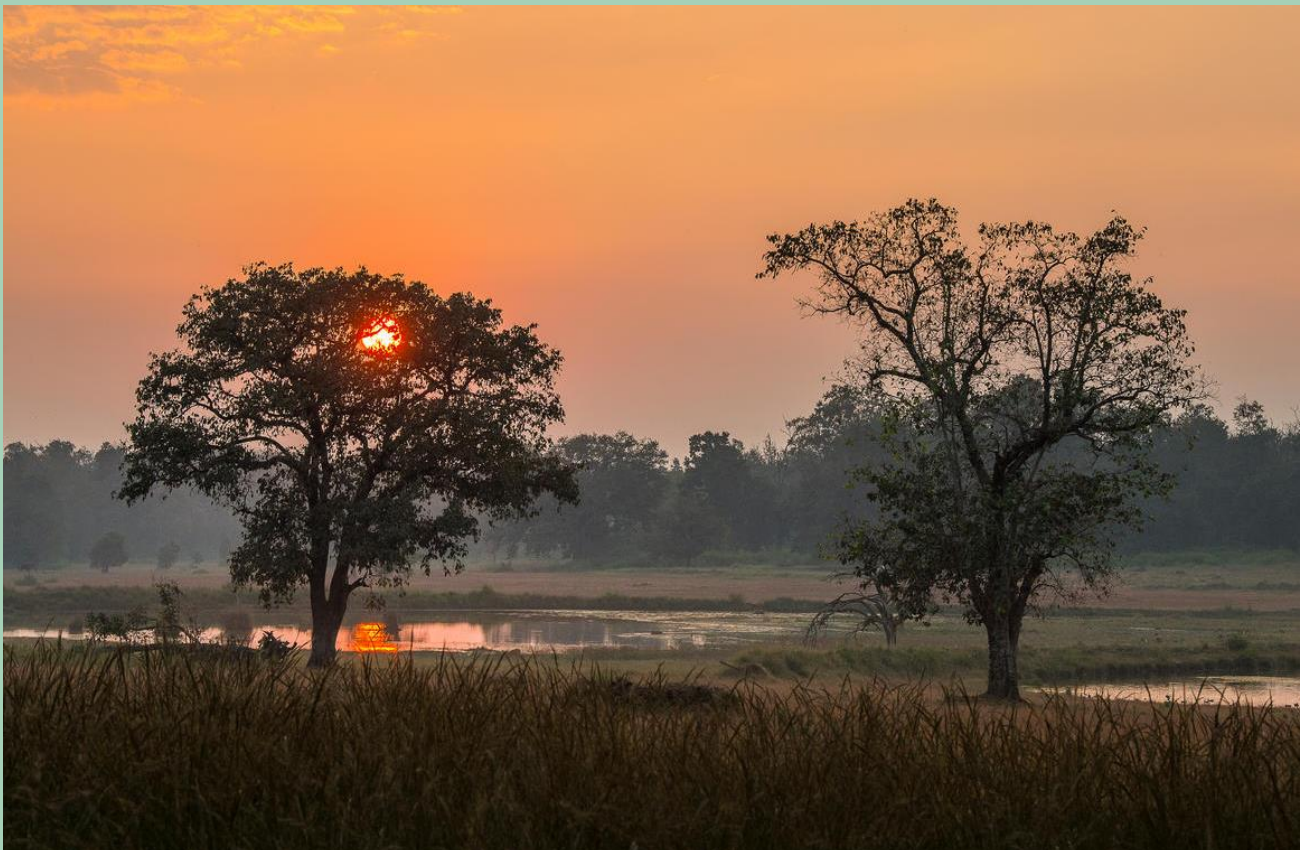
Water risks and Indian banks

With India continuing to face severe pressure on its water resources, its businesses face growing water risk, potentially to significant losses for the country's banks. Close to 40% of the gross credit exposure of Indian banks is in sectors where water risks are significant. Reeling under a crisis of non-performing loans, with close to 10% of the gross advances of the Indian banks at risk of non-payment from debtors, these exposures could put further liquidity constraints on the already stressed balance sheets of banks in India.

This issue provides a good example of the double materiality of environmental risks. While banks, as lenders to businesses, are exposed to their lenders' water risk, they are also in a unique position to influence businesses to proactively handle various water-related risks. At the same time, water-related solutions also have the potential to be a source of significant commercial value for banks.

Water is central to sustaining a functioning and resilient planet. All indispensable elements for human development rely on water services provided by the natural ecosystems. These ecosystems and their biodiversity are also essential for economic growth and poverty reduction while contributing to climate change adaptation and disaster risk reduction. Given that water is a shared resource, under growing demand from an expanding economy, water scarcity poses systemic risks to entire economies.

In India it is estimated that, by 2030, total demand from freshwater resources will be twice as much as available supply, these pressures could therefore be one among many critical constraining factors for India's economic growth. Water is therefore linked to India's future financial stability and economic prosperity.



5. Today's regulatory landscape

In addition to their responsibilities for macro-economic stability, central banks and financial supervisory authorities are responsible for the regulation of their financial sectors. There is an ongoing debate about whether environmental issues such as biodiversity loss fall within these supervisory mandates and, if so, what tools and mechanisms exist to enable central bankers and supervisors to fulfil this mandate.

It is clear to us that international environmental law creates an obligation for financial regulators to address biodiversity loss. Meanwhile, existing regulatory frameworks, such as the EU Capital Requirements Directive and Regulation, Basel III capital adequacy rules for banks and Solvency II for insurers, could be applied to biodiversity-related financial risk.

International law and biodiversity

One of the cornerstones in the protection of biodiversity is the Convention on Biological Diversity (CBD), which was drawn up in 1992 and counts more than 190 countries as signatories (or Parties) (Convention on Biological Diversity, 1992). Article 3 of the CBD enshrines in law a country's "responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction."

The convention says, among other things, that countries "integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies" (Convention on Biological Diversity Treaty, Article 6(b), 1992). In addition, the CBD's preamble states that a "lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat", i.e. a threat such as significant reduction or loss of biological diversity.

Countries are required to comply with international treaties in good faith. This includes ensuring that their regulatory and supervisory practices (including those related to the financial sector) are consistent with what is required by a treaty. Thus, from a systemic perspective, financial regulators and supervisors from countries that are Parties to the CBD can be seen to have a responsibility deriving from international law, based on their role as organs of the State, to support national efforts to comply with the treaty's provisions within their legal mandates, for example by considering the interconnectedness of biodiversity issues and financial stability.

Existing regulatory frameworks

Financial regulators and supervisors are mandated to ensure that risks, such as risks to financial stability or customers' protection, are appropriately regulated and supervised. To allow them to adequately address different risks, financial regulations generally adopt a principle-based approach towards what is considered to be a risk. Consequently, the task of identifying and appropriately managing risks that might have financial or consumer protection impact is shared among those regulating/supervising with those being regulated/supervised (i.e. financial market players). Consequently, as already postulated by the European Central Bank (ECB), existing regulatory frameworks such as the EU Capital Requirements Directive and Regulation already enable financial market players to consider and manage their risks related to biodiversity loss, even if these risks are not explicitly referred to within regulations. For example, based on the existing regulatory framework, the ECB encourages financial institutions to monitor, on an ongoing basis, the effect of climate-related and environmental factors (such as biodiversity) on their current market risk positions and future investments, and to develop stress-testing scenarios that incorporate risks related to such factors. The same rationale could also be applied to the other major prudential frameworks such as Basel III and Solvency II, which allow financial market players to consider risks related to biodiversity loss in their risk management systems.

In certain circumstances, law can explicitly require financial market players to consider certain issues as sources or triggers of potential risks. In the last few years, a key trend has been the increasing inclusion of climate-related topics

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within regulation, as per the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). Although biodiversity topics have received less regulatory attention compared with climate-related issues, there has been significant progress when it comes to the consideration of biodiversity as a potential financial risk. For example, some EU countries included biodiversity as an expected topic of disclosure when they transposed the EU Non-Financial Reporting Directive; in 2019, the French legislative incorporated mandatory disclosure expectations for portfolio managers for risks linked to biodiversity.

Extra-legal obligations

Financial institutions are subject to constraints on their behavior beyond those imposed by regulators and supervisors. Many adhere to voluntary sectoral and multisectoral initiatives, which they join for a variety of reasons, including reputational benefits, to meet the expectations of clients or other stakeholders, or to help them manage risk. Some of these impose obligations of relevance to biodiversity loss. For example, financial institution signatories to the Equator Principles are expected to categorize their projects based on the magnitude of potential environmental and social risks and impacts, including those related to biodiversity (Equator Principles Association, 2020). Similarly, the Taskforce on Nature-related Financial Disclosures was launched in 2021 and seeks, following the model of the TCFD, to develop reporting recommendations that allow investors, lenders, and insurers to provide comprehensive and comparable disclosures of biodiversity-related risks.

Providing further indication of the broad direction this topic could take is the EU's Biodiversity Strategy. Issued in May 2020, it stresses that the EU will ensure that its funding supports biodiversity-friendly investments by using the criteria established under the EU Sustainability Taxonomy Regulation (European Union, 2020). Finally, the outcome of the upcoming meeting on the CBD – to take place in October 2021 – will be important as the Parties are expected to agree on a Post-2020 Global Biodiversity Framework. Intriguingly, the zero draft of the framework refers to quantifying green investments and assessing public and private sector financial disclosures as ways to evaluate progress towards meeting the framework's 2050 goals (Convention on Biological Diversity, 2020, p. 4).



Convention of Biological Diversity's preamble: Lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize the biodiversity loss' threat.

Biodiversity loss as a driver of liability risk

Litigation and broader liability costs have the potential to be one of the most sudden, material sources of nature-related risk to the financial sector. These risks can manifest in a number of different ways. Exposure can originate from breaches of environmental, commercial, statutory or tort, or other bodies of law. Claims can be brought against the financial institutions themselves, the organizations they finance, or organizations they indirectly depend upon. Policy or legislative change, new court rulings and new evidence can all significantly increase liability risk in any one of these areas. This broad array of entry points provides the potential for biodiversity-related liability risks to increase rapidly.

The experience of climate strengthens the case that biodiversity-related liability is a "foreseeable risk" and that financial institutions have a fiduciary duty to prepare and respond now. Global cases of climate litigation increased from an average of 80 per year in 2010-2015 to roughly 140 per year in 2015-2019 (Setzer & Byrnes, 2020). The successful case against Royal Dutch Shell is just one example (Boffey, 2021). These risks extend beyond the private sector; ClientEarth has recently launched a lawsuit against the Belgian National Bank for failing to fulfil environmental protection and human rights requirements when purchasing carbon-intensive corporate assets (ClientEarth, 2021).

As biodiversity damages are localized, the potential for biodiversity-related litigation might far exceed that for climate. Proving causation of damages is one of the biggest obstacles to climate litigation.

Given the wide range of drivers of climate change all around the world, connecting a specific damage caused by climate change to a specific causal driver is challenging. This has been a major deterrent for launching cases (Toussaint, 2020). In the case of biodiversity, the drivers and impacts typically occur in proximity, making the link between them much easier to prove.

There is live political debate concerning whether and how direct legislative liability could be introduced in some jurisdictions. The UK and the European Union are introducing supply chain due diligence obligations that would require corporates to prove their products and services are deforestation-free (Directorate-General for Internal Policies of the Union, 2021). Over time, these may be expected to expand upstream to the financiers of those supply chains (Global Witness, 2020, 2021). There is already precedent for this globally; in Brazil, the legal system regards provision of credit to environmentally harmful projects as sufficient to constitute causation of damages (United Nations Environment Programme, 2016a).

Even today, financial institutions are at risk of breaching powerful anti-money laundering law (AML) cases due to the scale of proceeds from biodiversity-related crime. In 2016, biodiversity-related crime is estimated to have generated \$91–258 billion (United Nations Environment Programme, 2016b). While precise data is not available, a significant share of this is expected to have passed through the formal financial system. If financial institutions unknowingly handle these funds, they are exposed to the severe penalties associated with international AML legislation, an area which is already a priority for compliance departments across the financial sector.

Charlie Dixon, Finance for Biodiversity



6. Addressing biodiversity risk – emerging action and tools

Those advocating for central bank action on nature-related financial risk are pushing at an open door. The acceptance by many central banks that preventing the build-up of risks from climate change falls within their mandates has set the stage for their consideration of other environmental risks, such as those emanating from biodiversity loss. A growing number of central banks are conducting internal discussions, undertaking research and considering integrating biodiversity risk into their supervisory frameworks.

This mobilization is timely. In addition to regulatory and legal obligations, central banks and financial supervisors are facing growing scrutiny from civil society on the issue.

Shining a spotlight on financial regulation

An example of this is WWF's Greening Financial Regulation Initiative (GFRI), which has created a framework to assess the extent to which climate-related and environmental risks are being considered by banking regulators, supervisors, and central banks. The framework is detailed in the WWF's recent SUSREG report (Augoyard, 2021), and covers the major elements of prudential supervision, monetary policy and other measures that are critical to channeling financial flows towards more sustainable activities.

Initially focusing on the banking sector, the SUSREG framework will be gradually expanded to insurance, followed by capital markets and asset management. The assessment will be performed on more than 40 countries,² covering most members and observers of the Basel Committee on Banking Supervision.

The results will be publicly disclosed through the online SUSREG Tracker, which will allow users to understand the scope of measures taken by individual central banks and supervisors. More specifically, users can distinguish between measures that only cover climate-related risks and those that cover both climate and the broader range of environmental risks.

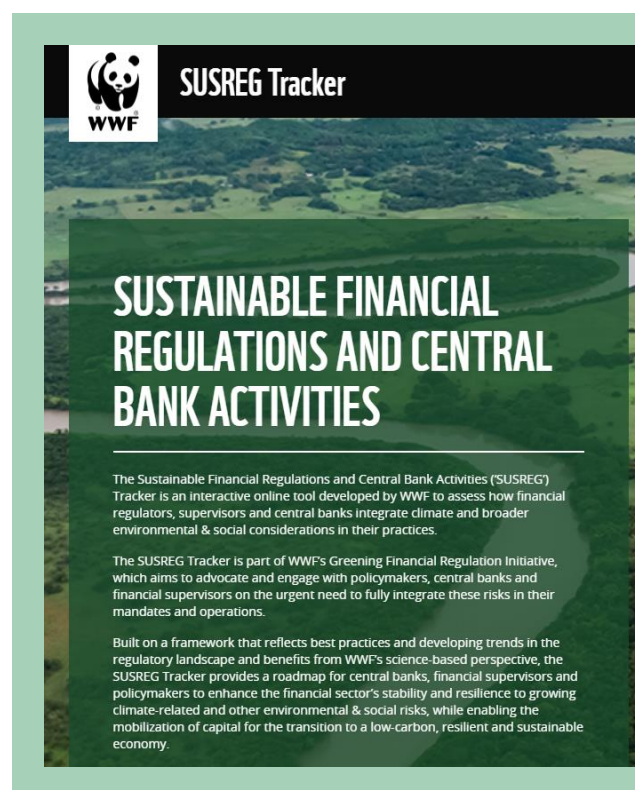
Among the countries covered, preliminary results show that 41% of banking supervisors have formulated a strategy or upcoming measures covering both climate and broader environmental risks, while an additional 36% are solely focusing on climate risk. Among central banks, these figures are respectively 38% and 31%.

² Argentina, Australia, Belgium, Brazil, Canada, Chile, China, Colombia, Costa Rica, European Union, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Italy, Japan, Luxembourg, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Norway, Paraguay, Philippines, Russia,

Interestingly, among the 35% of countries where sustainable banking regulations or supervisory expectations have been published so far, a vast majority of them (80%) covers the entire spectrum of climate and environmental dimensions, which include biodiversity risks. This is an encouraging sign that an increasing number of supervisors no longer consider these risks in isolation.

However, in most countries, supervisors are still in the process of reviewing and assessing banks' practices related to environmental risk and impact management. They are yet to implement specific supervisory actions, such as requiring additional risk management measures or increasing capital or liquidity requirements to better account for these risks.

WWF intends to use the SUSREG Tracker and forthcoming annual reports to evidence progress made on this and other fronts, and to facilitate the sharing of best practices among central banks, regulators and supervisors – promoting a much-needed strengthening and convergence of practices.



Saudi Arabia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Thailand, United Arab Emirates, United Kingdom, United States, Viet Nam

Central banks respond

A number of central banks have chosen to respond publicly to the WWF Greening Financial Regulation initiative, and the preparation of this report, by submitting 'cartes blanches' statements. Below, we present the statements from: Banco Central de Costa Rica, Banco de España, Banque de France, Bank of Greece, Morocco's Bank Al Maghrib and Banco de México.³

Banco Central de Costa Rica

The Central Bank of Costa Rica (BCCR) has been actively working on understanding the implications of climate change risks on macroeconomic policy and financial stability. However, the impacts of ecosystem degradation and biodiversity loss on economic and financial stakeholders is rather a new topic for BCCR.

Costa Rica is a small, highly biodiverse upper-middle income economy. Key economic activities for the country, such as agriculture and tourism (with a contribution to GDP of 4.4% and 4.7% respectively for 2018) are dependent on its biodiversity.

The publication of the environmental accounts of Costa Rica since 2016 has been a first step to provide evidence of the contribution of natural capital to total wealth. Also, BCCR has been working on ecosystem accounting to assess the contribution of certain ecosystems and their services to the economy.

As a member of the Network for Greening the Financial System (NGFS), BCCR has recently joined the Study Group on Biodiversity and Financial Stability launched by NGFS and the International Network for Sustainable Financial Policy Insights, Research, and Exchange (INSPIRE).⁴ Together with the other members, the aim is to define the role of central banks and supervisors in addressing biodiversity loss in the context of its complexities and uncertainties. We also aim to share our experience from the perspective of a country that has been at the forefront of conservation and environmental policymaking.

Banco de España

The Bank of Spain recognizes the importance of biodiversity loss and that it will have a sizable societal, economic and financial impact.

According to the scientific evidence, Spain faces biodiversity risks from desertification, land degradation and deforestation caused by forest fires. The European Green Deal, as well as the EU action plan for sustainable growth, includes as an explicit objective the protection and restoration of biodiversity and ecosystems, which is also one of the six environmental objectives covered in the EU Taxonomy Regulation.

Despite all the advances in this area, we must acknowledge that central banks and financial regulators are not yet fully equipped to tackle the biodiversity challenge from a policy viewpoint.

We need more subject knowledge and a common understanding of the economic and financial risks posed by biodiversity loss. Furthermore, we need quality data,⁵ standards and robust methodologies to assess through which impact channels biodiversity loss might affect, directly or indirectly: social trends (e.g. migration and depopulation) and social crisis (e.g. emerging infectious diseases); various elements of the macroeconomy, such as GDP growth, productivity, unemployment, prices and corporate profits etc.; and, ultimately, the stability of the financial system. We also need to be able to quantify these impacts over sufficiently long time-horizons.

In this regard, Banco de España applauds the work of the Taskforce on Nature-Related Financial Disclosures, particularly in developing corporate reporting frameworks. We also support and actively participate in the Joint NGFS-INSPIRE Study Group on biodiversity and financial stability. This Group's work will help us to establish an evidence-based approach to how central banks and supervisory authorities can fulfill their legal mandates in the context of biodiversity threats.

Banque de France

Researchers at Banque de France have joined forces with experts from other French institutions (namely, the French development agency AFD, the French office for biodiversity OFB and CDC Biodiversité) to launch exploratory work on biodiversity-related financial risks in France. Our work so far has focused on three related issues.

First, we are building on previous studies to clarify the analytical framework needed to approach and understand biodiversity-related financial risk. This framework emphasizes the complexity, the uncertainty and the multifaceted nature of the relations between biodiversity and the economic and financial system.

³ The views expressed in these cartes blanches are those of the named central banks, and do not imply endorsement of or support for views expressed and positions taken elsewhere in this report.

⁴ INSPIRE is a global research stakeholder of the Network for Greening the Financial System (NGFS). It commissions and shapes new research with input and exchange from the NGFS's Secretariat, its work streams, and its members. See: <https://www.climateworks.org/inspire/about/>

⁵ French financial institutions are now required to disclose both biodiversity- and climate-related risks and impacts, as a new decree from the French financial regulator is being published in the coming weeks. The inclusion of biodiversity in the new disclosure regulation signals a broader shift in the finance sector: climate risk is no longer the only environmental risk receiving significant attention.

Second, we are developing quantitative estimates of how the French financial system both depends on ecosystem services (the results could feed into future assessments of physical risks) and impacts biodiversity (the results could feed into future assessments of transition risks). This approach aims at seizing the idea of double materiality. Some preliminary results indicate that the direct exposure to physical and transition risks could be significant for some sectors.

Third, we are exploring potential future avenues of research to better assess biodiversity-related financial risk without losing sight of the radical uncertainty at stake. These include: developing biodiversity-related scenario analysis tailored to the assessment of financial risk; and applying specific methodological approaches to capture the transmission of biodiversity-related financial risk among economic sectors and to financial institutions.

Bank of Greece

It is now clear that climate change poses significant risks for the financial system. However, climate change is not the only pressing issue. The significance of current environmental risks is also emerging, and one of the most prominent risks of all is biodiversity loss.

Research shows that biodiversity is declining faster than at any time in human history and that this loss could undermine nature's productivity, resilience and adaptability, creating uncertainty and posing risks to the financial system through externalities, tipping points, and physical and transition risks.

According to a 2011 study on biodiversity loss under climate change by the Climate Change Impact Study Committee (CCISC) of the Bank of Greece, 60 of the country's 127 native freshwater fish are under threat, while several ephemeral ecosystems are expected to disappear and other permanent ones to shrink. Costs arising from the loss of the ecosystem services provided by forests and the habitats of two lakes were also calculated over the period 2011-2100 under specific climate change scenarios for Greece (for details see *The environmental, economic and social impacts of climate change in Greece*). Based on this work, the Climate Impact Study Committee of the Bank of Greece drafted the National Adaption Strategy for Greece, which also addresses biodiversity issues.

In this context, it is important to acknowledge that our economies are embedded within nature and to ensure that current growth patterns do not come at the cost of nature. Biodiversity loss is a challenge that needs to be urgently addressed by advancing research, filling in knowledge gaps and understanding the potential implications for financial stability and the financial system, thus supporting the framework for biodiversity conservation.

Like other African countries, Morocco faces the risk of continued loss of biodiversity due, on the one hand, to overexploitation of natural resources and environmental pollution linked to economic development model and population growth and, on the other hand, to climate change which is causing greater water stress for agricultural land and forests. This degradation directly affects agricultural ecosystems, which are the basis of economic development, contributing 13% of GDP and 38% of employment, as well as forest and marine ecosystems, providing food production for national consumption and export. The disturbance of these ecosystems is likely to impact key sectors of the economy, including agriculture and fisheries, which in turn could impact agri-food and agro-industry sectors.

In 2017, the cost of environmental degradation, including soil degradation, was estimated by the World Bank at 32.5 billion dirhams, i.e. nearly 4% of GDP and twice the global average.

Aware of these challenges, Morocco has been committed for several years to preserving biodiversity and mitigating climate change. We have ratified the International Convention on Biological Diversity in 1995 and the Paris Agreement in 2015. In this context, the public authorities have put in place several national strategies to protect and restore threatened forest and marine ecosystems, preserve water resources and develop sustainable agriculture.

Regarding the financial sector, Bank Al-Maghrib has led, alongside the national authorities, the adoption of a national roadmap for the alignment of the financial sector with sustainable development in order to strengthen the financial support of banks to sectoral plans and national strategies to combat environmental degradation and climate change.

Banks have contributed to the financing of major green energy and clean water as well as non-conventional resources access projects, which are critical to mitigating climate change. A financing programme has also been adopted by the government with a bank specialised in agricultural financing to support the implementation of Morocco's new agricultural strategy "Generation Green 2020-2030", which is aimed at crop and water development and soil conservation. These measures and actions have the potential to indirectly contribute to preserving agricultural and forest biodiversity.

To support this momentum, the central bank has issued a Regulatory Directive setting expectations for banks to integrate climate and environmental issues, in the broad sense, in the conduct of their business and understand, in a progressive manner, the related financial risks.

The implementation of this Directive is not without its challenges. It raises the question of building the skills and capacities of the banking ecosystem. One of the challenges will be to understand in particular the links between environmental degradation in the form of biodiversity loss and the banking sector, as methodologies for analysing environmental risks remain very underdeveloped at this stage.

To this end, the Central Bank intends to strengthen collaboration with international partners and multilateral and development agencies to better understand the links between biodiversity loss and financial risks for the banking sector. The international work undertaken on the associated financial risks, in particular by the NGFS, of which Bank Al-Maghrib is a member, will provide useful insights for central banks and regulators in this respect.

Banco de México

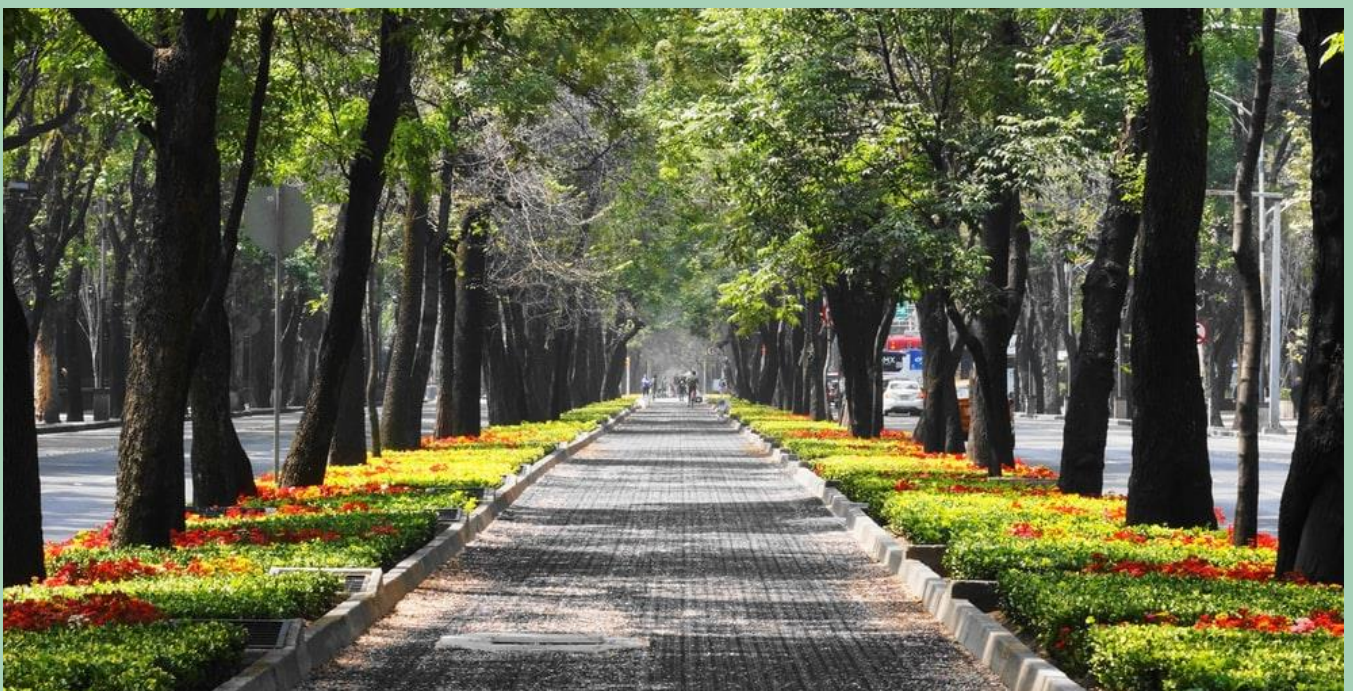
For Mexico, biological wealth is a fundamental heritage, the material on which our society, economy and culture was built.

There is an increasing realization among the international business and financial community that considering nature and the economy as separate systems is a flaw that can have serious ecological and economic/financial implications. This realization has motivated recent efforts to understand the impacts of any firm's activities on natural ecosystems, and the impact ecosystems have on the firm's sustainability.

These efforts confirm an understanding that the global economy is embedded in the earth's broader ecosystems and that as nature deteriorates, businesses, the economy and finance will be progressively affected and run more risks.

There is a close interlinkage between climate change and natural capital. Science has shown that many valuable ecosystems are vulnerable to the destructive manifestations of climate change (hurricanes, floods, fires, etc.) as well as the impact gradual global warming has on them (the effects of warming seas on coral reefs, etc.) and that the many services they provide are at even more risk of being compromised because of human action (pollution, destruction, etc.). The livelihoods of many communities that depend on these services are being affected.

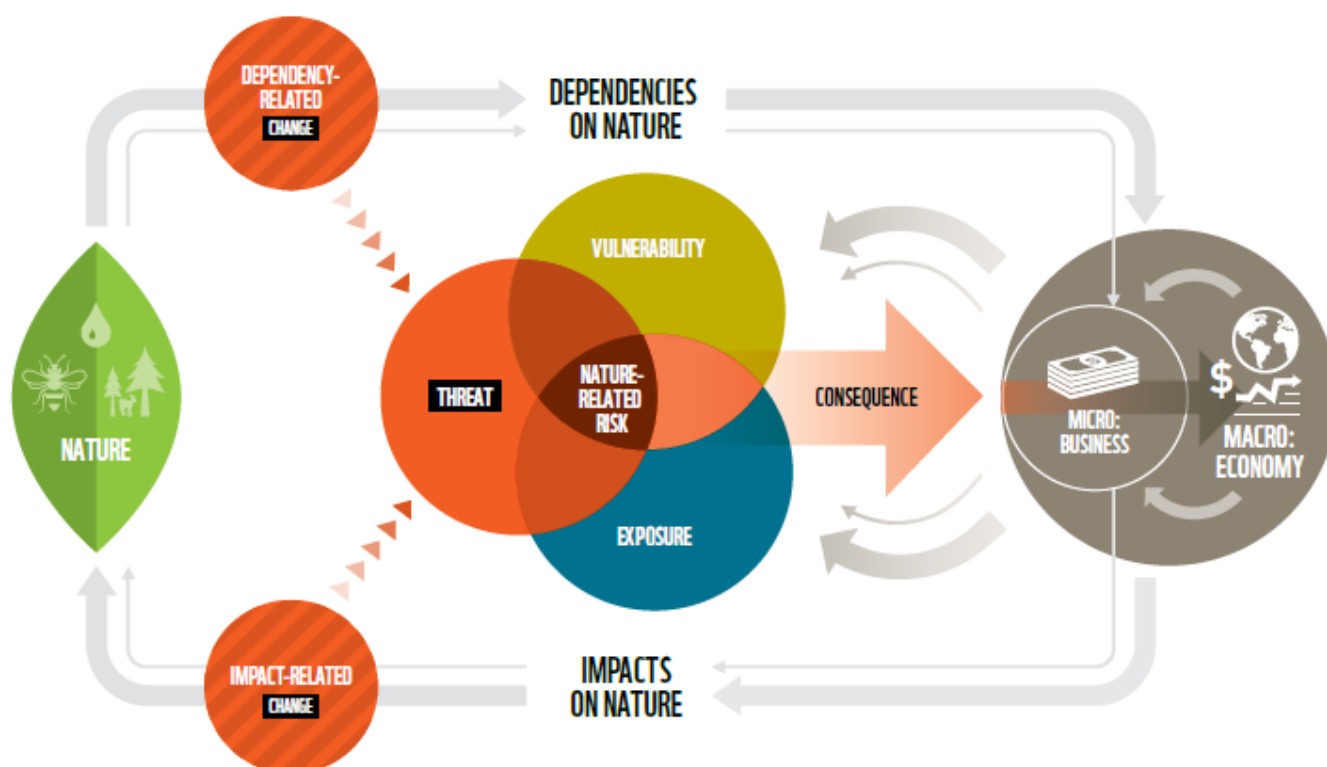
Mexico is one of the most biodiverse countries in the world. This offers a range of opportunities for sustainable development if we avoid diminishing its biodiversity for future generations. Preserving biodiversity and hence natural capital is perhaps the best way to foster better living conditions for current and future generations.



DNB's approach to biodiversity loss

Among central banks, De Nederlandsche Bank (DNB), the central bank of the Netherlands, has blazed a trail in its analysis of biodiversity-related financial risk. Last year, it published a landmark report, *Indebted to Nature* (De Nederlandsche Bank, 2020).

According to a conceptual framework developed here at WWF illustrating nature-related risk to business, nature-



Domestic financial sectors have a critical role in fueling the national economy by providing financing and investment capital to companies in various sectors. Hence, nature-related risks faced by companies can be transmitted to financial institutions if the latter are investing in or providing loans to companies that are dependent on nature, or which are exposed to particular nature-related threats. Assessing how risks related to biodiversity loss affect a country's financial stability (from a central bank's point of view) therefore starts from understanding the level of exposure of the financial sector to a particular threat related to biodiversity loss.

DNB has used a number of methodologies to measure the exposure of the financial sector to biodiversity or ecosystem loss, such as the loss of animal pollination. In one case, it identified 90 crops that are crucial for the Dutch economy, and where crop yields are highly dependent on animal pollination (DNB, 2020).

related risk is a combination of nature-related threats and a company's vulnerability and exposure to the threat, resulting from dependencies that the company's business has on nature (McCraine et al., 2019). In the presence of the high probability of nature-related threats, high exposure, and vulnerability to the threats, such nature-related risks become material financial risks to an individual company at a micro-level. When such risks from many companies are aggregated, they result in financial risks to the macro economy.

It then mapped these crops to industry sectors, and from there to lending and investment by Dutch banks, insurance companies and pension funds, to find that the Dutch financial sector's exposure to products that depend on pollination amounts to €28 billion.

Assessing the level of exposure is an important first step to understanding the potential impact of biodiversity loss on the financial system, but it is not sufficient. Vulnerability needs to be assessed as well. In the example of animal pollination, a central bank would need to assess how vulnerable companies in the relevant sectors are to the loss of animal pollination and how vulnerable the financial system is to the health of those companies. If some companies are well diversified or if they have robust risk management systems in place, the level of vulnerability to a reduction in animal pollination may be low. Threats can also come in a varying degree. For example, exposure would be very different in a scenario where animal pollination is reduced by 50% compared with one with a 90% reduction.

Some of the other exposure assessment methodologies do not use such bottom-up, aggregation-based approaches but instead apply top-down methodologies, calculating sector-level dependencies (e.g. the Natural Capital Finance Alliance's ENCORE tool). Such approaches can also provide a meaningful result to assess the exposure of the financial sector to material nature-related risks.

Metrics for central banks (IUCN)⁶

A key challenge for central bankers and financial supervisors is the dearth of tools, data and methodologies to enable them to come to a view on the extent of biodiversity risk within the macroeconomy and among the financial institutions they oversee.

To quote the International Monetary Fund, nature is "macro-critical" for financial stability. Nature underpins most of the economic activity in the world and, in particular, food production, so ensuring that national financial policy, as regulated through central banks, takes account of the state of natural assets is crucial. Central banks must therefore be able to assess the state and trends in natural asset wealth and the flows of benefits that come from them which underpin the health of national economies. Living natural assets, or biodiversity, are affected by human activity, and it is these pressures and their effects on nature that central banks can measure and thereby regulate.

Central banks can use several available key biodiversity metrics to analyze how the risks resulting from biodiversity loss translate into financial risks, via biodiversity-related physical and transition risks.

Physical risk metrics: Central banks can use the threats to biodiversity to capture and quantify physical nature-related risks to the financial system. The Species Threat Abatement and Restoration (STAR) metric can be used to assess which threats apply to biodiversity within their jurisdictions, at a fine geographical scale, which can then be related to commodity production or infrastructure development. The impacts of these threats lead to changes in ecosystem service asset flows, affecting the viability of production systems and benefits to humanity. The ecosystem service flows and their benefits are now accounted for through the System of Environmental Economic Accounting (SEEA), newly adopted by the UN, providing a means for central banks to understand the changes in national environmental assets.

Transition risk metrics: The ENCORE tool provides a country-level analysis of which sectors are exposed to biodiversity-related risk. Using the national biodiversity threat maps derived from STAR, the sectors and sector operators that are most exposed to biodiversity-related risks can be

identified and appropriate regulatory frameworks developed.

The Taskforce on Nature-related Financial Disclosures (TNFD)

The goal of the TNFD is to provide a framework for organizations to report and act on evolving nature-related risks, to support a shift in global financial flows away from nature-negative outcomes and toward nature-positive ones.

The TNFD scope is focused on living nature and elements relating to living nature such as air, soil and water. In addition to shorter-term financial risks, the scope includes longer-term risks represented by impacts and dependencies on nature. The TNFD is not a new standard but an aggregator of the best tools and materials to promote consistency for nature-related reporting.

The TNFD governance structure is a streamlined approach suited to a market-led initiative, with appropriate accountability and guardrails. It involves two co-chairs who represent the public and private sectors, the global North and South, and who bring topic expertise in nature and finance. The Taskforce membership comprises 30 individuals from the financial sector, data reporters and supporters such as data providers and accountants.

The TNFD has published a two-year work plan with the aim of putting its goal, principles and scope into action by 2023. It includes detail on how the TNFD framework will be developed, using the best available scientific and technical input, piloted broadly with institutions globally, consulted on widely with interested stakeholders, and eventually launched for adoption in the market from 2023 onwards.

The initiative, which builds on the successful experience of the Task Force on Climate-related Financial Disclosures, is primarily focused on delivering a reporting framework for private companies to better manage and act on their nature-related risks and impacts. By doing so, it will also help regulators and central banks to better capture the links between nature degradation and risks to financial stability.

Pushing the boundaries: partnering up for a biodiversity risk methodology

Biodiversity is the next frontier in financial risk management. The pressure is increasing significantly for financial actors and central banks to consider the material financial risks posed by biodiversity loss. If financial institutions, including central banks, are to proactively manage biodiversity-related financial risks, they need to have methods that allow them to understand the dependencies of their investments on biodiversity. In other words, they need to have insights on how the companies in which they invest are affected by the loss of biodiversity. However, such a comprehensive method is currently missing.

⁶ This section on metrics was contributed by Frank Hawkins, a director at IUCN.

Therefore, WWF Switzerland issued a request for proposals (RFP) to find a partner capable, on a large scale, of measuring companies' dependencies on biodiversity and translating this into financial risk metrics.

Together with the winner of the RFP and the support of selected financial institutions, WWF Switzerland is aiming to develop a methodology that enables financial evaluation of biodiversity-related financial risks at the level of listed equity and corporate bonds while taking existing initiatives and policy processes into account. It will aim to cover the assessment of biodiversity-related physical risks, reputational risks, regulatory risks and market risks.

With this project, WWF hopes to advance the understanding on how biodiversity-related risks affect financial institutions, thereby supporting the mobilization of capital for the protection, restoration, and sustainable use of biodiversity and ecosystems globally.



7. The roles, tools and impacts of central banks and financial supervisors

As central banks and financial supervisors expand their engagement on climate risk and begin to explore the financial implications of biodiversity loss, debates about their responsibilities and powers are moving up the agenda. A review of the principles that underpin the governance of finance is critical for that. For several decades, the prevailing narrative on the role of central banks defined them largely in terms of their responsibility to safeguard price stability. The dominant view saw inflation targeting as their exclusive goal, the use of a short-term policy rate as their key instrument and independence from policymakers as their core institutional feature.

Then came the financial crisis of 2008 and with it a painful reminder that, while price stability is an important pillar to safeguard prosperity, it is not the only one. Central banks responded forcefully with a significant expansion of their toolbox. They launched massive asset purchase programs for both public and private sector securities. They introduced long-term refinancing operations and targeted some of them at particular segments of the economy. Many also took on additional responsibilities and powers to preserve financial stability and protect the system against risks.

Some argued then that all this was an exception and that central banks would soon move back to the status quo ante. The response to the economic fallout from COVID-19 proved otherwise. The central bank playbook expanded further, their balance sheets continued to grow and coordination with other policymakers, in particular those driving fiscal policy, deepened.

As a result, the notion of a narrow central bank role that is limited to moving a short-term policy rate up or down to ensure price stability has become even more out of touch with reality than it had already been. Financial markets affect all aspects of our lives. How we govern them is critical. Central banks and financial supervisors are at the core of that – both in terms of addressing risks, as well as in ensuring alignment with broader societal objectives, including environmental ones.

Mitigating financial risks

Reducing financial risks and fostering the resilience of financial systems to absorb shocks is a key task for the institutions governing finance. Central banks and financial supervisors have responsibility to ensure that risks of individual financial institutions as well as the financial system as a whole are identified, assessed and properly accounted for. Central

banks also have a fiduciary duty to limit the financial risks on their own balance sheets.

In that context, over the last few years, the financial risks from climate change have moved up the priority list of central banks and financial supervisors around the globe. Today, the financial relevance of both physical risks from climate change as well as transition risks from the transformation to a low-carbon economy are widely recognized. As a result, climate-related financial risks are becoming integral considerations in both monetary policy and financial supervision.

Central banks and financial supervisors must now expand the scope of this engagement to include further environmental risks. The capacity they have built and the insights they have developed on climate provide a strong platform for that. Their engagement established the recognition of linkages between environmental trends and financial impacts. It has put a spotlight on the need to move beyond siloed approaches in the assessment of risks. Crucially, it has also underlined the fact that we cannot solely rely on historical data to assess risk. This applies as much to climate change as it does to pandemics, biodiversity loss and further challenges. A comprehensive forward-looking view on risks is vital.

Against this background, the engagement of central banks and financial supervisors on climate risks offers insights and experience that can and should now be scaled up. Three pillars are critical for that.

First, central banks and financial supervisors must expand the scope of disclosures they require from financial institutions to broaden their understanding of the environmental risks that financial markets face. Initial steps in that direction have already been taken. The Taskforce on Nature-related Financial Disclosures (TNFD), established in June 2021, will bring together partners "deliver a framework for organizations to report and act on evolving nature-related risks" (TNFD, 2021).

Council on Economic Policies (CEP) is an international nonprofit, nonpartisan economic policy think tank for sustainability focused on fiscal, monetary and trade policy.

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The amended article 29 in France's law on Energy and Climate adds information on biodiversity-related risks to the list of disclosures financial institutions are obliged to make (Government of France, 2021).

Second, a broader understanding of environmental risks must become an integral element of both micro- and macro-prudential supervision. To the extent that environmental risks are currently unaccounted for, they must be brought into risk management frameworks. Initial analysis, such as the one published by the Dutch central bank in 2020, provides an illustration for emerging practice in the field (DNB, 2020). The integration of broader environmental risk into the supervisory expectations of the European Central Bank (ECB) are a further case in point (ECB, 2020). The reflection of environmental risks in stress tests, supervisory dialogues and ultimately capital requirements must follow.

Third, central banks must practice what they preach and address broader environmental risks on their own balance sheets. In line with the recognition that "central banks should make sure that climate-related financial risks are given due consideration in their own risk management" (Weidmann, 2020), they must also account for further environmental risks.

Ensuring policy coherence

Beyond their role in mitigating financial risks, the institutions governing finance must also ensure policy coherence with broader societal goals – including environmental ones.

Specifically, the ECB, without prejudice to the objective of price stability, is mandated to "support the general economic policies in the Union with a view to contributing to the achievement of the objectives of the Union". These include, among other things, "a high level of protection and improvement of the quality of the environment". As ECB Executive Board Member Frank Elderson highlighted in February 2021, "this mandate [...] stipulates a *duty*, not an option" (Elderson, 2021). In early March, the UK Treasury amended the monetary policy remit of the Bank of England to highlight environmental sustainability as an integral part of the UK government's economic strategy that the BoE is tasked to support (Sunak, 2021). Shortly after, Yi Gang, the governor of the People's Bank of China (PBC), highlighted the responsibility of the PBC to "contribute its share" to China's goal of peaking carbon emission by 2030 and achieving carbon neutrality by 2060 (Yi, 2021).

The need for such policy coherence applies as much to mitigating climate change as to other key environmental objectives.

With this in mind, in addition to addressing financial risks from broader environmental threats, central banks and financial supervisors must also expand their understanding of the impacts of finance on the environment and align their toolkits accordingly. Again, three steps are crucial.

First, better disclosure of environmental risks must be complemented with information on the environmental impacts of finance. Several initiatives in the field, including the TNFD and France's new disclosure rules, already point in that direction.

Second, central banks and financial supervisors must engage the institutions as well as the markets they supervise on their environmental impacts. Where impacts are severely harmful – e.g., through the loan books of banks, the assets held by institutional investors or the activities that insurance companies insure – regulatory and supervisory action should drive realignment. In that context, a better understanding of the linkages between financial regulation, commodity markets and environmental outcomes is equally important.

Third, central banks must account for the environmental impacts of their own instruments (e.g., their asset purchases and refinancing operations), and transmission channels (e.g., the strong reliance of monetary policy transmission on mortgage loans and thus ultimately the housing market and land-use). Similarly to the financial institutions they supervise, they must ensure that their own balance sheets are not misaligned with the broader environmental objectives of the societies they serve. An ECB that ignores the impact of its asset purchases on the climate and biodiversity objectives of the European Union is in breach of its mandate.

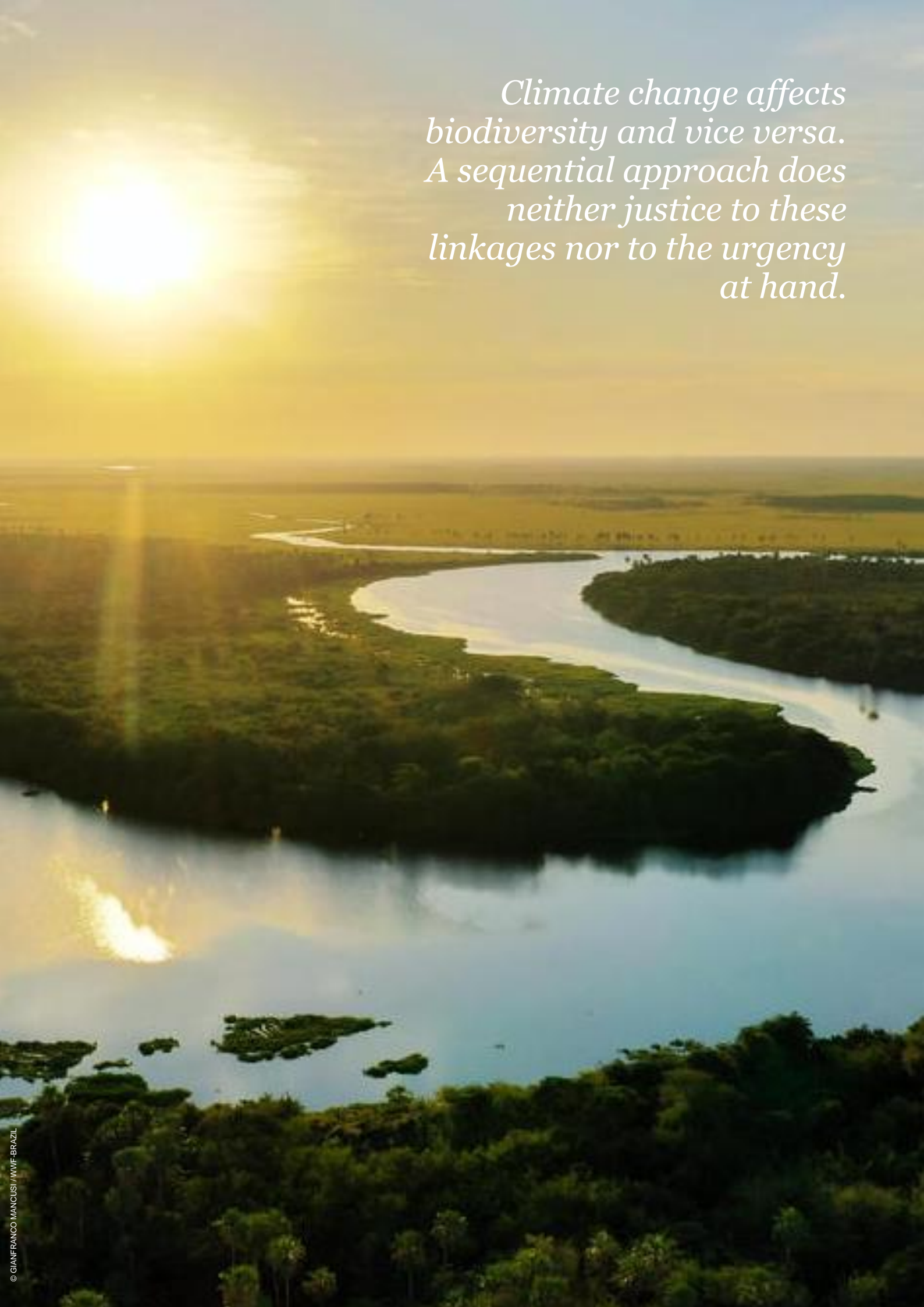
Accelerating speed

Central banks and financial supervisors have come a long way in moving climate risks up their priority list. A lot remains to be done in this field. With that in mind, some are concerned that the addition of further environmental dimensions to central bank and supervisory agenda could slow down vital action on climate change.

This risk exists, but it can and must be mitigated. We cannot ignore key environmental risks to the financial system because of an alleged lack of capacity to look beyond climate. We cannot afford to first deal with everything related to climate before broadening the scope for other environmental dimensions. The environmental risks we face are interrelated. Climate change affects biodiversity and vice versa. A sequential approach does neither justice to these linkages nor to the urgency at hand.

The fact that central banks and financial supervisors started their engagement on environmental risks with a focus on climate change was the right approach. It provided the necessary lens through which to review established convictions on the role they should play in relation to environmental threats. Now is the time to leverage the insights that have been generated during the last years, to scale up their engagement and include further environmental dimensions and to ensure that, as next steps on climate risks are taken, we build the conceptual foundation that fosters a holistic approach to strengthen alignment between financial markets and our environmental objectives.

*Climate change affects
biodiversity and vice versa.
A sequential approach does
neither justice to these
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at hand.*



8. A point of rupture

As the Bank for International Settlement's Green swan report shows, climate risks are only the "tip of the iceberg" (Bolton et al., 2020). "Climate change poses unprecedented challenges to human societies, and our community of central banks and supervisors cannot consider itself immune to the risks ahead of us", wrote François Villeroy de Galhau, Governor of the Banque de France, in the report foreword.

The authors of this report set out to show that nature loss is the hidden part of the iceberg, and that its impact could be disastrous if we continue to let it continue silently without action. We are already seeing such impacts, in the COVID-19 pandemic, which has caused the most difficult global economic crisis since 2008. This crisis is a direct consequence of the erosion of our ecosystem: the links between zoonoses and biodiversity loss are well documented and their economic and financial consequences are now visible to all.

Unfortunately, this link has still not been made by many economic actors and this report's primary objective is to demonstrate an undeniable reality. Climate and nature are two sides of the same coin, two parts of the same iceberg, and we must treat them together. This is especially true since nature is not only another risk to be considered but also holds enormous potential to mitigate climate change. Protecting and sustainably using nature will also help us to strengthen the resilience and sustainability of our financial system and to actively participate in the transition to a sustainable future.

This is a huge challenge, but the momentum is becoming equally huge for policymakers, financial actors and the general public. Throughout this report, the authors have evidenced the inextricable link between nature and climate, informed by concrete, tangible cases. They have also underlined the urgency to act.

Inaction has a cost; it is amplifying current risks and the magnitude of potential future crises. Indeed, inaction will increase economic and financial risks and, in that sense, it should be taken into account by the central bankers and financial supervisors whose job it is to anticipate and mitigate these risks.

The dual materiality embedded in environmental risks suggests that not only do climate change and biodiversity induce risks for the financial sector but also that the financial sector has an impact on climate and biodiversity. This impact could be positive if the right decisions are made now, or negative without action, or even worse if we continue to act against our policy objectives.

Without a change in practice, central banks and financial supervisors are contributing to the build-up of systemic risks related to climate change and biodiversity loss. And as President of the ECB Christine Lagarde said: "the fact that we are

not in the driving seat does not mean that we can simply ignore climate change, or that we do not play a role in combatting it" (Lagarde, 2021). The same is true with nature risk.

Traditional financial risk management models need to be adapted to capture these new risks, if they are not to be highly misleading, or worse, lead us down the wrong path. These models tend to be backward-looking and depend upon the future closely resembling the past. The task seems daunting, but it is not infeasible; although climate change and biodiversity loss are two new cross-cutting dimensions, they translate into traditional financial risks that financial sector is already used to managing.

In the same way, financial regulation and monetary policy operations already contain tools that can be used to mitigate traditional financial risks stemming from climate change and biodiversity loss. Inaction is therefore no longer excusable. Central banks and financial supervisors have the mandate, power and means to act now, preventively, on the financial actors they supervise and on the financial markets. They also have the capacity to innovate and adapt to take these new dimensions into account more precisely in the short and medium term, when regulations will allow access to relevant and harmonized data.

Major crises are moments of rupture not only in the trajectories of societies but also in the paradigms that underpin or reflect them. COVID-19 is a point of rupture, our society needs to adapt, and central banks and financial supervisors therefore once again have an obligation to act. They have to act immediately to curb the negative spiral that will lead to ever more risks and crises using the framework and tools they already have. But they must also innovate in order to design tomorrow's toolbox, the one that will enable the integration of fight against climate change and biodiversity loss at the heart of our economic and financial systems. The launch of the TNFD, the upcoming COP15, and ongoing discussions and research on biodiversity-related financial risks are all important steps. We must seize this momentum to convert initiatives and discussions into real action.

*Inaction has a cost;
it is amplifying current
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9. Recommendations: The Act Now Agenda

Given the risks we are facing and the huge cost of inaction, the authors of this report argue that there is an urgency for central bankers and financial supervisors to act. First, the burden of proof should be reversed, and they should assume that environmental degradation including biodiversity loss poses macroeconomic and financial risks in their jurisdictions. Second, preventive measures should be taken to mitigate *ex ante* the risks deriving from biodiversity loss alongside climate change-related risks. Third, central banks and financial supervisors should act consistently with our stated environmental objectives and advocate for a common international financial regulation that includes environmental dimensions.

1. The tragedy of risk management - Inverting the burden of proof.

It is the role of central banks and financial supervisors to anticipate, assess and mitigate risks to the financial system. The Network for Greening the Financial System (NGFS), a body comprised of central bankers and financial supervisors, already acknowledges that "climate-related and environmental risks are a source of financial risks and [...] central banks and supervisors should therefore ensure that the financial system is resilient to these risks" (NGFS, 2020a).

Facing new challenges posed by environmental degradation and specifically biodiversity loss, the first step is to assess the extent of those risks to the financial system. This work is currently being done by central banks and financial supervisors for climate-related risks. However, thus far few of them have undertaken the same assessment for all significant environmental risks to ensure they have a more complete view and accurate understanding of the risks involved.

As the Basel Committee on Banking Supervision (BCBS) states regarding the principles for effective banking supervision, "adopting a forward-looking approach through early intervention can prevent an identified weakness from developing into a threat to safety and soundness" (BCBS, 2019). Central banks and financial supervisors should then recognize the urgency to act and prove that:

- a. **They do not underestimate measurements of climate-related financial risks and take into account the amplification effect of biodiversity loss; and**

- b. **The financial risks derived from biodiversity loss are known and adequately mitigated.**

2. Preventive measures to mitigate risk deriving from environmental degradation

Data, tools and methodologies are rapidly developing and will soon be available to enable the more accurate assessment of risks derived from environmental degradation. In the meantime, early intervention and preventive measures should ensure that central banks and financial supervisors do not contribute to the amplification of future financial risks linked to environmental degradation. **Even if climate- and environment-related risks are still difficult to assess precisely, BCBS core principles need to be applied and "supervisors should make assessments that are as accurate as possible given the information available at the time and take reasonable actions to address and mitigate such risks" (BCBS, 2019).** To that end, the current financial regulation framework already provides an effective structure to mitigate those risks at both micro and macro levels through prudent *ex ante* measures, ensuring the soundness of our financial system over the long term. Moreover, monetary policy tools should also be used, ensuring that monetary policy does not contribute to the build-up of environment-related financial risks and offers financial market actors the right incentives.

(i) Microprudential supervision

International financial standards for banks and insurance companies already provide useful tools that should be used to mitigate *ex ante* environment-related risks. These frameworks confer enough power to financial supervisors to allow them to assess the risks to the financial system and take immediate action and prudent measures to ensure that those risks are mitigated by the financial institutions they supervise.

Regarding the banking sector, the three pillars of the Basel international regulatory framework should be applied to environmental considerations, ensuring they are captured in the management of traditional financial risks such as credit, market, liquidity, operational, and reputational risks, and requiring that banks are sufficiently capitalized to ensure their robustness over the long term. Some of the prudential tools within the Basel framework could be quickly deployed to implement preventive measures and act on the most problematic sectors of the economy (see Basel III Box). The same type of approach should be taken to assess and mitigate environment-related risks in the insurance sector.

Using Basel III to address environmental risks in the banking sector

The Basel III framework provides tools that could be used to mitigate micro-level environmental risks in the banking sector. Regulators could use its three pillars as set out below.

- **(I) Pillar II on institution-based, sector-based requirements**
 - Require stress-tests and sensitivity analysis of all environmental risks;
 - Review board-level responsibility for including environmental risk dimensions in financial risk management policies and processes;
 - Review governance and remuneration policies to include environmental considerations when aligning remuneration with prudent risk-taking;
 - Enhance capital requirements when institutions are exposed to sectors detrimental to the environment; and
 - Use the definition of high-quality liquid assets and stable funding to identify green assets/funding, and exclude assets/funding linked to activities that are detrimental to the environment, when calculating Liquidity Coverage Ratios and Net Stable Funding Ratios.
- **(ii) Pillar III on disclosure to ask for harmonized data, and work on the necessary adaptation of Pillar I requirements**
 - Set common principles for disclosure of all environmental risks;
 - Provide harmonized disclosure templates for the disclosure of qualitative and quantitative information on environmental risks; and
 - Ensure harmonization and convergence of disclosure practices.
- **(iii) adapt Pillar I to integrate climate and biodiversity considerations, using all relevant prudential requirements, into the management and mitigation of traditional financial risks, including credit, market, liquidity, operational and reputational risks.**

Central bankers can use Pillars II and III as they are currently constructed; the integration of environmental considerations into Pillar I will require a change in regulation and, while vital, will therefore take time to implement.



(ii) Macroprudential supervision

Macroprudential tools should be used to prevent the emergence of systemic financial risks deriving from environmental degradation and climate change.

Central banks and financial supervisors should define early warning indicators for all environment-related risks to clearly identify where such risks are building up within the financial system. These indicators should be developed with the help of environmental specialists.

Financial supervisors should already act to take preventive measures to mitigate systemic risks posed by environmental degradation. Depending on the jurisdiction, they have the capacity to mitigate risks stemming from the most problematic sectors of the economy, namely those that are not aligned with the transition towards a greener and safer economy and which therefore risk contributing to systemic financial risk.

Central banks and financial supervisors should:

- Set concentration limits on lending to or investment in certain sectors;
- Use leverage ratios or capital surcharges to limit bank exposures to sectors that have significant environmental impacts and which could impede the transition towards a greener and safer economy; and
- Use systemic risk buffers to prevent risks arising from the more environmentally detrimental economic sectors, and to incentivize the financing of green activities.

(iii) Monetary policy

Biodiversity loss can affect the transmission channels of monetary policy by amplifying the effects of climate change or by directly affecting these transmission channels, through asset devaluation and increases in credit risk. Conventional or unconventional monetary policy tools should therefore also be used to prevent the accumulation of risks and to maintain a sound financial system. A number of options have been explored by central banks (see NGFS, 2020c, for examples), and we now need to see central banks using these options in:

- The adjustment of collateral frameworks to consider environmental dimensions alongside credit risk;
- The use of targeted long-term refinancing operations to provide liquidity to projects that contribute to nature conservation and restoration;
- The adaptation of quantitative easing to focus investment in green assets;

- The use of reserve requirements to incentivize lending to activities in line with climate and environmental objectives; and
- Other types of monetary policy tools that are being used in coordination with fiscal policies in various parts of the world (credit guidance, quotas etc.; see New Economics Foundation, 2017).

These are just some of the ways in which central banks could integrate environmental risks into their operations and, at the same time, incentivize market participants to direct capital towards green activities and away from environmental destructive, and thus riskier, investments.

(iv) Own portfolio management

This is the area where we see the most encouraging action being taken so far on climate, but few actions are yet being taken regarding environmental degradation. For example, Banque de France has undertaken an analysis of the impact of its portfolio on biodiversity. Central banks have the power to act immediately and should:

- Include biodiversity loss alongside to climate change factors in their own portfolio management; and
- Align their portfolios with climate and environmental objectives and provide the right signals to financial markets.

3. Ensuring the resilience of our financial system by acting coherently with our environmental objectives

As with climate change, we cannot continue to ignore the effect of biodiversity loss on our economy. Central banks and financial supervisors should therefore act now and in coherence with our stated policy objectives to fight climate change and environmental degradation.

First, they have a key role to play in the messages they relay to policymakers and to financial market actors. While central banks may not be only actor in the fight against environmental degradation, they are well-positioned to influence the behavior of the financial sector and the wider economy.

On the operational side, they could take immediate mitigation measures to help preserve financial stability while ensuring the necessary coherence between our policy goals and the safety of our financial system. Central banks and financial supervisors should therefore use all the tools at their disposal to ensure that their operations do not impair the financing of an orderly transition towards a greener and safer economy. At the same time, the architecture of both national and international financial regulation needs to be reassessed

and, where necessary, adapted to ensure that environmental dimensions are placed at the heart of the financial system.

As the emerging dimension of biodiversity-related risks potentially affects the entire financial system, all elements of financial regulation should be assessed to see if environment-related risks at the micro and macro levels are efficiently taken into account in the regulations applicable to banks, insurance companies, asset managers and financial actors in the broadest sense.

This will support the necessary transformation of business models and ensure a less risky transition to a greener, nature-friendly economy.

Research recommendations

As with climate-related risk, research is needed to better understand how to measure nature-related risks and fully integrate them into monetary policy, financial regulation and supervision. Central banks and financial supervisors, key financial market actors and policymakers will need to refine, over time, their understanding of nature-related risks to improve their mitigation but also to ensure common understanding and consideration of risk at a global level and to ensure consistency of approaches across different jurisdictions.

As we are learning by doing, the precautionary approach and the preventive measures we are calling for in this paper are not exclusive of investments in research that are needed to better understand how biodiversity loss impacts the real economy and financial stability.

In this context, we welcome the launch of a specific workstream and joint research project by the Network for Greening the Financial System and INSPIRE, to better understand the links between biodiversity loss and financial stability.

In our view, there are at least three open issues that would need to be addressed, as priorities, concerning the systematic and comprehensive inclusion of biodiversity loss into financial risk management and financial market practices:

- The need to address biodiversity loss as an indirect driver of climate change-related risk: how biodiversity loss and climate change are interacting with and reinforcing each other, but also how biodiversity loss could impair the fight against climate change by undermining carbon sequestration solutions.
- The systemic risks faced by the financial system stemming from biodiversity loss in key economic sectors; how key economic sectors will be affected by a loss of biodiversity at the global, regional and national levels, but also how those sectors could benefit from nature-based solutions.
- The most effective financial regulation tools to use and/or adapt to mitigate environmental related risks and promote environmental policy objectives, which parts of financial regulation will be most efficient to tackle and mitigate nature-related risks, and how financial and economic tools could help in the conservation and restoration of nature.



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