Integrating nature risks into decision-making:

The study of the Dutch Central Bank

SUSTAIN | Strengthening Understanding and Strategies of Business to Assess and Integrate Nature

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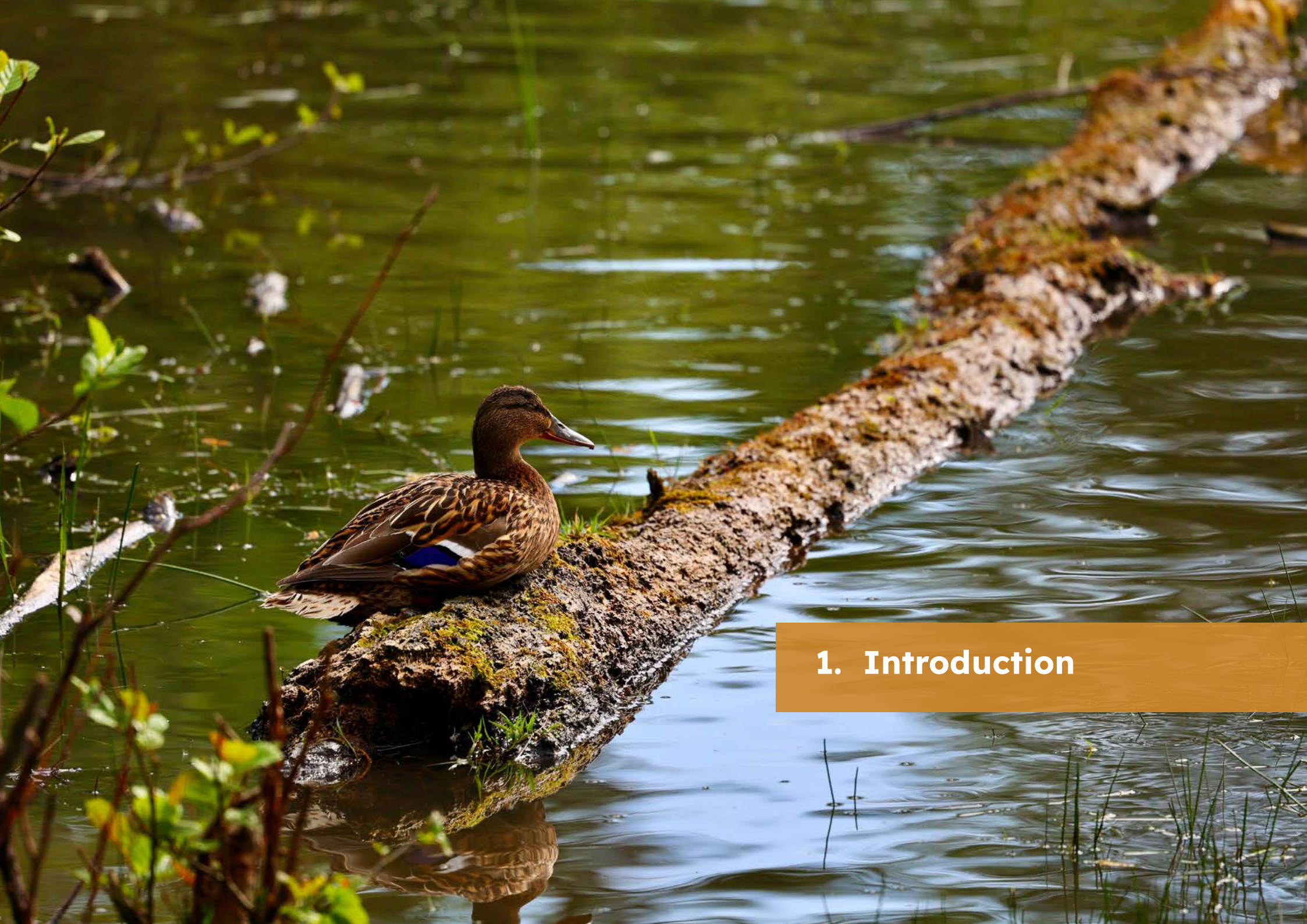
Disclaimer: This study was conducted using publicly available materials and through engagements with several parties, including DNB. This paper should not be interpreted as representing the views of the Dutch Central Bank. The views expressed are of the leading author.



1. Introduction

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The degradation of our natural world poses a threat to our economies and ambitions for human wellbeing currently expressed through the UN Sustainable Development Goals. Ecosystems, species and the services they provide are significantly threatened by economic activities, yet simultaneously are heavily relied upon for providing nearly all goods and services. To achieve the goals set out in the Kunming-Montréal Global Biodiversity Framework, the whole society and particularly business and finance must reconsider their ways of operating to halt and reverse their negative effects on nature and contribute to planetary wellbeing.

Central banks and supervisors have a responsibility – or mandate – to ensure financial stability and scan for risks across long term horizons. If a systemic risk is identified, they influence national policies by advising governments and setting relevant supervisory policies for the financial sector. They also indirectly influence the business sector by ensuring that financial institutions manage the risks in their investments, loans and insurance. Central banks and supervisors play an important role in achieving a nature-positive[1] economy through their policies, long-term risk focus and research and the guidance they provide to governments and financial institutions to manage nature risks.

The Dutch Central Bank[2] (DNB) has shown leading practice as a financial institution and a regulator through its integration of nature[3] into policies and decision-making. DNB's research into nature-related risks has identified that nature risks are financial risks: nature loss can affect the stability of financial institutions, companies, and the economy at large. The bank's research also revealed that Dutch financial institutions are exposed to nature risks through the finance they provide via loans, investments, and insurance. Nature risks could affect financial stability, and therefore fall within the Dutch Central Bank's mandate. Under its Sustainable Finance Strategy, DNB is taking action to integrate sustainability risks, including nature, into all its core functions and engages with others, including legislators, to contribute to the management of nature-related risks for the economy and financial systems.

DNB's work also reflects an understanding that climate and nature are interlinked: to design actions and strategies that benefit nature and add to overall resilience of financial institutions and companies, an integrated climate-nature approach is needed. DNB's leadership in this area comes at a critical time when all financial institutions must address their role in the nature and biodiversity loss crisis. To transition to nature-positive economy, credible and impactful actions on nature need to be taken by multiple actors. As a first step and to comply with Global Biodiversity Framework's targets, institutions must assess how their operations impact and depend on nature to determine their exposure to nature-related risks and opportunities.[4] The assessment should inform subsequent steps to adopt relevant targets and commitments, take transformative actions, and disclose relevant information to key stakeholders.

[1] Nature positive is a global societal goal defined as 'Halt and Reverse Nature Loss by 2030 on a 2020 baseline and achieve full recovery by 2050'. For full definition see www.naturepositive.org

[2] This report will use the following terms interchangeably: De Nederlandsche Bank, DNB, the Dutch Central Bank or simply 'the bank'.

[3] This study will use the Western view of nature which comprises both living (biotic) and non-living (abiotic) parts and includes biodiversity (the diversity of the living organisms) and ecosystems (structures and services) as that is the current dominant view of nature particularly within the economic context. In other, non-anthropocentric worldviews and knowledge systems, nature is considered a living system, and humans are an intrinsic part of it.

This study aims to showcase the work of DNB on nature and in the process help readers understand why and how nature loss should be addressed by societal actors, particularly financial institutions and businesses. The study will signpost relevant resources and draw out some of the lessons learned through the work DNB is doing to incorporate nature into its institutional policies and operations. The study is structured as follows:

An introduction to the importance of nature, current regulatory and legal landscape, and a potential course of action through the high-level actions on nature through the Assess, Commit, Transform and Disclose (ACT-D) steps.

A presentation of DNB's body of work on nature including its strategy to incorporate sustainability[5] into all core functions.

DNB's approach to assessing exposure of the Dutch financial sector to nature risks.

The bank's latest work on scenarios, stability, and analysis of its own investments.

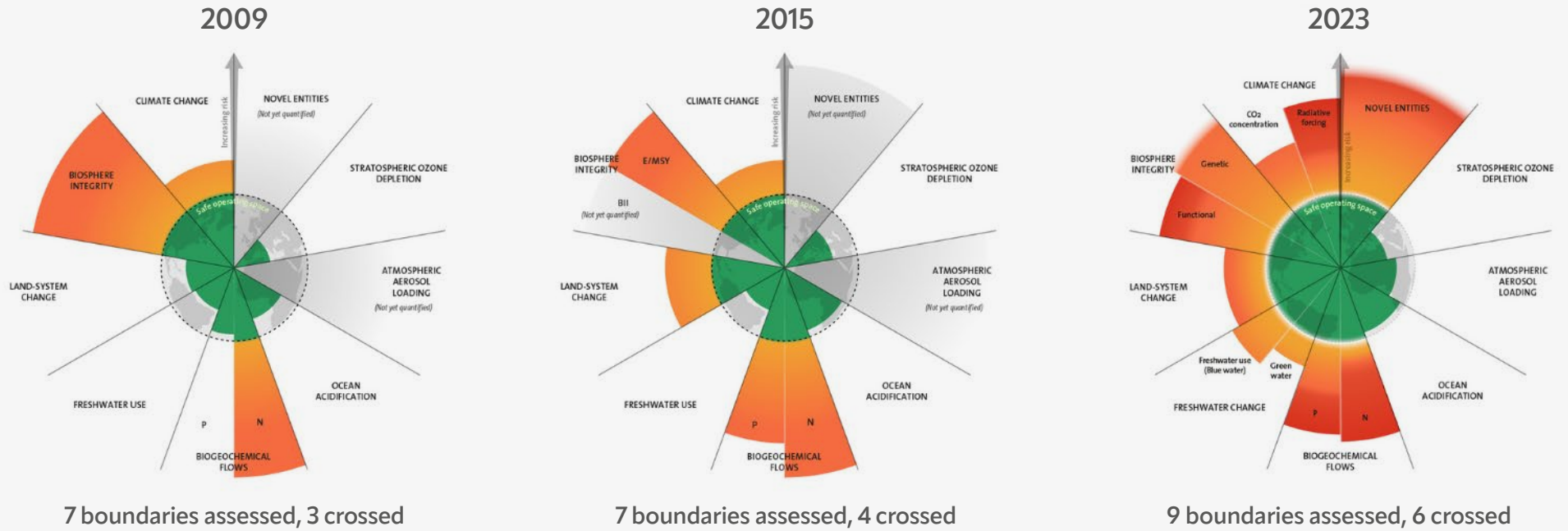
DNB's influence through its network and community building work.

A summary of high-level recommendations on how to effectively embed nature into strategies and operations and final thoughts.

1.1 Importance of nature

Our wellbeing as well as our economies are intrinsically linked with, and dependent on, nature. Yet, humanity is negatively influencing nature at an unprecedented rate. We have crossed the safe and just operating zone of six of the nine planetary boundaries, including change in biosphere integrity, climate change, land-system change, freshwater use, biogeochemical flows and novel entities including plastics.[6] These boundaries are interrelated and crossing them increases the risk of generating large-scale, sometimes irreversible, environmental changes. **Decline in biodiversity and ecosystem services**[7] creates risks for people, the

Figure 1: The evolution of the planetary boundaries' framework



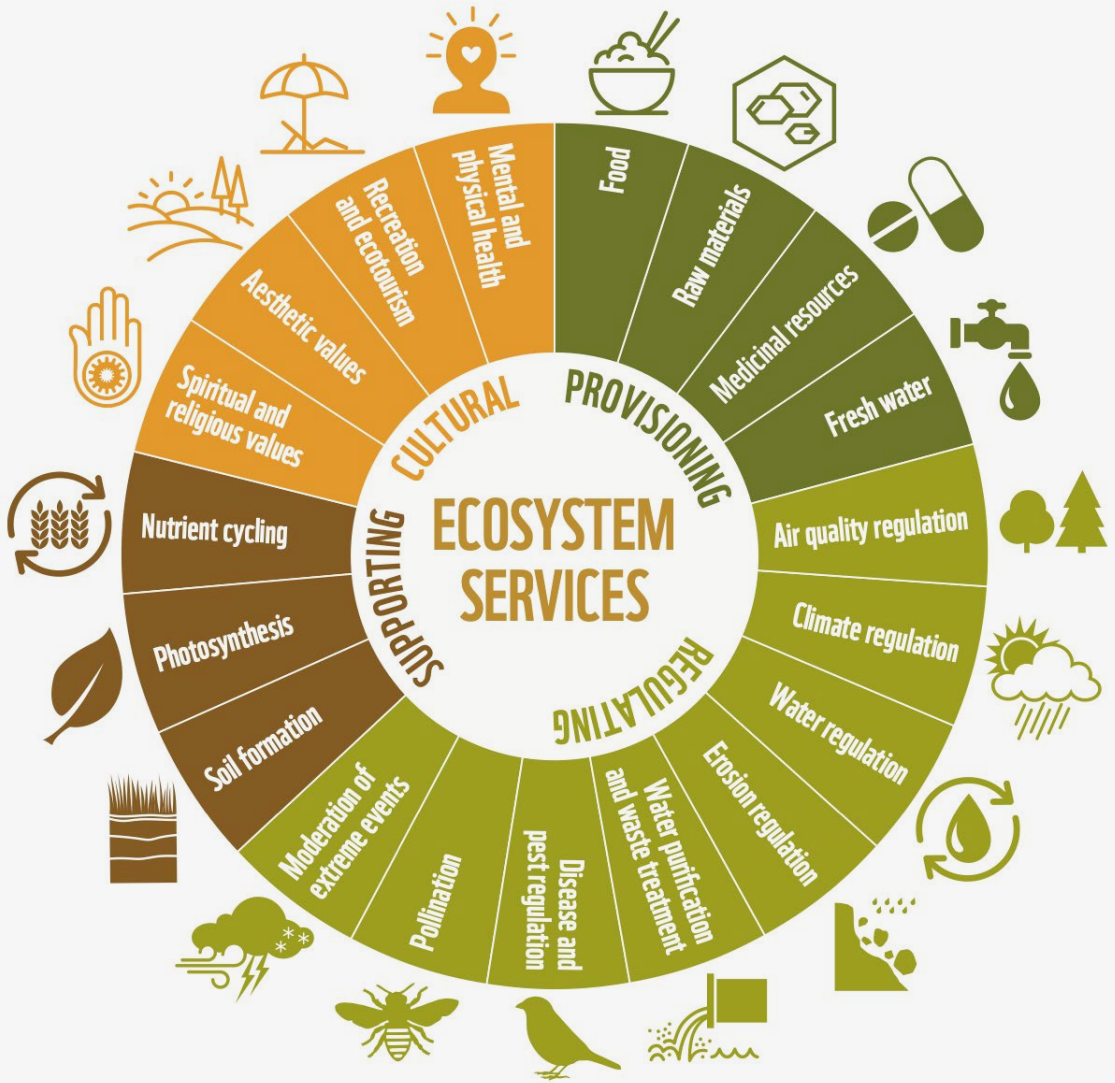
Source: Azote for Stockholm Resilience Centre, Stockholm University. Based on Richardson et al. 2023, Steffen et al. 2015, and Rockström et al. 2009, available from: www.stockholmresilience.org/research/planetary-boundaries.html

economy and the financial sector. The economic consequences of biodiversity and ecosystem services loss can be severe. According to a study published by WEF[8], more than half of the world's total GDP ($ 44 trillion) is highly or moderately dependent on nature and the ecosystem services nature provides, with the other half also dependent to a lesser extent. The companies and sectors that depend on ecosystem services for business continuity could experience disruptions and financial losses due to the loss of these services, potentially threatening their ability to continue their business as usual and increasing the risk of loan default and stranded assets. This can cause wider financial and economic stability risks.[9]

Land and sea use change, overexploitation of ecosystems, climate change, pollution and invasive species are driving biodiversity loss which in turn threatens the availability of ecosystem services - many of which cannot be fully repaired or replaced.[10]

Additionally, climate and nature are interconnected and need to be considered together so that action to address one does not exacerbate the other. Efforts to tackle climate change might result in nature or biodiversity loss, for example, planting tree monocultures for carbon credits can reduce biodiversity in the area. Climate adaptation efforts often result in costs for nature, like mining of rare minerals for batteries or seabed damage from installing offshore wind turbines. On the other hand, nature-based solutions, such as restoring wetlands or native forests, can help in climate change mitigation and adaptation.

Figure 2: Ecosystem services



Source: WWF (2016) Ecosystems service, adapted from 2005 Millenium Ecosystem Assessment

From WWF's 2019 *'Climate, Nature and our 1.50° C future'* report which brings together IPCC and IPBES insights;

- Climate change is the third major driver of nature loss by order of impact.[11] Nature and biodiversity suffer from climate change due to the degradation and transformation of habitats and several climate-exacerbated threats – such as more virulent or contagious plant and animal diseases, extreme weather events like droughts or wildfires, interrupted water cycles, and changes in ecosystems such as ocean acidification disrupting oceanic carbon sequestration.
- Climate change and the degradation and transformation of habitats negatively impacts biodiversity. Out of an estimated eight million plant and animal species on Earth, around one million of them are now threatened with extinction, many within decades.
- Nature loss and the unsustainable use and management of natural resources represent the second largest source of carbon emissions and is a key driver of climate change. Yet, protecting nature can help to mitigate climate risks. Addressing one crisis necessitates addressing the other simultaneously.

1.2 Regulatory and legal advances

The loss of nature and biodiversity is becoming an increasingly prominent issue on international, regional and national policy agendas. Financial institutions and businesses must be prepared to adapt to increased mandatory and voluntary expectations on international, regional and national levels.

At the international level, the **Convention on Biological Diversity (CBD)** calls on governments to stop biodiversity loss and increase protection areas across the world. In 2022, the agreed **Kunming-Montréal Global Biodiversity Framework (GBF)**, set out a series of targets and goals to halt and reverse nature loss by 2030 to reach the global vision of a world living in harmony with nature by 2050. A whole of society approach is encouraged by the GBF, and governments now translate the targets into national-level policy through **National Biodiversity Strategies and Plans (NBSAPs)** due in 2024.

While financial institutions and business can contribute to the achievement of nearly all targets, Target 15 of the framework is especially relevant as it **directly** calls on financial institutions and large corporations to monitor, assess and disclose their risks, dependencies and impacts on biodiversity along their operations, supply and value chains, and portfolios.[12] Financial institutions must not only meet this target.[13] They are also expected to align their portfolios and financial flows with all goals and targets of the GBF so should examine the impacts of their investments and the companies they provide debt, investment or insurance to.

At the EU level, relevant regulations include the **European Green Deal**, **Sustainable Finance Disclosures Regulation (SFDR)**, **Corporate Sustainability Reporting Directive (CSRD)** and **Corporate Sustainability Due Diligence Directive (CSDDD)**. As part of European Commission's **Action Plan on Financing Sustainable Growth**, the Commission is inviting European supervisory bodies to manage and explicitly embed social and environmental risks into regulatory frameworks. In the Netherlands, where DNB is located, the **Ministry of Agriculture, Fisheries, Food Security (LNV)** has launched the "Strengthening Biodiversity" programme which aims to improve biodiversity and halve its ecological footprint by 2050 on a national level.

There are also emerging nature and biodiversity standards such as **GRI's Biodiversity 2024 standard** and the S3 Nature standard planned by the **International Sustainability and Standards Board (ISSB)**. The **Taskforce for Nature-related Financial Disclosure (TNFD)**, a new risk and disclosure framework, was launched in September 2023. TNFD builds on existing guidance[14] and provides a set of disclosure recommendations to help business and finance to assess, report and act on their nature-related dependencies, impacts, risks and opportunities.

The role of company directors and their duties is also coming under much closer scrutiny from lawmakers and wider society. Neglecting to adequately manage climate and nature risks is no longer compatible with sound risk management for financial institutions and businesses. Recently, a series of independent expert legal opinions across multiple jurisdictions such as Australia, New Zealand, Singapore and UK firmly place nature risks within the remit of company directors' duties. Directors that do not properly consider the implications of nature and/or climate-related risks could be liable for breach of duties under company law.[15] In addition, integrating sustainability information within financial statements is recommended by both ISSB and CSRD. Including sustainability in financial statements (balance sheet and profit and loss accounts) to present a 'true and fair' view of a company is a subject of a new legal opinion in the UK.

Additionally, the human right to a clean, healthy and sustainable environment was recognised in the UN resolution **A/RES/76/300** in 2022. Countries are expected to enshrine this right in national constitutions and international treaties. With the rise of climate and biodiversity litigation, the new right can form a basis for litigation where parties breach this right. The latest **Network for Greening the Financial System's (NGFS)** report already refers to the growth of strategic nature-related litigation[16] and recommends that central banks, supervisors as well as financial institutions should monitor developments in this field.

1.3 Expectations for finance and business in addressing nature loss

A whole of society approach needs to be taken to achieve the GBF Plan for Life on Earth and to ensure the stability of our economies and wellbeing for all. Financial institutions and businesses are a key part of this equation and must both curb their impact on biodiversity and scale up initiatives to help restore and regenerate it.

In addition to taking action to mitigate negative impacts and risks to nature, such as by limiting investment in damaging sectors and setting transition expectations for investees, the financial sector can play a positive role by aligning financial flows with global biodiversity goals. This could involve financing nature-positive initiatives and restoration projects as well as encouraging nature positive efforts through the financial capital, loans, underwriting and advice they provide to business. The business sector can work toward nature-positive outcomes by developing and following credible steps to address negative impacts on nature from their operations and strategies. There are also opportunities to have positive impacts by switching to more regenerative products, processes or suppliers. The policy makers should support both directions through a mix of incentives, supportive measures and obligations.

Figure 3: ACT-D High level steps on Nature

Assess:

Measure, value and prioritize your impacts and dependencies on nature to ensure you are acting on the most material ones.

Commit:

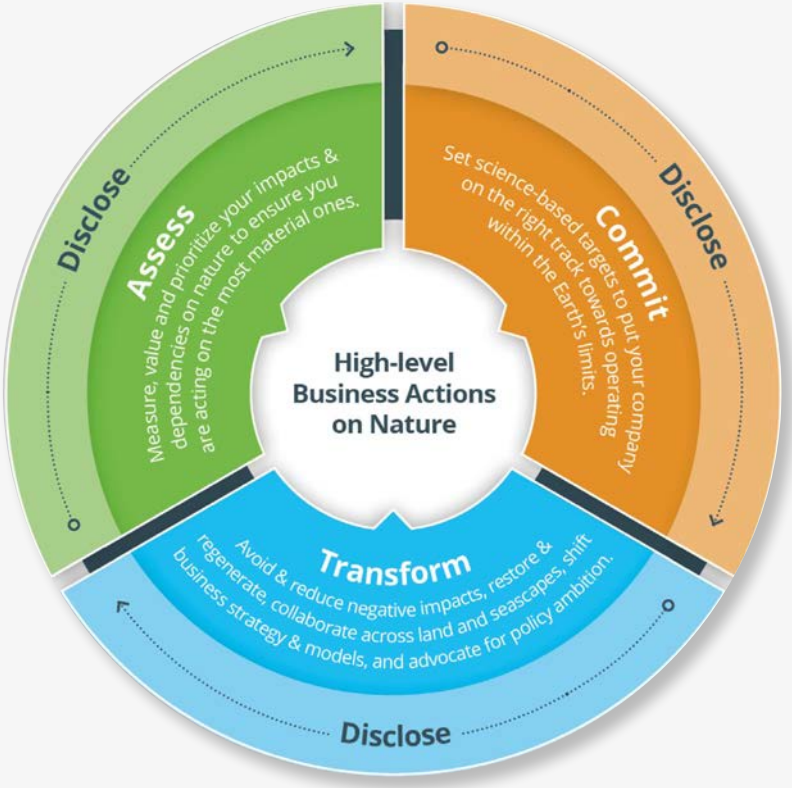
Set transparent, time-bound, specific, science-informed/based targets to put your company on the right track towards operating within the Earth's limits.

Transform:

Avoid and reduce negative impacts, restore and regenerate, collaborate across land and seascapes, shift business strategy and models, and advocate for policy ambition.

Disclose:

Track performance and prepare to publicly report material nature-related information throughout your journey.



Source: Business for Nature (2022)

Financial institutions and businesses must first assess their contribution and exposure to nature-related issues, which can then inform next steps. This pathway is reflected in the ACT-D High level steps, which provide an outline of nature action steps – Assess, Commit, Transform and Disclose – institutions can take to effectively address nature loss in their organisations. ACT-D steps also specify various tools, frameworks and initiatives available in the market to help institutions do so.[17]

Most of DNB's current activities can be described as part of the Assess step, and the results provide a clear signal that nature-related financial risks need to be addressed and financial institutions need to manage them.

1.4 Introduction to DNB

Over the last decade, De Nederlandsche Bank has emerged as a leader amongst central banks in advancing the understanding of how nature loss poses risks to the economy and financial stability. As an independent organization, prudential supervisor[18] and resolution authority of the Dutch financial sector, DNB works alongside European partners to ensure:

- price stability and a balanced macroeconomic development in Europe;
- a shock-resilient financial system and a secure, reliable, and efficient payment system;
- sound and ethical financial institutions that fulfil their obligations and commitments.

DNB maintains its own reserves of nearly EUR 9 billion (excluding gold) invested in stocks and bonds. DNB manages its own portfolios as well as outsourcing investments to other investment bodies, therefore acting, in effect, as both an investor and asset allocator. The bank also conducts research, writes articles, and develops reports on subjects relevant to their tasks and provides economic advice to the Dutch government.

In a joint effort with Netherland's Environmental Assessment Agency (PBL), DNB was the first central bank to measure the impacts and dependencies of their financial institutions on nature and quantify the extent to which the financial institutions it oversees are exposed to nature risks.[19] During the research of Dutch financial institutions, the bank highlighted how

nature-related physical, reputational and transition risks translate into traditional financial risks. This pioneering work has inspired other central banks to follow with similar analyses.[20] DNB also contributed to the nature-related financial risks work done by the NGFS,[21] a group of central banks and supervisors across the world which aim to share best practices and contribute to the development of environmental and climate risk management in the financial sector. More recently, DNB was the first central bank to develop scenarios to explore economic and financial stability repercussions of nature degradation for the Netherlands.[22] It has also been the first public example of a central bank that has piloted the framework developed by TNFD to explore nature-related financial risks in its own reserves.[23]

DNB has raised the standard for finance in understanding the connection between nature and financial risks.[24] This leads to increased expectations for other central banks to understand and address how their activities contribute to nature risks, leading them to examine and ask financial institutions to manage these risks. The consideration of impacts and dependencies as part of risk assessment and management can lead to subsequent pressure on key sectors and companies that depend on and negatively impact nature. Societal expectations for financial institutions and businesses are growing. The aim now is to go beyond mere understanding of negative impacts on nature, but to shift to accounting for externalities, mitigating negative consequences and contributing towards a nature-positive economy.

This study aims to introduce how DNB exemplifies institutional leadership in understanding that nature loss threatens financial and economic stability on a national as well as global level. DNB's actions on nature aim to mitigate the financial sector's vulnerability to nature and biodiversity loss and illustrate how it contributes to those risks through the activities it funds, insures or invests in.

2. DNB's actions on nature

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Nature has not always been on DNB's agenda. Sustainability emerged as a key theme in 2011 when, after the 2008 financial crisis, it became increasingly clear that a long-term perspective would be key to restoring trust in the financial system and DNB placed the emphasis on sustainable prosperity in its mission.[25] While initially most emphasis was placed on climate change, work on broader sustainability challenges gradually increased. For instance, in the Supervisory Strategy for 2018-2022, DNB included a key priority to foster "a forward-looking and sustainable sector" and began to explore impacts of other long-terms risks including climate, nature and social risks.

To contribute to the priorities in the Supervisory Strategy, DNB explored in 2019 to what extent selected environmental and social challenges pose risks to financial institutions. The **'Values at risk? Sustainability risks and goals in the Dutch financial sector'** report focused on four specific types of risks – water scarcity, raw materials availability, human rights controversies and biodiversity loss. The report found that Dutch financial institutions are exposed to these environmental and social risks including clear examples of the negative impact biodiversity loss has on economic activity.

To further examine the relationship between biodiversity loss and financial risks, DNB partnered with biodiversity experts at PBL. Together, they published the 2020 **Indebted to Nature**[26] report which identified how biodiversity and nature loss can pose physical, transition and reputational risks to the financial sector, the ways in which these risks can transfer to financial institutions, and why Dutch financial institutions have material exposure to these risks.

2.1. Sustainability strategy

Instead of a separate nature strategy, DNB has a strategic priority to fully include sustainability into all its core tasks by 2025 as it aspires for "sustainable economic growth that has no harmful effects on the environment".[27]

Some of the linked objectives include:

- Integrating sustainability-related risks in DNB's **supervisory approach** and playing an international and a catalyzing role to integrate this in supervisor rules.
- Integrating socially responsible investment in DNB's **reserve management** and performing an international pioneering role in this respect. For example, by taking the effects of the energy transition into account when implementing monetary policy.
- Fuelling public debate by doing **research** and contributing facts and insights about risks and their effects on the economy.

Supervisory approach influences the financial sector. DNB's **Supervisory Strategy 2021-2024** breaks down its sustainability ambitions into concrete steps signposting to the Dutch financial institutions that the bank is aspiring to:

Firmly anchor management of sustainability risks through:

- Adequately managing sustainability risks by developing an appropriate set of future-oriented supervision instruments, bridging data gaps so financial institutions identify risks, and ensuring that adequate control measures are taken;
- Maintaining active dialogue with institutions on communicating and managing sustainability risks;
- Conducting research and encouraging the financial sector to devote more attention to sustainability risks.

Building robust financial sustainability regulations by:

- Being actively involved in shaping international financial regulation regarding sustainability risks;
- Encouraging active collaboration in the field of sustainability on national and international levels.

The bank also fully expects financial institutions to anticipate and cope with upcoming changes and reflect whether their own defined risk profiles and exposure to risks remain appropriate in the face of changing environments and markets.

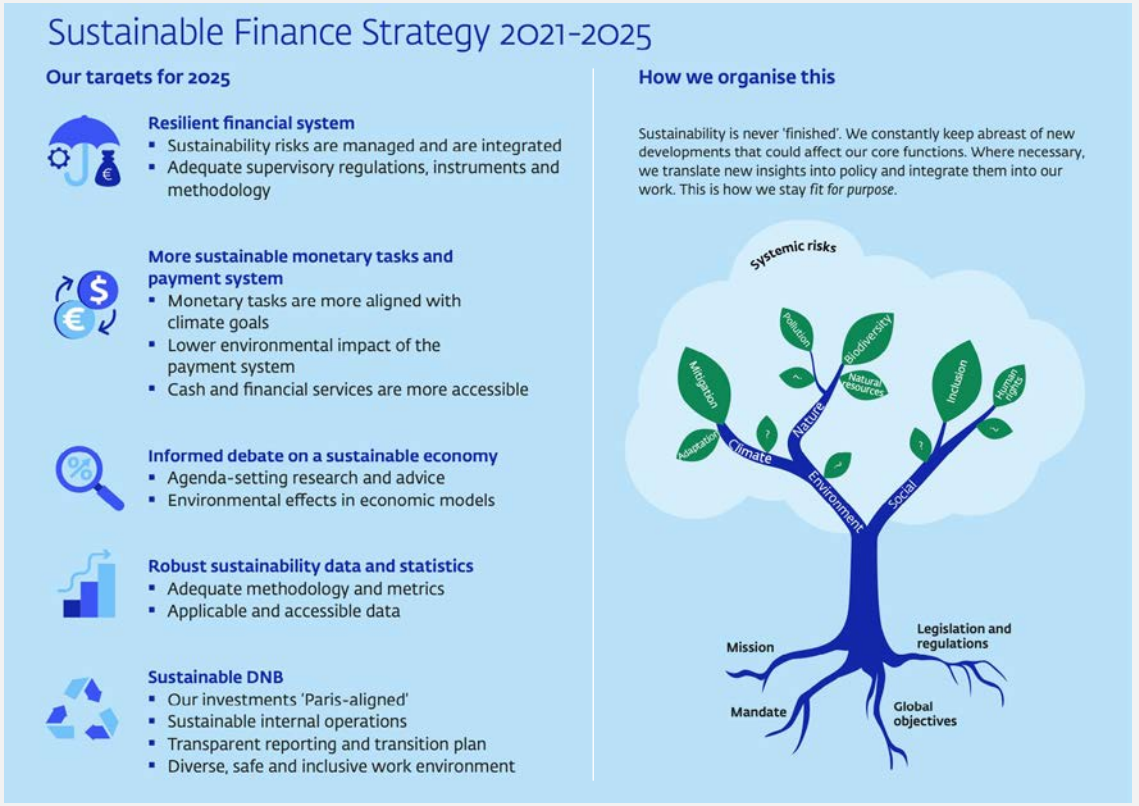
To incorporate sustainability further, DNB set up Sustainable Finance Office (SFO) and launched a Strategic Sustainable Finance Programme as well as a **Sustainability Finance Strategy for 2021-2025** in 2021.[28] The objective is to take a sustainable and responsible approach for the assets that DNB has the full and sole responsibility of. Additionally, DNB wants to make a positive contribution to global sustainability targets and actively share experience and expertise with other central banks.

DNB signposted again that **global societal and environmental risks and related transitions "translate into financial risks that threaten our economy, the solidity of the financial system or individual institutions"... and "therefore affect our mission and mandate"**.[29] This means that environmental risks are not considered fundamentally different from other risks and therefore must be managed as part of the central bank's traditional work. DNB aims to respond to these risks in its activities as well as contributing to international and national goals as a central bank, supervisor and resolution authority.

In December 2023, the bank published its **Sustainable and Responsible Investing Strategy at DNB**[30] (SRI), which covers the assets for which DNB has full and sole responsibility, specifically their own funds and foreign reserves portfolios. The bank embraces a dual investment objective: solid financial return targets and sustainable and responsible investment practices.

The strategy contains multiple Sustainable and Responsible Investment principles, which DNB calls 'beliefs',[31] including active engagement with companies and long-term investment horizons. Other beliefs include that climate change is a systemic risk and investments should be in line with the Paris agreement, and that sharing experience with others helps to make the financial sector more sustainable. Another SRI belief is to exclude investing in companies that do not meet one of the EU's six 'Do no significant harm' (DNSH) environmental objectives[32] which includes biodiversity. Every three years, the bank sets out its new optimal investment mix called Strategic Asset Allocation (SAA) which needs to align with the SRI beliefs.

Figure 4: Sustainable Finance Strategy



Source: Abridged from DNB's Sustainable Finance Strategy 2021-2025

The Stewardship guidelines are applicable to DNB's portfolios in developed market equities and DNB aims to encourage companies it invests in to create long-term economic, environmental and social value. The bank can engage in active dialogue and voting at shareholder meetings to motivate companies to, for example, have effective systems for proper internal control of risks linked to all material environmental, social, and governance matters. In general, DNB also supports resolutions encouraging implementation of transition plans and/or resolutions calling for more transparency on environmental and social issues.

2.2. DNB's approach to assessing nature risks

The understanding that nature-related risks can lead to financial risks – a concept that DNB first explored in the Values at Risk report in 2019 – was further expanded in the Indebted to Nature report, which also examined the exposure of Dutch financial institutions to several nature-related risks.

DNB, in collaboration with PBL, was the first central bank in the world to examine the exposure of their financial institutions to nature-related risks and to quantify the results in financial terms. In its seminal **Indebted to Nature** report, published June 2020, the bank assessed how Dutch financial institutions, **specifically banks, pensions funds and insurers**, are exposed to physical risks from the loss of biodiversity and ecosystem services; transition risks stemming from policy and other measures to halt and reverse nature degradation, and reputation risks caused by nature-related controversies.

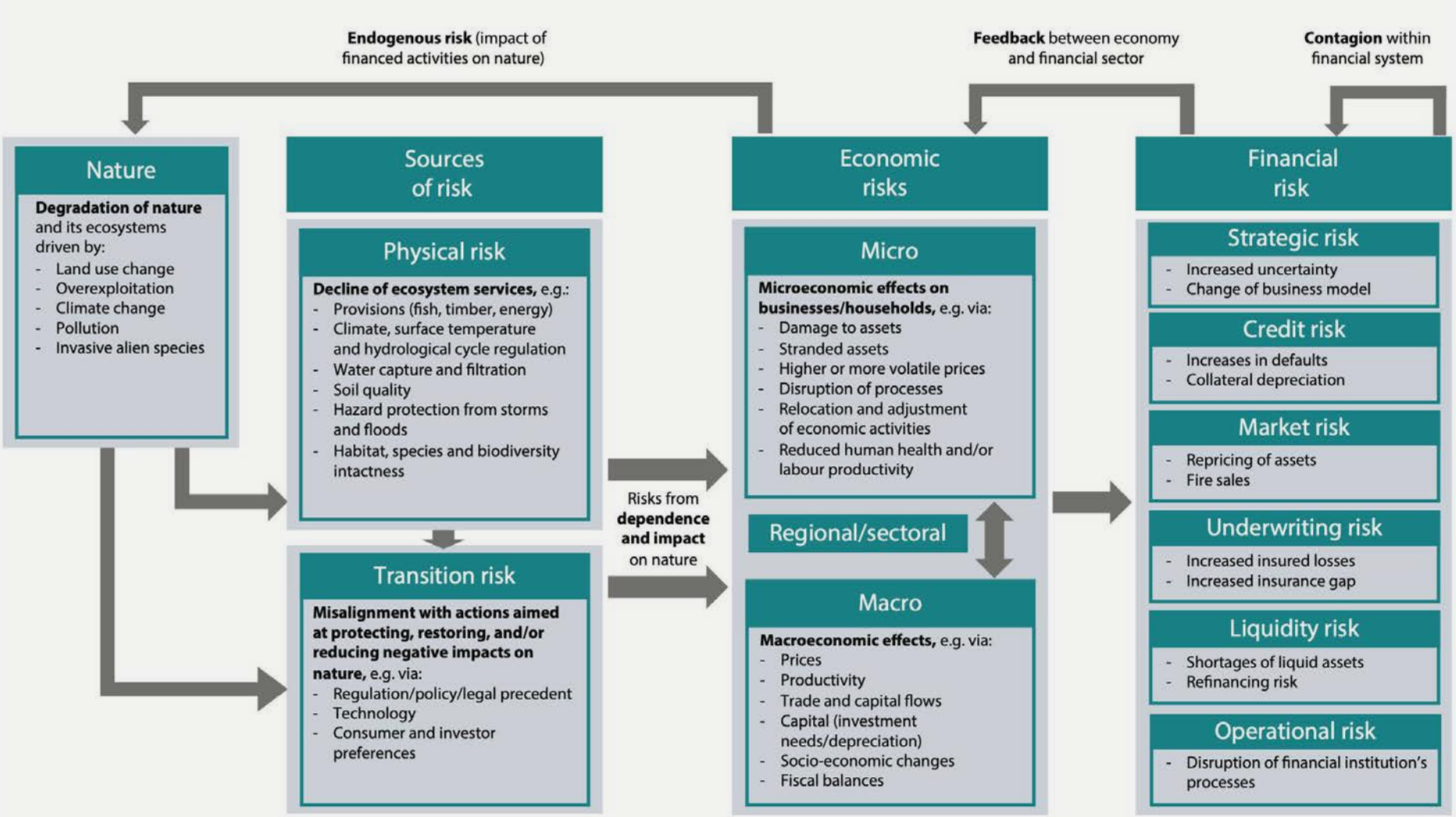
The main findings of the report are:

The financial sector is exposed to physical, transition and reputational nature risks

Financial institutions are exposed to nature-related financial risks indirectly through the companies they lend to or invest in. The way nature loss risks transfer to finance and economy are called *transmissions channels*. The channels identified by DNB were later expanded on by the NGFS – Figure 5 reflects a current understanding of how nature risks translate into financial and economic risks.

By financing companies that depend on ecosystem services to produce their goods and services, financial institutions are exposed to **physical risks**. For example, the agri-food sector is highly dependent on various ecosystem services including pollination, climate stability, clean and abundant water, and soil regulation and productivity. Declining ecosystem services resulting from nature loss and degradation – both systemic and caused directly by a company – can compromise companies' financial position and pose a challenge to their business models. This in turn creates risks for financial institutions. If companies negatively impact ecosystem services, they are also exposed to transition and reputational risks.[33] Companies with large dependencies can also be sensitive to transition measures.

Figure 5: Transmission channels



Source: NGFS (2024) Figure 2 Transmission channels

Biodiversity loss risks can be translated into financial risks

Physical risks can jeopardize business continuity, reduce business value and compromise the ability to repay debts and generate profits. For financial institutions, this translates into **market and credit risks**. A transition, particularly if abrupt, can increase the probability of write-downs of investments or default on loans in companies which have a negative impact on biodiversity. Reputational damage or liability claims can lead to higher operational risks. Substantial credit, market and **operational risks** can additionally make it more difficult for financial institutions to obtain refinancing in the short-term leading to potential liquidity risks. In turn, financial risks can worsen an economic downturn, which then leads to greater systemic financial risks.

The bank recommends that financial institutions identify their nature-related financial risks to understand and manage their risk profiles and resilience. Additionally, they should develop broadly applied and consistent standards for measuring and reporting on biodiversity risks.[34]

The Dutch financial sector is exposed to nature loss

Whilst an exhaustive understanding of the interaction between the economy and ecosystem services is still incomplete, the economic consequences of biodiversity loss can be potentially severe. Table 1 shows a summary of Dutch financial institutions's exposure to biodiversity risks.

Table 1: Key findings of Indebted to Nature

Physical risks	Transition risks	Reputation risks
Dutch financial institutions worldwide have **EUR 510 billion in exposure** to companies with **high or very high dependencies** on one or more ecosystem service. Surface water, climate regulation and ground water ecosystem services are most affected and relevant to Dutch financial institutions. At a global level, Dutch financial sector exposure to products dependent on pollination alone is **EUR 28 billion**.	The study looked at exposures to different protection scenarios. The Dutch financial sector has **EUR 28 billion** in exposure to companies active in already protected and areas protected under the 30% scenario which at that time was not an adopted GBF policy. Government policies to reduce nitrogen-intensive business models can expose **EUR 81 billion** in loans from three large Dutch banks to transition risks in sectors with nitrogen-emitting activities.	Dutch financial institutions have contributed **EUR 96 billion** in finance to companies involved in environmental controversies. The exposure of the financial sector to businesses with a heightened reputational risk due to deforestation related activities totals **EUR 97 billion**.
Tool used: ENCORE knowledge base, in-house data, and a deep-dive on pollination using detailed product lists that can be connected to pollination services.	**Tool used:** GLOBIO model + geographical data including the Key Biodiversity Areas database (UN-WDPA). Nitrogen risks and nitrogen emission data was used (PBL–RIVM), in combination with finance data on sectoral investments.	**Tools used:** MSCI environmental controversy database, CDP.

The study led to recognition that nature risks affect DNB's core mandate. The need to develop broadly applied and consistent standards for measuring and reporting on biodiversity has also led DNB to co-operate with others and actively guides the bank's future work. DNB expanded its knowledge from DNC expanded its knowledge from just understanding exposure to now understanding risks, which led which led to an economic and financial stability study in collaboration with PBL in 2023[35] and trialling TNFD's LEAP approach in a study of DNB's own portfolio in 2024.[36]

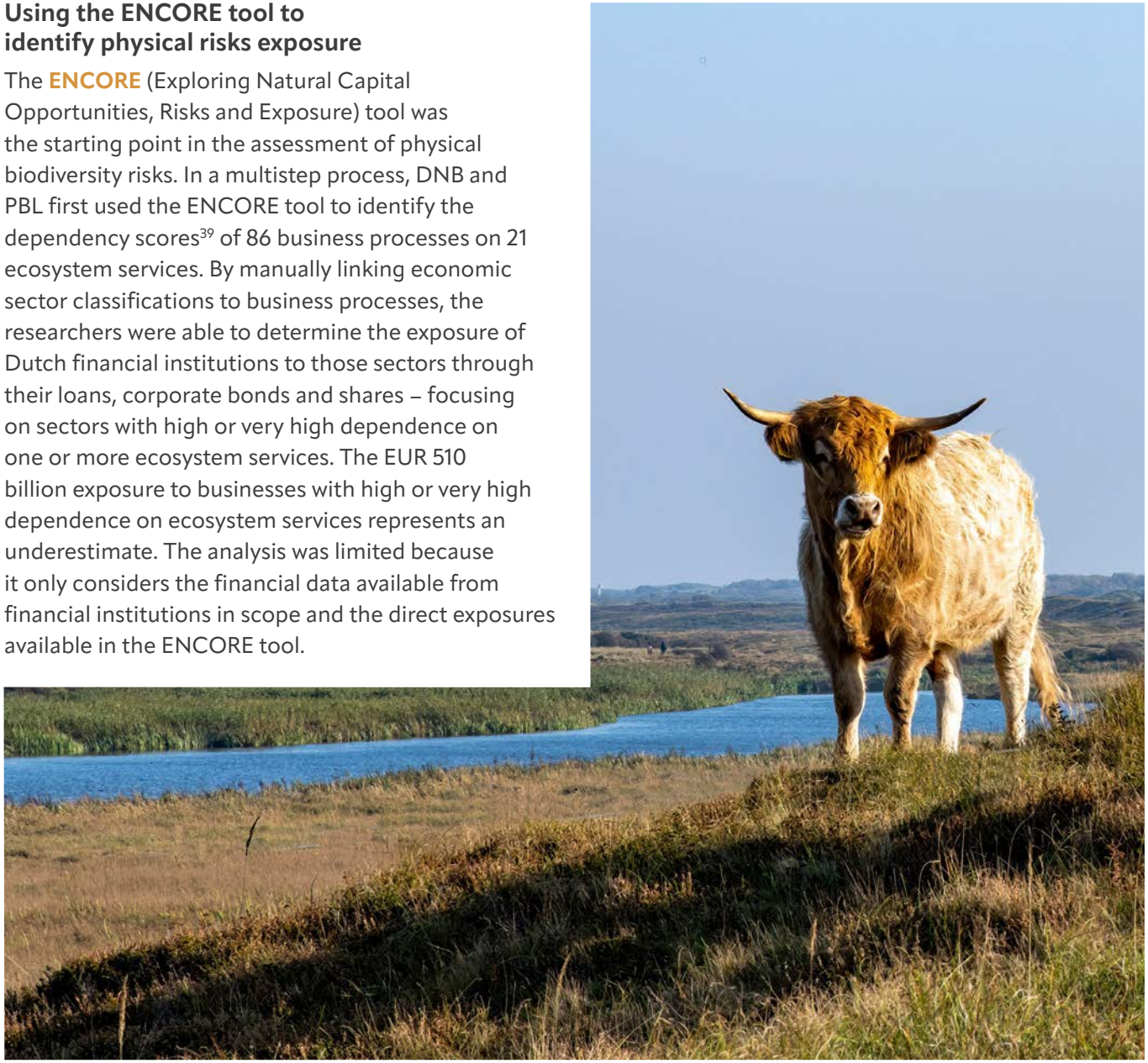
Methods

DNB used a variety of tools and data to identify the Dutch financial sector's exposure to nature risks. A more detailed description of the methods used can be found in **Methods for Analyses in Indebted to Nature**.[37] DNB used ENCORE to assess physical risks, GLOBIO model and geographical data including the **Key Biodiversity Areas** database, and nitrogen emissions data for transition risks and company location data **MSCI ESG Controversies database** and **CDP** to understand reputational risks. The following section will describe DNB's use of the ENCORE tool which can support financial institutions to identify impacts and dependencies on nature as part of the Assess step of ACT-D.

It is important to note that the risks chosen to be studied were partly based on the availability of biodiversity and financial data that can be coupled by sector or sub-sector, or by location. Only direct impacts were considered for physical risk analysis as the data for the value chain (indirect) impacts and dependencies was not available at the time. This does not imply that other risks are less relevant or smaller. For example, potential systemic risks from biodiversity loss and their interconnection with climate-related risks were excluded. DNB cautions that as **"not all the risks resulting from the loss of biodiversity were studied, the results only represent a lower limit for total exposure".**[38]

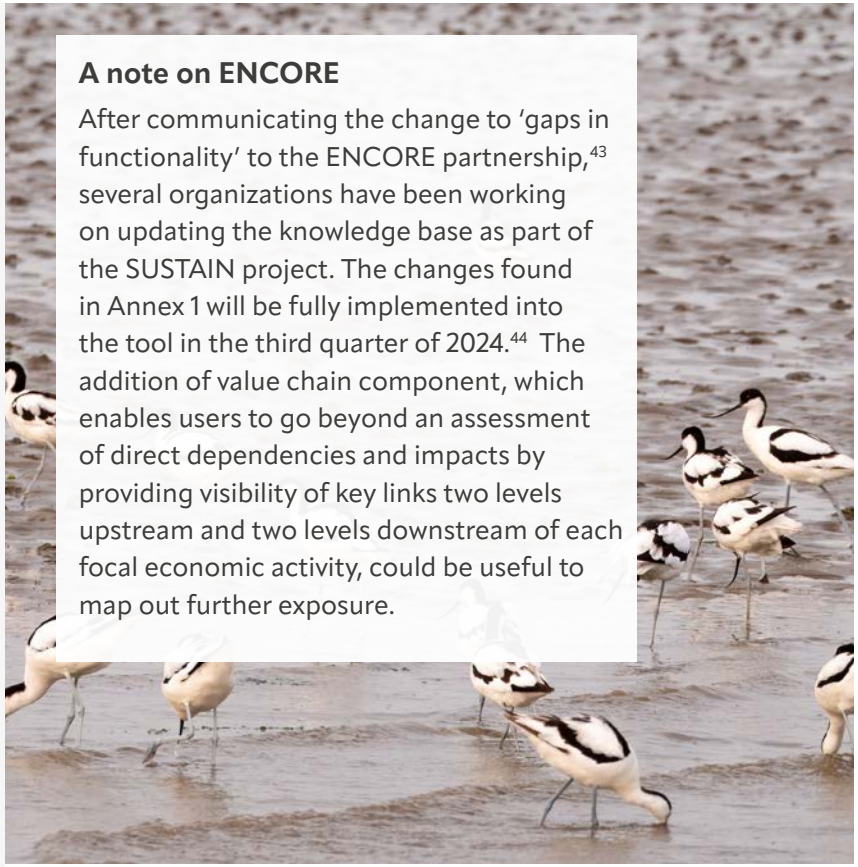
Using the ENCORE tool to identify physical risks exposure

The **ENCORE** (Exploring Natural Capital Opportunities, Risks and Exposure) tool was the starting point in the assessment of physical biodiversity risks. In a multistep process, DNB and PBL first used the ENCORE tool to identify the dependency scores[39] of 86 business processes on 21 ecosystem services. By manually linking economic sector classifications to business processes, the researchers were able to determine the exposure of Dutch financial institutions to those sectors through their loans, corporate bonds and shares – focusing on sectors with high or very high dependence on one or more ecosystem services. The EUR 510 billion exposure to businesses with high or very high dependence on ecosystem services represents an underestimate. The analysis was limited because it only considers the financial data available from financial institutions in scope and the direct exposures available in the ENCORE tool.



From DNB's interview on the use of ENCORE[40]

- ENCORE continues to be a very useful starting point in DNB's research. It allowed us to map out the exposure of Dutch financial sector as well as our own reserves portfolios to nature-related financial risks. Then to get a more granular view of risks, it does need to be supplemented with other tools such as WWF Risk Filter and sources of location or other data.
- ENCORE currently only captures direct impacts. The addition of the indirect (value chain) impacts and dependencies can hopefully improve our understanding of exposure and areas of focus.
- Another aspect to consider is that there are no differences between firms within a sector in ENCORE. If you want to look at a portfolio level, every business in one sector will get a similar score. Among other things, this could negatively affect institutions that operate in a high impact/dependency sector but due to their business model or operations, they actually have limited impacts and/or dependencies. Additional company specific data and other tools are therefore needed to generate company-level estimates of exposure and risk.
- Finally, location-specific information needs to be added with the help of other tools / databases. Having sector-based information is helpful to understand where key risks may lie, but data on the location and characteristics of assets in combination with location specific ecosystem information[41] is needed to have a proper understanding of risk.
- Mapping out exposure needs to happen first, but exposure is not risk. Further information is needed on how likely risks are to materialize, and how vulnerable economic actors are to those risks. That's why we made a first attempt to move from exposure to risk with an explorative scenario study.[42] Improving those scenarios is the next step.
- Overall, ENCORE allows you to start identifying exposure to impacts, dependencies and potential risks. To move forward and identify areas that need closer inspection, the use of other tools such as WWF Risk Filter can provide a more granular view of the risks. Once we get granularity within the sectors and locations, we can then figure out where we should focus efforts to manage risks.



A note on ENCORE

After communicating the change to 'gaps in functionality' to the ENCORE partnership,[43] several organizations have been working on updating the knowledge base as part of the SUSTAIN project. The changes found in Annex 1 will be fully implemented into the tool in the third quarter of 2024.[44] The addition of value chain component, which enables users to go beyond an assessment of direct dependencies and impacts by providing visibility of key links two levels upstream and two levels downstream of each focal economic activity, could be useful to map out further exposure.

The Indebted to Nature report confirmed that nature risks could affect financial stability and therefore fall within DNB's mandate. DNB now expects that financial institutions also identify their physical, transition and reputational risks resulting from the loss of biodiversity as part of their risk management process. Going forward, DNB will seek to improve the identification and assessment of risk by improving the granularity of exposure analyses and by improving methods to measure economic and financial risks.

2.3. Latest work: Looking into stability and own reserves

Recently, DNB published two new studies. The first one investigates how various nature shocks could affect the Dutch economy and the financial sector. The second one examines the role of DNB as an investor and assesses nature risks from a financial institution's perspective.

Economic and financial stability: exploration of nature degradation scenarios

Whilst contributing to the NGFS's Conceptual Framework, DNB carried out its first exploration into the potential economic and financial stability impacts of a set of four transition risks and one physical risk event scenarios in 2023.[45] Some, such as removal of fossil fuel subsidies and delay of tackling the nitrogen crisis, carried "non-negligible initial risks" to economic and financial stability.[46] Still, the preliminary results suggested that "it should be possible to take transition measures without causing a substantial impact on the Dutch economy and financial stability".[47] The authors highlighted multiple knowledge and methodological difficulties in analyzing the nature-risk scenarios that will affect the results. For example, each risk was considered on its own (one-dimensional view) rather than in a combination with others which may provide a more realistic multi-dimensional view.[48] This means that the underestimation of the real impacts on financial and economic stability of nature shocks is highly likely, and more work is needed in this area.

[46] De Nederlandsche Bank (2023b, p6). The author interprets non-negligible as meaning significant rather negligible.

DNB's review of its own investments

In another pilot for a central bank, DNB – this time in its role as an investor – published an exploratory assessment of nature-related financial risks in a subset of its own account investments in March 2024.[49] In effect, DNB analyzed two of its externally managed global developed markets equity portfolios to gain a better understanding of nature-related financial risks they are exposed to and how they can be managed. One of the funds is a passively managed broad-market fund (BMF) with ESG screening and the other is an actively managed fund that has a Paris-aligned objective (PAM). Both are invested in developed market equities with broad sectoral diversification. This assessment of investments was done using publicly available tools and data, which other financial institutions can access for similar analysis. (see Table 2).

Key insights:

- In line with the broader market proxied by the MSCI World Index and other studies, a substantial part of the studied portfolios could have high/very high impact or dependencies on nature. Therefore, DNB itself is exposed to nature-finance risks.
- There is a need to look at climate and nature in an integrated way as improvements in climate dimensions do not necessarily lower nature-related financial risks. Learning about the interplay is crucial for effective climate and nature action.
- Finally, it is possible to start with tools and data that are free and publicly available. It is best to start with a narrower scope of analysis to develop skills in the assessment process before expanding to an in-depth analysis of all assets.

Methods

Whilst the ENCORE tool was used as a starting point, additional tools were used to achieve a more granular analysis of risks. DNB used the **TNFD LEAP** approach to identify how much of the bank's portfolio is exposed to high dependency and impact sectors. DNB then performed a sectoral deep dive into electric utilities subsector by first identifying the location of power plants of the utility companies present in both portfolios and then combining them with WWF's Biodiversity Risk Filter to identify physical and reputational risks.[50]

Table 2: LEAP steps and tools used by DNB

Phase	Description	Tools
Locate the interface with nature:	Filter and prioritize potential nature-related issues using three filters: sector, value chain and geography.	**ENCORE** tool to map potential exposure and focusing on energy subsector. **Global Power Plant Database** of the World Resources Institute to identify locations associated with investee energy companies.
Evaluate dependencies and impacts:	Develop an understanding of organizations potentially material dependencies and impacts on nature.	**WWF Biodiversity Risk Filter** (BRF) for a deeper understanding of potential impacts and dependencies on nature in electric utilities.
Assess risks and opportunities	Identify, measure and prioritize risks originating from the dependencies and impacts on nature identified in the Locate and Evaluate phase, and understand which should be disclosed.	A combination of location data with WWF BRF to get asset-location- specific physical and reputational risk scores.
Prepare to respond and report – not in scope for DNB	Decide how the organization should respond to the identified material nature-related issues.	In the Lessons Learned & Next Steps chapter, engagement with external asset managers was mentioned.

Source: Adaptation of Table 1 LEAP Approach (DNB, 2024) risks

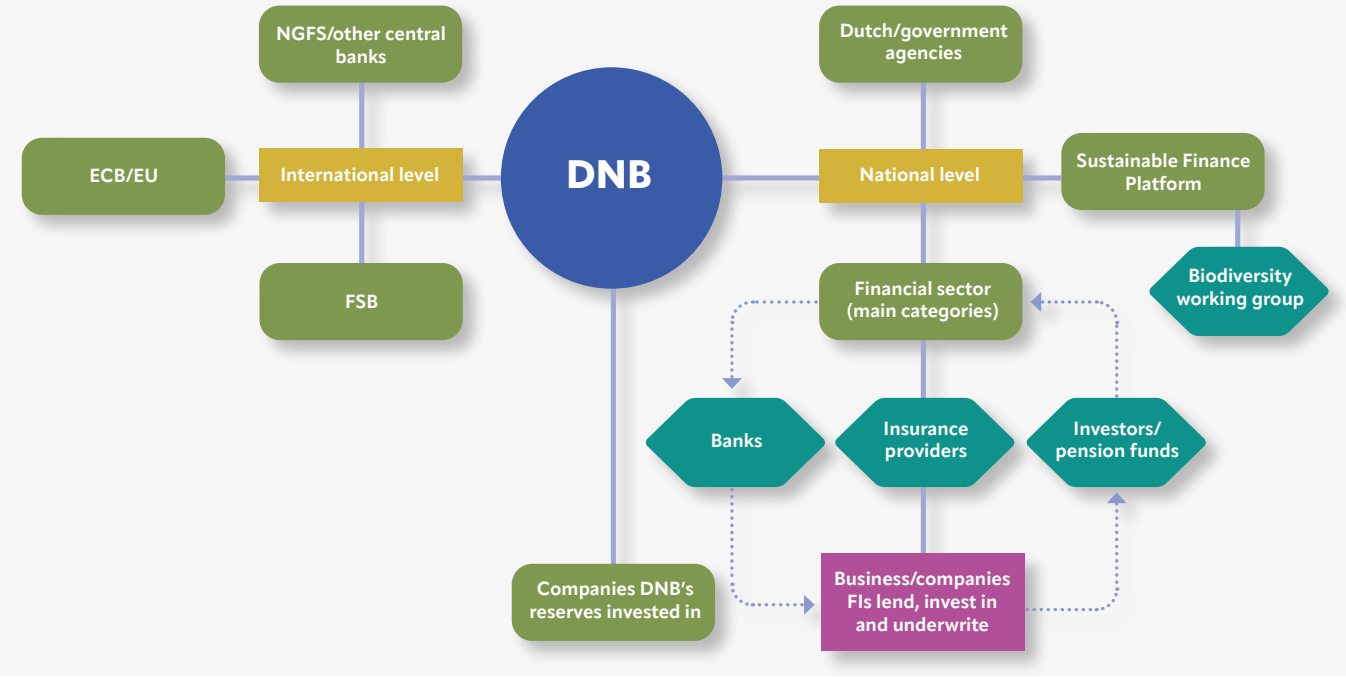
In addition to analyzing exposure and nature risks, and considering future investment allocations, DNB is also playing a crucial role network effect role by collaborating with others both within the sector as well as with policy-makers on a national and international level.

3. Pioneering standards: DNB's influence on others

3. Pioneering standards: DNB's influence on others

DNB aims to do its part in making the financial and economic system more sustainable through promoting the transition to a more sustainable financial sector. It does so by putting sustainability on the agenda in the international forums, networks and working groups DNB participates in. In its role as an investor, DNB is part of various networks engaged in sustainable finance and actively shares knowledge and experience with other central banks and similar investors to increase its impact and contribute to making the global financial system more sustainable.[51]

Figure 6: Mapping DNB's flow of information/influence



The influence of DNB's work on nature is spreading far and wide. In DNB's home jurisdiction, a **Biodiversity Working Group** has been established under the **Sustainable Finance Platform**, which is a forum for collaboration between the financial sector, supervisory authorities and ministries working on finance-related matters in the Netherlands. Internationally, DNB has inspired other central banks. The language of the Indebted to Nature report was instrumental in bringing the global regulators community together to discuss nature and biodiversity including at the NGFS.

Leaders at DNB have also gone on to influence nature finance at a larger scale. The former president of DNB Frank Elderson, who is a strong nature advocate, was part of DNB's executive board until 2020. He was also the chair of the NGFS since its inception until 2022 when he became executive board member of the European Central Bank (ECB). The current president of De Nederlandsche Bank, Klaas Knot, also vocally acknowledges the relevance of considering nature-related financial risks. In 2023, at the launch of the NGFS nature risks conceptual framework, Knot stated: **"as central banks and supervisors, we have every reason to be concerned, because it's an illusion to think we can preserve financial stability if this [nature] degradation continues"**.[52]

Knot also serves as the Chair of the Financial Stability Board (FSB), an international body that monitors and promotes financial stability by coordinating national financial authorities and international standard-setting bodies as they work toward developing strong regulatory, supervisory and other financial sector policies. The Brazilian G20 Presidency has asked the FSB to conduct a stock take of regulatory and supervisory initiatives on nature-related financial risks, which is due to be published in 2024.[53]

Dutch-focused Sustainability Finance Platform

To help remove barriers to sustainable financing and improve collaboration on sustainability initiatives, DNB set up the Sustainable Finance Platform (SFP) in 2016. The platform enables connections between financial institutions, the government and supervisory authorities in the Netherlands. Amongst the platform's participants are the **Dutch Banking Association**, the **Federation of the Dutch Pension Funds**, **Dutch Authority for Financial Markets** and various ministries including the **Ministry of Finance** and **Ministry of Agriculture, Nature and Food Quality**.[54]

There are several working groups within the SFP across sustainability topics, including on climate adaptation; SDG impact assessment; circular economy and biodiversity. Each group includes a wide range of parties from the financial sector and other relevant actors. Many of the members of the **Biodiversity Working Group** which consists of 12 Dutch financial institutions and two societal organizations are front leaders themselves. The Sustainable Finance Lab, called by DNB a "sparring partner", brings together academics and financial sector practitioners and regularly publishes research about various aspects of sustainable finance including on the role central banks and supervisors. Another member of the group, the ASN Bank, set itself a "Net positive effect on biodiversity as a result of all of our loans and investments by 2030" goal and collaborates with multiple partners and initiatives including The Partnership for Biodiversity Accounting Financials (PBAF) on the development of a harmonized biodiversity accounting metric for the financial sector.[55]

Drawing on their various experiences, the working group produced a **Roadmap for Biodiversity in the Financial Sector** to help financial institutions counter biodiversity loss. It provides guidance for all financial institutions, from absolute beginners to the very advanced to help them assess their impact, set targets and report progress on the theme of biodiversity.[56] Other publications include guides about deforestation risks, biodiversity opportunities and finally a biodiversity training guide for financial professionals.

According to Sustainable Finance Lab's recent guide, central banks and supervisors can start acting on nature-related risks by adopting the four main recommendations[57] and implementing them into their internal and external policies:

- **Integrate nature and climate together:** Climate change and nature degradation are interconnected so they need to be considered together to harness synergies and avoid unintended harm. The climate crisis cannot be resolved without action on nature. This will mean new policies as well as broadening their focus from climate to nature.
- **Acknowledge endogenous risks:** i.e. the risks created by the financial system to nature. Central banks and supervisors are uniquely positioned to address the systemic nature of climate change and nature degradation through their policies and recommendations as well as influence the market as investors of their reserve or sovereign funds.
- **Adopt a precautionary approach:** Emphasize proactive measures even with imperfect data and methodologies. It is better to be "roughly right than exactly wrong". As DNB experienced, analysis and method development takes time, but the tools and frameworks are already there to start.
- **Focus on harmful activities:** Concentrate first on sectors causing the most harm. Prioritize supervisory measures on the most harmful sectors such as agriculture, pesticide production, deforestation, mining and energy. The databases, tools and methodologies for these sectors are already available.

Other central banks and the ECB

DNB's research helped to pave the way for other studies. Banque de France's own study called **'"Silent Spring" for the Financial System?'** was carried out only a year later and acknowledged building on the methods of the Indebted to Nature "pioneering study in the Netherlands".[58] Other front leading central banks such as **Banco Central do Brasil**, **Bank Negara Malaysia**, **Banco de México** and the **ECB** soon carried out similar assessment practices as DNB to analyse their financial institutions' exposure to nature risks. Whilst the scopes and tools varied, the nature risks to financial sector are significant. The ENCORE tool was used in all analyses.

The ECB and DNB regularly exchange information and ideas including via networks such as the NGFS. The ECB has a supervisory role for large Dutch banks such as ABN Amro and Rabobank. Recently, the ECB published a study that assessed the dependencies of European businesses (non-financial corporations) and banks on different ecosystem services which included the Netherlands. The study's approach built on previous studies on nature-related exposures such as those by DNB and the Banque de France. The results showed that almost 75 percent of all bank loans in the Euro area are provided to companies that are highly dependent on at least one ecosystem service.[59] The ECB has now published its first **Climate and Nature plan** for 2024-2025 and aims to "further explore the impact of nature-related risks on our economy to deepen our understanding of the possible implications for monetary policy and the financial system".[60]

Network for Greening the Financial Systems (NGFS)

DNB is the co-chair of the NGFS's task force on nature-related financial risks and led the team that produced the NGFS's **Nature-related Financial Risks: a Conceptual Framework to guide Action by Central Banks and Supervisors**. The framework adopts an integrated approach and considers climate-related financial risks within the scope of nature-related financial risks, i.e. **climate needs to be considered within the broader lens of nature rather than as a standalone issue**. It also highlights the potential for physical and transition nature-related risks to adversely affect the economy and financial stability through impact on financial institutions and the financial system as a whole. At the same time, it acknowledges that "nature-related financial risks are also endogenous: the impacts that economic and financial actors have on nature affect the financial risks these actors need to manage".[61]

The framework finds that decline of nature can influence the economy at micro, sectoral/regional and macro levels and could affect financial stability. Whilst not making recommendations to governments and financial sectors directly, it would be prudent and pre-emptive for economic actors to identify exposure and manage nature-related risks including in their climate plans to prepare for potential legislative or policy changes. The NGFS's recent publication on climate transition planning now asks governments to "include adaptation, nature and broader sustainability goals and targets into transition planning and plan guidance".[62]

The NGFS is of the view that nature-related financial risk should be considered by central banks and supervisors in the fulfilment of their mandates.[63] The updated The Framework reiterates this view and provides useful guidance to assist with the risk assessment of nature-related financial risks by central banks and supervisors. The NGFS recommends three actionable phases to identify sources of physical and transitional risks (Phase 1), assess economic risks (Phase 2) and assess risks to, from and within the financial system (Phase 3). These phases are expanded by multiple guiding questions to help break down the assessment into more manageable parts. Two illustrative cases about freshwater ecosystem (Colorado River Basin in North America) and a forest ecosystem (Amazon Rainforest in South America) demonstrate possible application pathway. These were selected for their importance to economic and social functions, availability of data and their interlinkage with climate change.[64]

The framework and its guiding questions may be used to "facilitate a dialogue with the financial sector about the identification, assessment, management and disclosure of nature-related financial risks".[65]

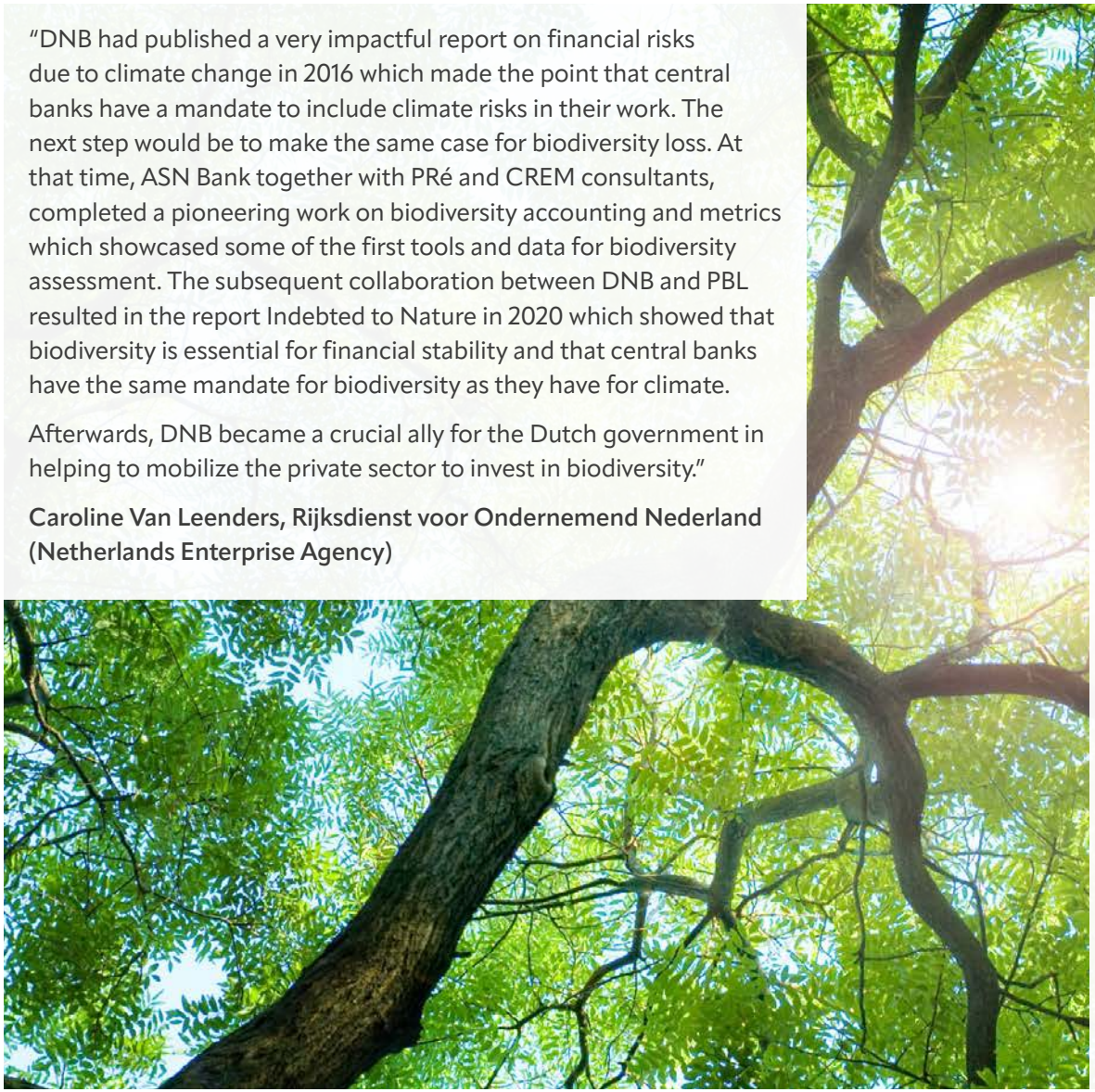
DNB uses the work of the NGFS on climate-related topics in its own work. At the same time, as a front-runner on nature-related risks, DNB leverages NGFS's platform to share information, co-operate to divide the workload with others & explore nature-related risks further.[66]

Feedback from organizations influenced by DNB's work

"DNB had published a very impactful report on financial risks due to climate change in 2016 which made the point that central banks have a mandate to include climate risks in their work. The next step would be to make the same case for biodiversity loss. At that time, ASN Bank together with PRé and CREM consultants, completed a pioneering work on biodiversity accounting and metrics which showcased some of the first tools and data for biodiversity assessment. The subsequent collaboration between DNB and PBL resulted in the report Indebted to Nature in 2020 which showed that biodiversity is essential for financial stability and that central banks have the same mandate for biodiversity as they have for climate.

Afterwards, DNB became a crucial ally for the Dutch government in helping to mobilize the private sector to invest in biodiversity."

Caroline Van Leenders, Rijksdienst voor Ondernemend Nederland (Netherlands Enterprise Agency)



"At the request of DNB the working group on Biodiversity was initiated in 2019 as part of the Sustainable Finance Platform in the Netherlands. DNB was, therewith, one of the first central banks to take a position on ESG risk management beyond climate.

Together with the Indebted to Nature paper that was published in 2020 it created a clear signal to Dutch financial institutions that ESG risk management should go beyond climate and should also focus, amongst other issues, on biodiversity. Supported by DNB, the working group has developed and published several thought leadership papers on biodiversity in the financial sector. The working group started with a small group of front runners in biodiversity - sharing plans and good practices on financing and investing in biodiversity. Since then, the working group has grown in number of participants demonstrating the increasing attention given to the topic of biodiversity by financial institutions. Including biodiversity in both impact and risk strategies of financial institutions is essential for the long-term financial health of institutions as many value chains that financial institutions finance or invest in are dependent on ecosystem services."

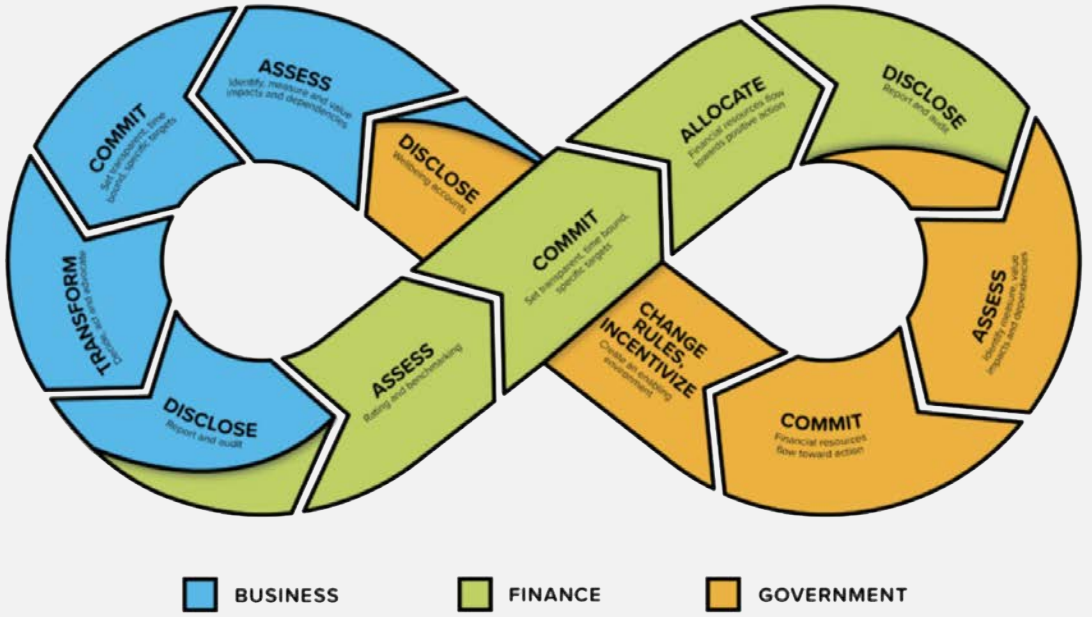
Merel Hendriks, Biodiversity Group at the Sustainable Finance Platform

4. Conclusions and final thoughts

Conclusions and final thoughts

Nature and biodiversity loss poses a threat to the stability of our economies, financial system and human and planetary wellbeing. DNB is a leading institution in translating nature loss into financial risks and in taking steps to integrate nature into all its work. DNB's steps can inspire other central banks and supervisors and serve as a call to action for financial institutions and business. The increased understanding of how financial institutions are exposed and contribute to nature risks should lead to into increased collaboration with the governments to ensure financial and economic stability. Greater physical risks and abrupt transition risks can be lessened or avoided through better management of nature by business and financial institutions and early signalling and proactive transition planning by governments.

Figure 8: Achieving transformative change in collaboration between business, finance, government



Source: Capitals Coalition

Central banks and supervisors have a lot of influence given their mandate for financial stability even though they cannot substitute for broader national and international policy-making action. Most central banks are independent to conduct research without the influence of political short-termism. Their research on risks can shape international debates, financial regulators and national government's thinking, policies and regulations. Their supervisory expectations and policies can influence and enable the financial sector to implement prudent nature risk management and identify and manage their exposure to nature risks in businesses they lend to, invest in or underwrite. Businesses must be aware that soon, if not already, financial institutions are likely to engage with them with the expectation that businesses understand their impacts and dependencies on nature and increase their resilience by managing them accordingly.

Recommendations for readers

As nature risks and opportunities to protect nature appear at different levels, all economic actors must act with their own spheres of influence. Frank Elderson has called this a "levers-for change approach". There is a need to collaborate and act across a whole society to prevent systemic risks, ensure stability of our economies and well-being for all.

Just like DNB, other central banks, financial institutions and business can take key action steps to address nature loss:

Assess nature-related impacts, dependencies, risks and opportunities.

DNB has shown the effective use of tools and frameworks such as the ENCORE and the TNFD. The findings of an assessment should drive further decision-making.

As this process takes time, it is important to set manageable scope and start promptly to begin mitigating nature risks. Most companies that have done an assessment repeat the process later when they want to gain a more granular view.

Develop credible nature actions strategy, including steps on assessment, commitments, transformation and disclosure.

Once an institution has assessed its exposure to nature-related issues, it can begin to set commitments and targets and take transformative actions, all while disclosing these actions, progress and findings. **The Nature Strategy Handbook** is a crucial resource to support this progress. It guides organizations through the supportive tools and frameworks available, building on the ACT-D High-Level Business Actions on Nature, and includes TNFD's final recommendations, guidance from the Science Based Targets Network and new sector-specific guidance.

Integrate nature into stewardship and capital allocation policies to effectively align financial flows with the GBF.

Financial institutions should ensure that their assessment of nature-related issues informs their stewardship policies and capital allocation decisions, including by understanding and taking action to limit exposure to nature loss in investments, loans, insured assets, and underwriting services.

Explore all targets of the Global Biodiversity Framework

including Target 19 to mobilize at least $200 Billion per year for biodiversity from all sources and Target 14 to Integrate Biodiversity in Decision-Making at Every Level which encourages governments, businesses and financial actors to incorporate biodiversity and its multiple values in decision-making processes.[67]

Learn from and collaborate with others including peers to develop best practices for nature action.

Existing networks of financial institutions and more informal working relationships between peer institutions can provide countless opportunities to share best practices and research findings. Institutions should take advantage of these collaborative opportunities to understand available solutions to common challenges. It is crucial to inspire each other, work together on action and solutions, and activate the levers that will accelerate nature action.

Final thoughts

Treating nature-related risks as part of DNB's core tasks and the work the bank has done so far sends a clear signal that central banks can play an influential role and act as a catalyst in transitioning to a nature-positive economy.

Times are changing and the primacy of maximizing financial returns whilst externalizing environmental and social costs at the expense of life systems is rapidly becoming outdated. The emerging expectations and demands are for business, finance and economic models that incorporate long-term, integrative thinking that is in kinship with life and fosters, not undermines, resilience of nature and people. DNB is moving towards a relational way of thinking that acknowledges that financial systems can affect nature – both positively and negatively – and in turn be affected by nature whose positive flows of benefits can no longer be taken for granted.

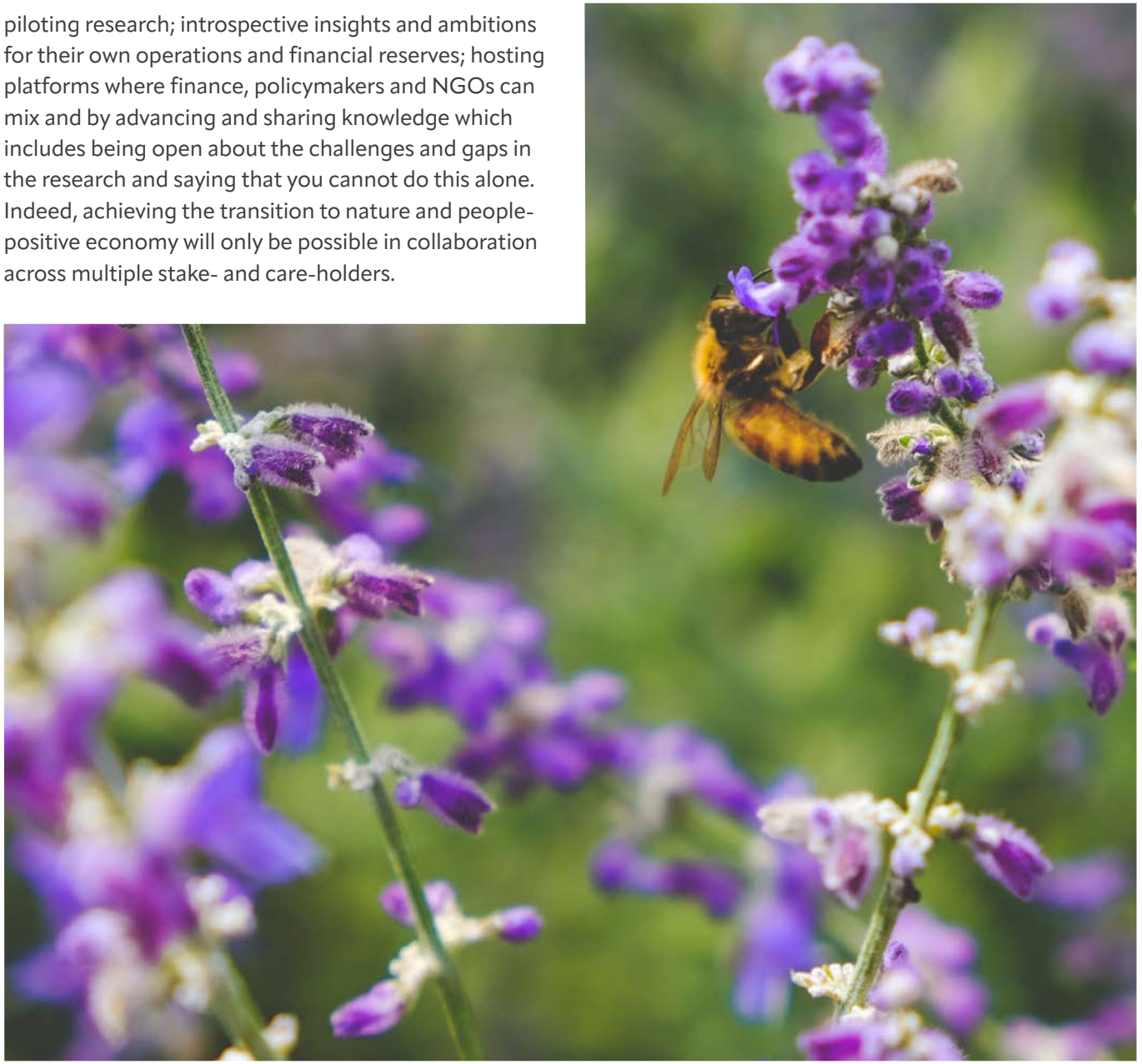
The bank includes environmental and social considerations as part of its mandate because it is "committed to a reliable financial system and solid financial institutions. If financial institutions are exposed to environmental and social risks, their solidity can be under threat".[68]

DNB expresses a desire to contribute to wider societal goals, consistently working to support the stated goals and inviting other financial institutions to do the same. The bank has stated that financial institutions "can use

their influence to contribute to meeting environmental and social challenges - to make an impact... Although seeking to make an impact and managing risks are considered two completely different things, making an impact will most likely in the long run also contribute to mitigating the risks to which the financial sector is exposed".[69]

Cross-cutting collaboration is a key recommendation from DNB. In 2020 when the Indebted to Nature report was launched, Frank Elderson asked financial institutions to "look for fruitful partnerships with organizations that can help them with their data, knowledge and network to shape this very important topic further in their organization".[70] Financial institutions and businesses should leverage existing knowledge and newly developed nature-risk frameworks and tools to identify, assess and manage their dependencies and impacts on nature. As this field is a new territory for most, sharing experiences and contributing to new knowledge is "essential for building a collective understanding of nature-related financial risks".

DNB is clearly on a journey to embed sustainability into its institutional core. With the Sustainable Finance Strategy running until 2025, it will be interesting to see what the next steps and policies are and how this contributes into voluntary or mandatory action for the financial sector and the application of similar requirements for business.[71] By acting as part of a wider ecosystem, DNB helps co-create much needed enabling conditions for nature action and provides inspiration for others. It does so through partnerships; piloting research; introspective insights and ambitions for their own operations and financial reserves; hosting platforms where finance, policymakers and NGOs can mix and by advancing and sharing knowledge which includes being open about the challenges and gaps in the research and saying that you cannot do this alone. Indeed, achieving the transition to nature and people-positive economy will only be possible in collaboration across multiple stake- and care-holders.



Annex 1 – Updates to the ENCORE knowledge base

A major addition to the ENCORE knowledge base is the value chain component, which will enable users to go beyond an assessment of direct dependencies and impacts by providing visibility of key links two levels upstream and two levels downstream of each focal economic activity. The update includes seven key improvements:

- Expansion of the previous list of 92 'production processes' to 271 'economic activities', catalogued by the globally recognized **International Standard Industrial Classification for All Economic Activities** (ISIC). These economic activities, ranging from livestock farming to the manufacture of chemicals and nuclear power production, offer a more detailed breakdown on economic sectors.
- The list of ecosystem services is now better aligned with the categorization proposed by the UN's **System of Environmental Economic Accounting - Ecosystem Accounting**. Cultural Ecosystem Services - such as recreation, aesthetic appeal, education, and spiritual, artistic and symbolic services - which were previously not included in ENCORE, have been added.
- Improved clarity on how economic activities can impact nature, enabling users to gain more actionable insights.
- Natural capital is now separated into different ecosystem types aligned with the IUCN Global Ecosystem Typology 2.0. This will help users better understand how impacts and dependencies may vary based on where they are located.
- All data on impacts and dependencies of economic activities have been updated based on the latest scientific research, industry expert reviews and grey literature, such as company sustainability reports, organizations' websites and industry news.
- Improved methodology of the materiality ratings (which indicate how significant potential dependencies are, and how much pressure economic activities have on nature) to enable comparisons across economic activities and sectors. Where possible, these materiality ratings draw on quantitative indicators.
- New information has been added on key value chain links covering two tiers of suppliers and two tiers of consumers for each economic activity, enabling users to see their indirect nature-related impacts and dependencies.
- The updates, particularly the qualitative descriptions, the value chain links and the materiality ratings, have been reviewed by 78 industry experts representing 14 out of the 21 ISIC sections (level 1).
- The improvements to the knowledge base behind ENCORE enable users to explore their use of, and dependency on, nature in greater detail than before. The expert technical research behind the knowledge base update revealed more than 10,000 links between economic activities and ecosystem services, and economic activities and pressures. The updated knowledge base can now be downloaded by ENCORE users running analysis on their activities.

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Footnotes

[1] Nature positive is a global societal goal defined as 'Halt and Reverse Nature Loss by 2030 on a 2020 baseline and achieve full recovery by 2050'. For full definition see www.naturepositive.org

[2] This report will use the following terms interchangeably: De Nederlandsche Bank, DNB, the Dutch Central Bank or simply 'the bank'.

[3] This study will use the Western view of nature which comprises both living (biotic) and non-living (abiotic) parts and includes biodiversity (the diversity of the living organisms) and ecosystems (structures and services) as that is the current dominant view of nature particularly within the economic context. In other, non-anthropocentric worldviews and knowledge systems, nature is considered a living system, and humans are an intrinsic part of it.

[4] There are multiple case studies available illustrating institutions that have carried out these assessments, including from Capitals Coalition, WBSCD, and TNFD.

[5] DNB aims to fully integrate sustainability into all core functions by 2025. It is important to note that sustainability does not just refer to climate. DNB focuses on the themes of "Environment" and "Social" ambitions expressed in SDGs and aims to analyse them in conjunction with each other where possible.

[6] For more information about the Planetary Boundaries and the research behind them see https://www.stockholmresilience.org/research/planetary-boundaries.html

[7] Ecosystem services are also known as nature's contribution to people (NCPs) or nature's contribution to human wellbeing. The four most recognised categories are 1) Provisioning services that create tangible outputs such as food, cotton and timber; 2) regulating services responsible for the regulation of ecosystem processes such as crop pollination, air and water filtration, soil fertility, mitigation of climate change through carbon sequestration; 3) cultural services are the non-material benefits such as recreational, spiritual and aesthetic; 4) supporting services, fundamental process that support the delivery of other ecosystem services such as nutrient cycle, soil conservation and habitat creation. **Nature also has an intrinsic or existence value which is not dependent on providing benefits to people but to itself and other living systems**.

[8] WEF (2020). The report also highlights that the three largest sectors highly dependent on nature are construction ($4 trillion); agriculture ($2.5 trillion); and food and beverages ($1.4 trillion).

[9] It is important to note that most analyses have so far focused on exposure to potential risks which is a good first step to begin mitigating nature-related risks. To fully understand nature risks, the interlinkages between local to global / systemic dimensions as well as the compounding, cumulative and cascading effects of not acting to halt the degradation of nature need to be studied as well.

[10] IPBES (2019)

[11] The five main drivers in the order of impact are 1) changes in land and sea use 2) the direct exploitation of organisms 3) climate change 4) pollution and 5) invasive species

[12] There are numerous other targets relevant to financial institutions and businesses. See https://www.cbd.int/gbf/targets.

[13] UNEP's 2023 publication "Stepping into Biodiversity" offers an excellent overview of the key implications for investors of the goals and targets of the GBF aiming to support them in managing associated risks and prepare them for anticipated policy developments.

[14] To learn from and incorporate existing standards, frameworks and tools into the TNFD Recommendations and Additional Guidance, the Taskforce collaborated closely with its knowledge partners, including standards bodies such as the ISSB and GRI, scientific and conservation organisations such as IUCN and UNEP-WCMC, and framework providers including the Capitals Coalition and the Science Based Targets Network (SBTN).

[15] For more information see: https://pollinationgroup.com/global-perspectives/company-directors-and-nature-risk-a-landmark-english-law-legal-opinion. Additional legal opinions are planned for other jurisdictions.

[16] NGFS (2024a). NGFS defines **strategic** nature-related litigation as litigation "aimed at achieving the protection of nature itself, and of the planetary boundaries which safeguard human existence on Earth, rather than focusing on a narrow issue or single site. In other words, such litigation seeks to safeguard nature's ability to provide the ecosystem services on which humanity depends. It is being used by litigants as a tool to influence policy and regulatory outcomes, as well as to change broader corporate and societal behaviour." p, 2.

[17] More information about the ACT-D steps and the organisations that helped to develop them can be found here: https://capitalscoalition.org/business-actions. There are also multiple sources of case studies which include Capitals Coalition, WBSCD, TNFD. For an overview of ACT-D case studies see https://capitalscoalition.org/wp-content/uploads/2023/11/ACT-D_CaseStudies_Mar-8_Full.pdf

[18] DNB supervises over 1200 financial institutions from banks, pension funds and insurers to cryptocurrency service providers.

[19] NGFS/INSPIRE Group (2022). De Nederlandsche Bank (DNB) was responsible for the financial data and analyses in this collaborative project, and PBL Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving – PBL) supplied the data on nature and the environment.

[20] Other frontleaders include, for example, Banque de France, Brasilian Central Bank, Malaysian Central Bank and Mexican Central Bank

[21] NGFS was established in 2017 and consists of 134 members and 21 observers as of December 2023.

[22] DNB (2023b)

[23] DNB (2024)

[24] Several other central banks such as the Banque de France, Central Bank of Mexico and the Brazilian Central Bank rapidly carried out the research into the exposure of their financial institutions to nature-related financial risks.

[25] This article (in Dutch) talks about DNB's partnership with Sustainable Finance Lab as a sparring partner to keep DNB

on this mission at a time when sustainability was not yet as institutionally established as it is now. The article emphasises the need for finance to embed long-term thinking into strategy and that financial institutions should not just strive for prosperity but also for wellbeing. Speech Klaas Knot - "Duizend bloemen laten bloeien: het SFL is jarig" (dnb.nl)

[26] DNB, PBL (2020). In Dutch, the report is not called *Indebted to Nature: Exploring Biodiversity Risks for the Financial Sector* but *Biodiversity and the financial sector: a cross-pollination?* This is to indicate the need for partnerships with multiple organizations that can help with the understanding and embedding of biodiversity into the financial sector.

[27] DNB (2019), p. 6

[28] DNB (2023 update), 'Sustainable Finance Strategy 2021-2025', p. 2

[29] DNB (2023 update), 'Sustainable Finance Strategy 2021-2025' p. 3

[30] DNB (2023c). DNB manages EUR 9 billion of assets (equities, corporate and government bonds) in their own portfolio.

[31] The term "belief" is used by DNB in the strategy but the word principle might be a better word to convey

[32] In addition to climate mitigation and adaptation, objectives related to nature can also include sustainable use and protection of water and marine resources; pollution prevention and control; and the protection and restoration of biodiversity and ecosystems. For more detailed overview see https://knowledge4policy.ec.europa.eu/glossary-item/do-no-significant-harm_en

[33] Often reputational risks are considered a part of transition risks.

[34] The TNFD which launched in 2023 offers one such broadly consistent risk identification and reporting framework.

[35] DNB (2023) "The economic and financial stability repercussions of nature degradation for the Netherlands Exploring Scenarios with transition shocks'

[36] DNB (2024)

[37] DNB & PBL (2020b)

[38] DNB (2020), p6

[39] Dependency score is based on 2 factors: 1) How significant is the loss of functionality in the production process if the ecosystem service is disrupted? and 2) How significant is the financial loss due to the loss of functionality in the production process? For more info see https://encorenature.org/en/data-and-methodology/materiality

[40] These reflections have been edited for length and clarity.

[41] such as functional ecosystem integrity

[42] DNB (2023b)

[43] The partnership is comprized of the United Nations Environment Programme Finance Initiative (UNEP-FI) and the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and Global Canopy

[44] The work is sponsored by the EU and the partners working on updating the database are UNEP-WCMC, Capitals Coalition, ETH Zurich, PBL, IUCN. More information about SUSTAIN can be found here: https://capitalscoalition.org/project/sustain-project/

[45] De Nederlandsche Bank (2023b). The four transition risks with varying geographical scope were 1) nitrogen measures (in Netherlands), 2) deforestation tax (in the EU) and globally 3) ending harmful subsidies and 4) dedicating Half Earth as a conservation area. The physical risk considered was global pollination decline.

[46] De Nederlandsche Bank (2023b, p6). The author interprets non-negligible as meaning significant rather negligible.

[47] De Nederlandsche Bank (2023b, p6)

[48] The study is done from a financial and economic stability perspective, but the human dimension should also be incorporated when the methodologies and tools advance. For example, in some of the scenarios the price of food would rise significantly affecting the resilience and stability of people and therefore the economy too. In the Half Earth scenario, it is not clear whether and how human and social dimensions were built into the assumptions which raises questions of equity, fairness, political stability and peace.

[49] DNB (2024) 'Nature-related financial risks in our own account investments: An exploratory case study and deep dive in electric utilities", online, available from: https://www.dnb.nl/media/q5jf0td4/dnb-analyse-nature-related-financial-risks-in-our-own-account-investments-an-exploratory-case-study-and-deep-dive-in-electric-utilities.pdf 2024)

[50] NGFS and TNFD regard reputational risks a part of transition risks, meaning only a subset of transition risks is assessed.

[51] DNB (2023a)

[52] For the full speech see https://www.dnb.nl/en/general-news/speech-2023/lessons-from-mount-everest-acting-now-to-curb-nature-related-financial-risks/

[53] See https://www.fsb.org/2024/04/financial-stability-risks-and-the-fsbs-work-program/

[54] For a full list see https://www.dnb.nl/en/green-economy/sustainable-finance-platform/

[55] For more information about the goal and collaborations see https://www.asnbank.nl/over-asn-bank/duurzaamheid/biodiversiteit/biodiversity-in-2030.html. ASN has also been working on a biodiversity footprinting for financials (BFFI) methodology for impact assessment

[56] Sustainable Finance Platform (2021)

[57] Sustainable Finance Lab (2024)

[58] Banque de France's study is available from: https://publications.banque-france.fr/en/silent-spring-financial-system-exploring-biodiversity-related-financial-risks-france

[59] For a recent summary of central banks studies, see ISFCOE & KPMG (2024) publication, Figure 3

[60] Boldrini et al (2023)

[61] ECB (2024) 'Climate and Nature Plan 2024-2025', p. 3. Available online: www.ecb.europa.eu/ecb/climate/our-climate-and-nature-plan/shared/pdf/ecb.climate_nature_plan_2024-2025.el.pdf (accessed Feb 2024)

[62] NGFS (2023), p. 8

[63] NGFS (2024c), p. 7

[64] For more details see this press release: www.ngfs.net/en/communique-de-presse/ngfs-acknowledges-nature-related-risks-could-have-significant-macroeconomic-and-financial

[65] The criteria for selection are explained on p. 28 and include: (i) several national and regional impact and dependency studies highlight the potential economic importance of the ecosystems services provided by freshwater and forest ecosystems; (ii) degradation of these ecosystems and pressure affecting them present recognizable examples of nature-related financial risks; and (iii) the degradation of these ecosystems is closely linked to climate change, offering an opportunity to highlight the climate- nature nexus.

[66] For more information about the relationship between DNB and NGFS see NGFS's In Conversation with Ms Cindy van Orschoot, DNB between NGFS and DNB.

[67] In target 14, GBF also mentions different values which in addition to intrinsic value can also include the valuation of nature (in monetary, quantitative or qualitative terms). The resources developed as part of the Align and Transparent projects are a good starting point to understand measuring and valuing nature.

[68] DNB (2019), p.5

[69] DNB (2019), p. 5

[70] From Frank Elderson's speech at PBL. Available from: https://www.dnb.nl/algemeen-nieuws/speech-2021/speech-frank-elderson-pbl-academielezing-verduurzaming-van-de-economie-en-de-rol-van-de-financiele-sector/ (translated via Google)

[71] Lots of next steps suggestions for central banks are contained in Sustainable Finance Lab's "Finding a way with nature" report which was published in 2024.

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