

NATURE RISK

An analysis of use
and applicability in
the Nordic countries



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This publication is also available online in a web-accessible version
at <https://pub.norden.org/temanord2022-547>.

List of terms and abbreviations

CBD	Convention on Biological Diversity
CRFR	Climate-related financial risks
ENCORE	Exploring natural capital opportunities risks and exposures
ES	Ecosystem Services
ESG	Environmental, social and governance
GHG	Greenhouse gas
IPBES	The Intergovernmental Science-Policy Platform of Experts on Biodiversity and Ecosystem Services
KPI	Key Performance Indicator
NCP	Nature's contribution to people
NGFS	Network for greening the financial system
NRFR	Nature-related financial risks
OECD	Organisation for Economic Cooperation and Development
SBTN	Science-based Targets Network
SDG	Sustainable Development Goals
TCFD	Taskforce on Climate-related Financial Disclosures
TEEB	The Economics of Ecosystems and Biodiversity
TNFD	Taskforce on Nature-related Financial Disclosures
UN	United Nations
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

The purpose of this publication is to generate an overview of the use of the nature risk concept, to describe the scope and possible areas of application, and assess the applicability of the concept in the Nordic countries Sweden, Norway, Iceland, Finland and Denmark, as well as in international organisations as WWF, OECD, UN and the European Commission. Nature risk has a natural global scope, as effects on nature are cross border, and since supply chains very often are global. The term nature risk refers to:

Potential threats posed to an organisation linked to its and other organisations' dependencies on nature and nature impacts. These can derive from physical, transition and systemic risks¹

Nature-related risks arise due to the impact and dependency we have on nature. These risks can be physical, transitional or systemic. The term nature risk is based on an anthropocentric set of values, where the value of nature and environmental resources is determined by human preferences. Nature risk is thus related to potential risk for organizations and society and not predominantly for nature itself.

The concept of nature-related risks is found to be mainly in use in relation to the financial sector. In the broadest definition, nature risk is the potential threat that arises due to an organisation's impact on and/ or dependency on nature, and the potential business-related threats arising from a tightening of the regulatory framework. The application of the term nature risk has increased rapidly in recent years, and there are numerous efforts to implement the concept. Moreover, similar concepts precede nature risk under different names, largely covering the same scope; the earliest being biodiversity risk used in the beginning of the 2000s. Multiple large initiatives such as The Economics of Ecosystems and Biodiversity and the Millennium Ecosystem Assessment have followed since the early 2000'es.

Nature risk is currently mainly used as a term and concept in the financial sector and in civil society organisations such as the WWF. Few initiatives and little literature have been identified from academia or the regulatory sector. However, numerous current policy initiatives address the same issues, or the drivers behind nature loss. Prevailing challenges lie in assessing a business exposure to nature-related risks as well as its impact on the deterioration of natural capital. Several initiatives such as the Taskforce on Nature-related Financial Disclosures (TNFD) are actively seeking methods to assess impacts, exposure, and dependencies on ecosystem services and to create a common framework to report and set targets on these areas. The TNFD categorizes the nature-related financial risks to be either physical, transitional or systemic.

The nature risk concept is rarely used in the Nordic countries with the exception of Norway, where nature risk is used by the financial sector, civil society organisations, and the regulatory sector. Moving forward, it is recommended that each of the Nordic countries take active steps to implement the concept of nature risk in relevant policies, regulations and sectors. It is also recommended that the Nordic

1. This definition is from the Beta 1v by the Taskforce on Nature-related Financial Disclosure, there is an overview of the wording used by different organizations through time in chapter 9

countries follow the international development on nature risk and related policy areas, such as the EU taxonomy and the TNFD framework, and ensure that national policy is aligned with the international agenda.

KEY FINDINGS

- Nature risk is not applied in an environmental policy context.
- Nature risk is mainly a financial concept and applied in the finance and business sector.
- Nature risk as a concept is gradually gaining more awareness on a global scale.
- Numerous initiatives dealing with Nature risk are currently under development, most notably the Taskforce on Nature-Related Financial Disclosures (TNFD).
- Norway is the Nordic country where the concept is most widely applied.

1. INTRODUCTION

Biodiversity loss is considered one of the main threats facing humankind. We are at the beginning of the sixth mass extinction, with more than 25% of all assessed species estimated to be threatened², and the extinction rate of species currently being 100–1000 times higher than the natural background extinction. The loss of biodiversity and nature constitutes a risk to the world's ecosystems and as such the ecosystem services we rely on.

The main drivers of biodiversity loss are factors such as land and sea use change, resource exploitation, climate change, pollution, and invasive species. All these drivers are of anthropogenic origin, and our society and industries are threatening the state of nature. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) estimates that up to 75% of the land-based environment and approximately 66% of the marine environment have been significantly changed by human actions, and that the annual loss of land caused by degradation is equal to 10% of the world's annual GDP³.

In recent years, there has been an increased focus on the potential consequences of nature damage to private sector companies from international organisations such as WWF, OECD, the UN, and the EU, providing knowledge and frameworks to promote the understanding of the emerging challenges that can be referred to as nature risks. The UN Convention on Biological Diversity set the goal: "No net loss by 2030 and net gain by 2050" concerning biodiversity at COP 15 in 2021 (CBD 2021). Members of the UN have complied to reach the 17 Sustainable Development Goals by 2030, of which several concern or are dependent on the state of nature, including goal 13: climate action, goal 14: life below water, and goal 15: life on land. Moreover, national organisations such as financial institutions and NGO's have carried through studies and awareness activities that have shed light on the existing and emerging risks from the consequences of pervasive changes in nature.

However, the effects and derived risks of decreased biodiversity and loss of ecosystem services are often not taken into concern in risk assessments and corporate mitigation strategies. Although climate change adaption strategies and circular economic business models addressing resource scarcity are gaining ground in the executive corridors, a more broad and systemic view of the risk of loss of crucial ecosystem services is yet to be mainstreamed in the private sector - and in many cases also in the environmental regulation.

Nature risk as a concept is not widely known, and is not yet used in a systematic way or incorporated into risk assessments. The approach behind current initiatives is widely inspired by the term and concept of climate risk, which has gained a more widespread acceptance as an emerging matter to address, e.g., when conducting due diligences. Climate risk describes a company's, a sector's or a country's vulnerability to future extreme situations, both in the form of major climate changes

2. The IUCN RED LIST: <https://www.iucnredlist.org/>

3. [IPBES. (2019). *Global assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*]

and in the form of major changes in climate policy and the energy market. Nature risks are equally acute, but whereas the governing principles of climate mitigation strategies might be applicable to nature risk management, the fundamental approach to understanding the risks and consequences must be different, since the causalities of ecosystem services and private sector market models and value creation are less clear.

The Nordic Council of Ministers has commenced this study that can generate an overview of the use of the nature risk term, describe the content and possible areas of use, and evaluate the usefulness of the concept in the Nordic countries' environmental policies and finance sectors. The study has been carried through in 2021-2022 by PlanMiljø and Anthesis. The authors are Rikke Fischer-Bogason, Amalie Engelbrecht Hansen and Elvira Borgman from PlanMiljø and Linda Stafsing, Alexander Eriksson and Salla Hossi from Anthesis.

2. SCOPE OF THE STUDY

The study covers the use of the term nature risk in the Nordic countries Sweden, Norway, Iceland, Finland and Denmark, as well as in international organisations as WWF, OECD, UN and the European Commission. Nature risk has a natural global scope, as effects on nature are cross border, and since supply chains very often are global.

The study is focused on effects such as biodiversity loss, changes of ecosystems, resource scarcity, air pollution, habitat loss, and invasive species, whereas natural disasters, natural hazards, and risk assessment of these incidents are beyond the scope.

The study has a focus on the environmental regulation/policy making, as well as the private sector – and to a large extent specifically the financial sector. The financial sector plays a significant role in the theme of nature risk, as there is great relevance in being able to risk assess the activities and operational potentials of companies for financing and investment purposes.

2.1 Initial understanding of the term Nature Risk

Defining nature risk as a concept equivalent to climate risk is part of the aspiration to create an analytical framework to include in risk assessments in both financial and policy decisions as well as at company and finance level. Loss of nature can have implications for several types of risks for business and financial stakeholders; both physically, politically, at market level, in reputation, systemically, and in the form of financial risks.

To analyse the use and applicability of nature risk in the Nordic countries, an initial understanding and definition of the term nature risk has been essential to inform the study. The initial understanding has provided a scope and guide for the search for relevant literature and initiatives and has been crucial for the final selection of literature to be included in the actual review. The initial understanding of nature risk has been based on i) definitions of biodiversity, ecosystem functions and services and ii) the mutual risk that is located between nature and organizations or institutions.

The term nature risk is based on an anthropocentric set of values, where the value of nature and environmental resources is determined by human preferences. Nature risk is thus related to potential risk for organizations and society, and not predominantly for nature itself.

The term nature covers the natural world, with an emphasis on the diversity of living organisms and their interactions among themselves and with their environment. Risk refers to the probability and consequence of loss or degradation of nature over time, and the probability and consequence of economic loss due to a change in regulation.

2.2 Concepts relevant to understanding Nature Risk

When accounting for the use and application of nature risk, several other concepts are in use, which need to be defined. There are numerous other closely related words, concepts and terminology that address – or are related to – the human interaction with nature, and the impact on important ecosystem services that provide a welfare effect. In this section, these main terms are accounted for, as they are used throughout this report, and are used in literature and studies as part of approaches or theories similar to nature risk. The definitions presented below and used in the report are the ones most commonly cited and referenced to.

Biodiversity

This definition for biodiversity was adopted by the UN Convention on Biological Diversity (CBD): *“The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within the species, between species and of ecosystems”* (UN 1992).

Dependencies

Aspects of ecosystem services that an organisation or other actors rely on to function. Dependencies include ecosystems' abilities to regulate water flow, water quality, and hazards like fires and floods; provide a suitable habitat for pollinators (who in turn provide a service directly to economies), and sequester carbon (in terrestrial, freshwater and marine realms) (TNFD 2022).

Ecosystems

The definition of ecosystems most commonly used is also from CBD: *“A dynamic complex of plant, animal, and microorganism communities, and the non-living environment interacting as a functional unit”* (UN 1992).

Ecosystem Services

In the global initiative 'The Millennium Ecosystem Assessment' (MEA), the following definition of Ecosystem Services was used: *“The benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling that maintain the conditions for life on Earth.”* This is a combination of earlier definitions from the late 1960's, where the concept of ecosystem services was first established (World Resources Institute 2003), and onwards. This definition by the MEA is the most widely used to date.

Impacts

Changes in the state of nature, which may result in changes to the capacity of nature to provide social and economic functions. Impacts can be positive or negative.

They can be the result of an organisation's or another party's actions and can be direct, indirect or cumulative (TNFD 2022).

Nature's contribution to people

In 2018, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), launched a new concept *"Nature's contribution to people"* (NCP) (IPBES 2019). NCP is an expansion of ecosystem services (ES) that includes social sciences and humanities, and accounts for the nature-human relationship. ES is used throughout this report, but part of the literature uses the term NCP⁴.

Natural capital

Natural Capital Alliance defines natural capital as: *"The stock of renewable and non-renewable natural resources (e.g., plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people"*. This definition is adapted from academic literature published in the 1990's (Natural Capital Coalition 2016).

Nature value

Literature concerning the value of nature often distinguishes between the intrinsic value of nature and the economic value, nature holds to people. It is mainly the latter that is considered and quantified in risk assessments (Dasgupta 2021; Suttor-Sorel 2019; TEEB 2010).

Tipping points

An ecological tipping point is defined as: *"A set of conditions of an ecological and/ or social-ecological system where further perturbation will cause rapid change and prevent the system from returning to its former state."* by IPBES (IPBES 2019)

The Global Commons

There are two major definitions; both are taken from the Global Commons Alliance. The first (geopolitical) is most often used, but the second (economic) is the definition most relevant in the context of this report:

Geopolitical definition: *"In this definition the global commons are areas – and their potential economic resources – that lie beyond national jurisdiction: The atmosphere, the high seas, Antarctica and outer space"*.

Economic definition: *"(..) The global commons are things we all share – all 7.8 billion people – and that we all need to thrive and prosper. They include the atmosphere and land, the ocean and ice sheets, a stable climate and abundant biodiversity, the forests, the gigantic flows of carbon, nitrogen, water and phosphorus and more"* (Global Commons Alliance 2022).

4. It should be noted that NCP has sparked a debate, where some welcome the new aspects of the concept and others fear it can undo accomplishments made on the foundation of ES.

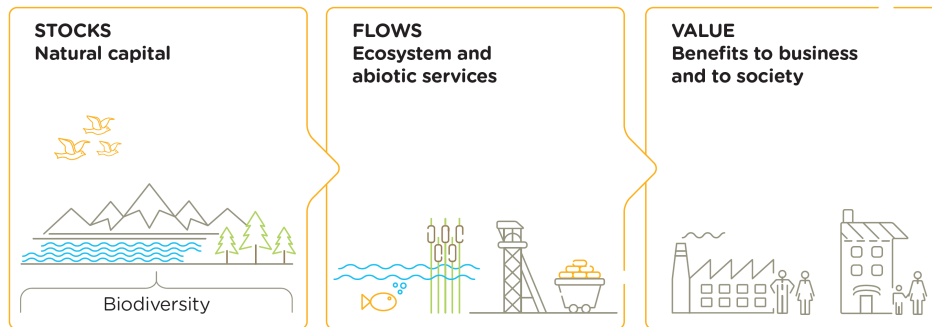


Figure 1: The term 'natural capital' is an extension of the economic notion of capital to the goods and services provided by the natural environment. The stocks, in this case, are natural capital and the flows are ecosystem and abiotic services. From <https://www.thebiodiversityconsultancy.com/our-work/our-expertise/strategy/natural-capital/>

The image above illustrates the flow of resources from natural capital to economic value.

3. METHODOLOGY

The study is based on a literature review supplemented with interviews. In order to gain further insights from ongoing activities and initiatives, as well as to engage stakeholders and experts, a webinar has been held with presentations and discussions in light of the preliminary study results, the activities of WWF, and the approach to nature risk of the Swedish Handelsbanken.

3.1 Literature review

A systematic literature review and mapping of initiatives related to nature risk has been conducted as a main activity of the project. The literature study has included academic articles and reports from agenda-setting organisations, as well as academic research studies and articles. The desk study has been systematically conducted through the following steps:

- Identification of relevant literature
- Criteria for short list of literature
- Review of selected literature

Scientific papers have been identified by preparing a list of search words in combination with boolean operators ("AND", "OR" etc.) related to nature risk, applied in SCOPUS⁵. The search words combinations function to limit the number of articles and ensure relevance, together with the number of references an article has received. An analytical framework has been developed, enabling a comparison between articles as well as overview of the insights they provide.

It was rapidly acknowledged that in several of the Nordic countries there is not an established, clear definition of nature risk, nor is it widely applied. For some of the countries in scope, no literature was found in either the native language or when using "nature risk/ nature-related risk/ nature-related financial risk". Therefore, the search scope was widened to include ecosystem risks and biodiversity risks. Search words used have been nature risk, nature-related risk, nature-related financial risk, biodiversity risk, ecosystem risk in English and native languages.

The selected articles and initiatives have informed the assessments in the present report and has provided the conceptual understanding and an illustration of the practice and use of the term and concept of nature risk.

5. Database and search engine of primarily peer-reviewed articles from more than 5000 publishers covering natural science, technology, social science and humanities

3.2 Interviews

Interviews have been carried through with Stefano Esposito, Senior Advisor on Sustainable Finance at WWF in Norway, Josefin Johansson, Head Sustainability at Handelsbanken Equity Research, and Christian Sjöland, Biodiversity and Strategy Team at Ecogain.

The interviews have been carried through by phone and based on a semi-structured interview guide.

3.3 Webinar

The webinar "Nature Risk in the Nordics" was held 20th January 2022. At the webinar, three presentations were held: i) The concept of Nature Risk: presentation of ongoing study on Nature Risk⁶, ii) A Framework for Understanding Nature-related Risk to Business⁷, and iii) Biodiversity from a financing and investment viewpoint – responsibility, risks, and options⁸. Afterwards, a discussion was facilitated on the subject of 'How can the concept of nature risk add useful aspects to environmental policy in the Nordic countries?'

Participants were from universities, governmental agencies, private sector businesses, the financial sector, and CSO's. Participants joined from Finland, Norway, Greenland, Denmark, Sweden, Iceland, Åland, Faroe Islands, Canada, UK, Brazil, Bhutan, USA, Mexico, Germany, Tunisia, Australia and India.

6. Presentation by Rikke Fischer-Bogason, PlanMiljø, and Linda Stafsing, Anthesis

7. Presentation by Stefano Esposito, Sustainable Finance Advisor at WWF Norway

8. Presentation by Josefin Johansson, Sector Head of Sustainability at Handelsbanken, Sweden

4. THE BACKGROUND HISTORY AND DEVELOPMENT OF THE TERM NATURE RISK

The use of the term nature risk or nature-related risk is still fairly new, and the understanding of some of the aspects of the concept and how to assess it is as well. It is, however, a continuation of a still changing and international discussion, and part of a research area that has evolved rapidly in recent years. This development can partly be seen as a response to the growing acknowledgement from organizations, governments, the financial sector and others, that humankind and our societies not only possess a risk to nature due to our impacts on nature, but we are fundamentally dependent on nature, its services and resources.

The following section outlines the development of nature risk as a term at global level. Identified reports using the terms 'nature risk', 'nature-related risk', 'nature-related financial risk' or provide a framework to assess these types of risk, are included in this account, and an overview of previous initiatives is presented as well.

4.1 F&C Management

Some of the earliest reports on biodiversity in relation to business and finance primarily focus on extractive sectors, especially mining, gas and oil, due to the assumption that biodiversity risk is most likely to be material for these sectors (ACBE 2000, Earthwatch Institute 2002 & Isis 2004). In 2004, F&C Management Plc (acquired by BMO Global Asset Management in 2014) published the report "Is biodiversity a material risk for companies?", presenting their survey findings based on interviews with experts and industry representatives in the UK. They concluded that biodiversity-related risks are likely to be material, and not just for extractive sectors. The paper also concluded that at the time of the survey, a majority of companies exposed to a high level of risk did not take sufficient action to address the problem. F&C Management recommended that:

- *"All companies potentially exposed to high levels of biodiversity risk should assess if these risks are material to their business.*
- *These companies should develop and publish specific policies or statements recognizing the significance of the relationship between biodiversity and their business.*
- *Having identified material risks, companies should put in place measures to manage these risks, including:*
 - *Those arising directly from activities of the company*
 - *Those arising indirectly from activities of the company, including supply chains and the impact of secondary development*
 - *Those that may threaten their business as a result of the mismanagement of biodiversity by others*
- *Management of biodiversity should be integrated with the company's pre-existing risk management systems and should set performance targets.*

- *Companies exposed or potentially exposed to high levels of biodiversity risk should report on their management of biodiversity" (F&C Management 2004)*

This is very much in line with the recommendations proposed today, almost 20 years later.

4.2 Millennium Ecosystem Assessment (MEA)

There have been several initiatives investigating the relationship between finance and nature, and how to account and estimate the goods and services nature provides. In 1998, the Millennium Ecosystem Assessment (MEA) was founded as a joint initiative by World Resources Institute, UNDP, UNEP, and the World Bank. The purpose of MEA was to estimate the current state of ecosystems on a global level, as well as to analyse the linkage between biodiversity and ecosystem functioning, and how this interrelationship affects ecosystem services (ES). In 2005, MEA published the synthesis "Ecosystems and Human Well-being: Opportunities and Challenges for Business and Industry". MEA had analysed the state of ES and found that 15 of 24 ES were degraded or used unsustainably, and only three had a positive trajectory in the foregoing 50 years. It was stated that business leaders were getting increasingly aware of the risks of biodiversity loss, and the need to respect Earth's ecological limits. 'Environmental risk' was used to refer to the risks that come from the degradation of biodiversity, ecosystems, and its services (Millennium Ecosystem Assessment 2005).

4.3 The Economics of Ecosystems and Biodiversity (TEEB)

In 2007, at the G8+5 Potsdam Meeting between ministers of environment, the ministers proposed the launch of a global analysis of the economic significance of biodiversity, and the cost of biodiversity loss versus the costs of effective conservation. Subsequently, the Economics of Ecosystems and Biodiversity (TEEB) was launched by the Government of Germany and the European Commission (TEEB 2007).

TEEB has developed several policy recommendations for mainstreaming the economics of nature and implementing it into decision-making. TEEB aims to mainstream ecosystem services into policy making and encourages to integrate biodiversity and ES into impact assessment for new legislations, agreements, and investments. Not just in environmental management policies, but across the spectrum in business, social and economic development policies: *"Biodiversity in all its dimensions – the quality, quantity and diversity of ecosystems, species, and genes – needs to be preserved not only for societal, ethical or religious reasons but also for the economic benefits it provides to present and future generations. We should aim to become a society that recognizes, measures, manages and economically rewards responsible stewardship of its natural capital."* (TEEB 2012). In their report from 2012, "TEEB for Business", the terms 'biodiversity' and ecosystem risks are mainly used, but environmental risk is also used a few times. The report does not clearly distinguish between the terms. (TEEB 2012).

4.4 The Ecosystem Services Benchmark (ESB)

In 2007, UNEP FI and Fauna & Flora launched a project together with other stakeholders: The Natural Value Initiative. The purpose of the project was to develop a tool, the Ecosystem Services Benchmarking Tool (ESB), by combining earlier initiatives. The ESB was defined to be: *"A tool for investors to assess the management of biodiversity and ecosystem services risks and opportunities in companies with an agricultural supply chain"*. They published a guidance document in 2009 together with the results of their pilot project conducted in cooperation with 31 companies from the industry in scope. One conclusion from the pilot project was that few in the finance sector considered the loss of ES and biodiversity as a business risk, but they observed that this was gradually changing. The benchmark guide highlighted what they considered to be some of the strengths of the ESB: *"The ESB focuses on impacts and dependence on biodiversity and ecosystem services associated with the production and harvesting of raw materials in companies with agricultural supply chains" and "It increases understanding of risks and opportunities associated with ecosystem services within the finance sector to enable poor performance to be identified and addressed and good performance rewarded."* (Grigg et al 2009)

These two aspects are part many of the more recent initiatives as well. The Natural Value Initiative published other papers including: "Linking shareholders and natural value: Biodiversity and ecosystem services risk management in companies with an agricultural supply chain" and "Dependency and impact on ecosystem services – unmanaged risk, unrealised opportunity: A briefing document for the food, beverage and tobacco sectors" (Grigg et al 2009).

4.5 World Economic Forum

World Economic Forum (WEF) published a briefing on biodiversity and business risks in 2010. They gave the following definition of biodiversity risk: *"In this paper we use the term 'biodiversity risk' to refer to business risks related to biodiversity in the broadest sense. This includes risks as a result of direct impacts or dependencies on biodiversity and ecosystem services, as well as regulatory, financing, reputational and supply chain risks that arise due to business's relationships with biodiversity and ecosystems"* (WEF 2010). They categorized risk as: Physical risk, regulatory and legal risk, market risk, and other risks (reputational, financing or supply chain risk). This is in line with the scope covered by nature risk when compared to the TNFD, as explained in the following section.

4.6 The Stockholm Resilience Centre

The Stockholm Resilience Centre identified nine global processes that are changing due to anthropogenic actions and developed the Planetary Boundaries concept in 2009. By 2015, four of the processes had crossed their boundaries for safe operating space due to human activity, and according to the Planetary Boundaries concept now pose high or increasing risk: Climate change, loss of biosphere integrity, land-system change, and biogeo-chemical cycles (phosphorous and nitrogen), see figure 2. Some of the processes have not yet been quantified in a way that make it possible to estimate the current state of risk (Steffen et al. 2015).

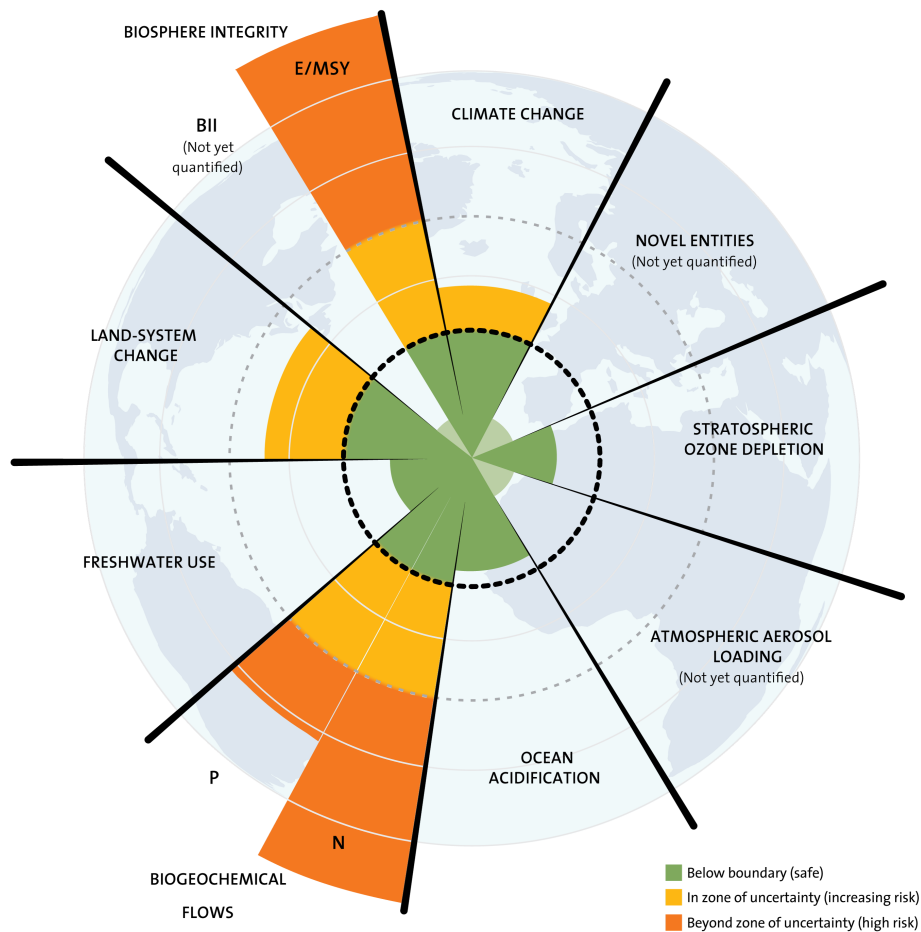


Figure 2: The Planetary Boundaries concept developed by Stockholm Resilience Centre. The figure illustrates the 9 planetary boundaries, and in what zone they currently are. (J. Lokrantz/Azote based on Steffen et al. 2015.)

4.7 The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)

In 2019, The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) published "The global assessment report on biodiversity and ecosystem services". The report concluded that: *"Nature is essential for human existence and good quality of life. Most of nature's contributions to people are not fully replaceable, and some are irreplaceable"* and that *"Nature across most of the globe has now been significantly altered by multiple human drivers, with the great majority of indicators of ecosystems and biodiversity showing rapid decline."* Moreover, it was concluded that *"Goals for conserving and sustainably using nature and achieving sustainability cannot be met by current trajectories, and goals for 2030 and beyond may only be achieved through transformative changes across economic, social, political and technological factors."* (IPBES 2019)

IPBES identified the main drivers of nature loss to be:

1. Land/sea/water use change
2. Resource exploitation
3. Climate change
4. Pollution
5. Invasive species and other

The assessment report received a lot of attention, and due to its stark prognosis, it sparked a debate that called for new initiatives and measures to incorporate nature, biodiversity and ecosystem services into risk assessments, in the same way we have seen for climate risks. The Finance Watch Report: "Making finance serve nature" from May 2019 called for a revision of our current economic paradigm if we want to avoid environmental collapse. The report outlined eight policy ideas. One was to create an international taskforce for nature-related or environmental finance using the Taskforce on Climate-related Financial Disclosures as a template (TCFD). Throughout the report, the author uses the term environmental-related risk rather than nature-related risk, but does not distinguish between these two (Suttor-Sorel, 2019). The five main drivers identified by IPBES are identical to the drivers identified to be the cause of biodiversity loss by the CBD in the Kunming declaration (CBD 2021).

4.8 Taskforce on Climate-related Disclosures and Taskforce on Nature-related Disclosures

The TCFD was established in 2017 by the Financial Stability Board (FSB), following a request from the G20 finance ministers in April 2015: *"We ask the FSB to convene public- and private sector participants to review how the financial sector can take account of climate-related issues"* (G20, 2015). The TCFD is a guidance framework that enables companies to disclose climate-related financial risks to investors, lenders and insurers. The TCFD focuses on how companies are affected by the physical effects of climate change and the expected transition to a climate-resilient and low-carbon economy. The framework was used as an outline for founding a similar initiative for nature-related risks. Taskforce for Nature-related Financial Disclosures (TNFD) was officially launched by Global Canopy, UNDP, UNEP FI and WWF in 2021. Prior to the launch, an informal working group had been formed in

2020. The working group consisted of 74 financial actors, regulators, governments and NGOs, and their recommendations for the technical scope and ongoing operation model were published at the official launch of TNFD in June 2021.

TNFD is a market-led initiative meant to service financial risk identification by providing a framework that can assist in assessing and managing dependencies and impacts on nature, thereby helping to build a more stable economy (TNFDa 2021). The purpose of TNFD is: *"... to build on lessons from implementation of the TCFD recommendations by developing an approach for disclosure on biodiversity. However, disclosure alone is not enough to integrate biodiversity into financial decision-making across portfolios. While existing efforts by the finance sector have predominantly focused on risks, there is increasing recognition of the need to go beyond this to measure the impacts of financial flows on biodiversity"* (TNFD 2021).

In 2021, two reports were published to explain the scope and the workplan for the taskforce: "Nature in scope" and "Technical Scope". In March 2022, the taskforce published the first of four framework beta versions. Corporates, finance actors and scientific experts have been invited to test the framework and provide feedback, to take into account in the later beta versions.

The framework for TNFD is structurally similar to the TCFD framework, with some modifications. It is structured around how organizations operate and the framework uses a four-pillar approach in line with TCFD:

1. Governance
2. Strategy
3. Risk management
4. Metrics and target

Figure 3: The Figure illustrates how TCFD has structured their recommendations around 4 themes, it is the same structure TNFD has adopted (from TCFD 2017).

Core Elements of Recommended Climate-Related Financial Disclosures



Governance

The organization's governance around climate-related risks and opportunities

Strategy

The actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning

Risk Management

The processes used by the organization to identify, assess, and manage climate-related risks

Metrics and Targets

The metrics and targets used to assess and manage relevant climate-related risks and opportunities

There are several reasons for aligning the TNFD structure with the TCFD. The TNFD states in the beta v0.1 report that it was done to encourage finance actors to assess both, in acknowledgement of the inseparable feedback-loops between climate and nature-related risks, one cannot be solved without solving the other. This is also in line with the requests from the sector itself, which seeks an integrated approach when assessing nature and climate risk.

Nature-related Financial Risks

Physical risks: Risks arising when natural systems are compromised, due to the impact of climatic (i.e. extremes of weather) or geologic (i.e. seismic) events or changes in ecosystem equilibria, such as soil quality or marine ecology. These can be event driven (acute), chronic or both.

Transition risks: Risks that result from a misalignment between an organisation's or investor's strategy and management and the changing regulatory and policy landscape in which it operates. Developments aimed at halting or reversing the damage to nature, such as government measures, technological breakthroughs, major changes, litigation and changing consumer preferences can all impact risks.

Systemic risks: Risks arising from the breakdown of an entire system, rather than the failure of individuals parts. Characterised by modest tipping points combining indirectly to produce large failure and cascading interactions of physical and transition risks (contagion), as one loss triggers a chain of others and stops systems from recovering their equilibrium after a shock.

In the first beta version, the TNFD provides an outline of fundamental concepts and definitions they recommend using when assessing and disclosing nature-related risks and opportunities. It entails a glossary with definitions and explanations of basic terms to ensure a scientific common foundation for the framework. This is, as they state, especially important since the terminology for nature, biodiversity and ecosystem services is not yet an incorporated part of most financiers' vocabulary in the same way as climate change terminology is today. The two major components of the first beta version are the TNFD's draft disclosure recommendations for nature-related risks and opportunities and the introduction of the LEAP process for nature-related risk and opportunity assessment. LEAP is a voluntary guidance for corporates and financial institutions on how to undertake the nature-related risk assessment, to help inform disclosure decisions internally in line with the TNFD's draft disclosure recommendations. LEAP stands for:

- **Locate** your interface with nature;
- **Evaluate** your dependencies and impacts;
- **Assess** your risks and opportunities; and
- **Prepare** to respond to nature-related risks and opportunities and report.

Despite the similarities in the risk assessment approach there are several differences between the TNFD and the TCFD. The TCFD operates with two major types of risk, i) transitional and ii) physical (TCFD, 2017). The TNFD operates with three types to help account for the complexities of nature risks, i) physical, ii) transitional and iii) systemic (can refer to both the ecosystem or the economic system).

Another major difference between the TCFD and the TNFD is that TCFD accounts for impacts of climate change on finance and business, while TNFD accounts for both the risk arising due to business and finance's impact on nature and the risks that arise from their dependencies on nature. Furthermore, nature-related risk is location specific, in a way that climate risk is not. To account for this, the TNFD states in the first beta report: *"A corporate or financial institution should undertake a location-based assessment of its dependencies on nature and nature impacts in order to identify its risks and opportunities, recognising that dependencies and impacts occur in specific locations"*. There is a need for organisations to map the geographical locations of their assets and activities (both direct and across the value chain) and the ecosystems wherein they are located. This requires location-specific data.

The fact that companies are not only vulnerable to environmental risks, but also contribute to the emergence of these environmental risks through their activities, can be referred to as double materiality (Oman and Svartzman, 2021), in the beta v0.1 version the taskforce present their current take on materiality.

"(..) In line with the gradual convergence in the perspective on materiality in the market, the TNFD framework recognises that consideration of both nature-related dependencies and impacts is required for a comprehensive assessment of risks and opportunities, and that impacts on nature become relevant to enterprise value when assessed over a future time horizon (e.g. through scenario analysis)." The convergence, is in reference to a previous tradition to consider the types of materiality to be mutually exclusive; single materiality, double materiality and dynamic, however this is changing according to the report. The TNFD's viewpoint will be elaborated in later beta versions and they have earlier stated on their website that: *"The TNFD will adopt the double materiality concept and include disclosure recommendations for both impacts and dependencies on nature. This is a departure from the TCFD, which only requires financial institutions to disclose dependency-related risks."* (TNFDc 2021)

Materiality

Single materiality: Financial materiality: Outside-in perspective only considers the impacts (nature-related or climate-related) on the company or institution. TCFD only considers this type of materiality (EU Technical Expert Group on Sustainable Finance 2019)

Impact materiality/environmental & social materiality: Inside-out perspective, considers company impact on climate and nature (EC 2019)

Double materiality: It is not only the nature-related impacts that can be material for a company, but also a company's impacts on nature - The term was first introduced by the EC as part of the 2019 Non-Binding Guidelines on Non-financial reporting update.

Dynamic materiality: Impact materiality can be considered as a 'pre-financial' materiality, since they may become material for financial reporting purposes over time – first presented in 2020 by WEF.

Another challenge for TNFD compared to TCFD is the absence of established indicators. For climate risks, tonnes of CO₂-metrics or the global mean average temperature change are used to measure overall outcomes (Kedward et al, 2021). The aim of the TNFD is not to develop an entire new standard, but rather to implement the outputs from TNFD into already existing frameworks and standards. The TNFD seeks to align with CBD's global targets of "no net loss by 2030 and net gain by 2050" (TNFDa 2021).

The TNFD generally applies a broader definition of the term "risks and opportunities" than for climate risk and suggests the term: "nature-related risks and opportunities" to refer to the connection between nature and the actions of an organization both on the short and the long term. The three upcoming beta versions will elaborate and focus on:

- Sector specific guidance
- Climate-nature nexus
- Scenarios and timeframes
- Defining the term nature-positive – the TNFD asks for feedback on how to define the term in subsequent beta versions of the framework

Currently, there are no existing nature-related scenarios. The taskforce will establish a working group to address this specifically. In relation to scenarios addressing the climate-nature nexus, the taskforce will also explore potentials for an integrated approach that consider both climate change, nature loss and a potential global target for nature in the forthcoming Global Biodiversity Frame. Other organisations such as NGFS and IPBES are currently developing initiatives to address the lack of nature-related scenarios. IPBES has already begun working on nature-related scenarios. IPBES has also published a report together with the IPCC in order to address the nature-climate nexus.

The TNFD is expected to publish their final framework in 2023.

Table 1: Frameworks and indicators for understanding and measuring nature-related financial risks compared to climate-related financial risks (Adapted from "Managing nature-related financial risks: a precautionary policy approach for central banks and financial supervisors", 2020)

Frameworks and indicators	Climate-related risks	Nature-related risks
Clear, quantifiable goal	The 2015 Paris Agreement aims at limiting global average temperature increases since the industrial revolution to below 2°C and ideally below 1.5°C.	There are no internationally agreed headline targets for resolving other environmental threats, with the exception of the Aichi Biodiversity Targets, and none of the targets were met by their 2020 deadline. At COP 15, 2021, a new target was announced: "no net loss by 2030 and net gain by 2050", it is expected adopted in 2022.
Established scientific metrics and indicators	The tonnes of CO2 equivalent metric is well-established for measuring the drivers of climate change, while global mean average temperature change is the single indicator for measuring progress. There are established frameworks for reporting and recording CO2 emissions from human activities.	Multiple metrics are required to track multiple problems across different time and spatial scales, and types of local environments. Drivers are multi-dimensional, meaning there is no single indicator for tracking human impacts (like emissions). For threats such as biodiversity loss, there is no scientific consensus on the best way to measure trends or progress (Mace et al. 2018).
Acknowledgement of financial system within international agreement(s)	The Paris Agreement article 2.1 sets the expectation to align financial flows with the headline goal.	There are various conventions/agreements, mostly focused on biodiversity, but currently none explicitly expressing the need for public or private finance flows to be aligned with environmental protection, and the need to transition business models.
Materiality of financial risks	Climate risks are widely acknowledged to be material, including at the systemic level, and are well-established in the academic literature.	The concept is less established than climate risk. Awareness is growing, but there is limited academic research empirically testing materiality of the financial risks associated with broader environmental threats.
Financial tools and metrics	Frameworks for disclosing financial risks such as the TCFD. There are a variety of portfolio tools, including Climate VaR, Carbon Earning at Risk, and Paris Agreement Capital Transition Assessment (PACTA).	There are no standardised or widely used tools for measuring financial impacts or risks, though multiple approaches are under development (like the TNFD), the TNFD Beta version 0.1 is already published. Numerous others are also available such as the Global Biodiversity Score by CDC Biodiversité and the Biodiversity Footprint for Financial Institutions by ASN Bank. A global baseline for sustainability standards are under development by the ISSB ⁹ .
Central bank and supervisory initiatives	Central banks (especially NGFS members) are increasingly establishing infrastructure for climate stress testing.	The NGFS is beginning to explore nature-related risks from a supervisory perspective. The Dutch central bank, DNB, has undertaken a preliminary exercise to quantify financial exposures resulting from biodiversity loss (DNB 2020).
Financial opportunities	The opportunities posed by the transition (new sectors and technologies) as a solution to climate change are better understood by investors. There has been an increase in new financial instruments, such as green bonds, though concerns remain about the robustness of standards and greenwashing.	Critical questions remain as to how nature can become a new sector of opportunity. Many Ecosystem Services are public goods, which calls into question the feasibility and suitability of monetising such assets for financial instruments. Additionally, environmental protection often requires minimising human claims upon nature, which implies a reduction of economic activity as known today.

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9. The International Sustainability Standards Board (ISSB) founded by the IFRS foundation was officially launched at COP26 in November 2021. In March 2022 they published "Illustrative Guidance on (Draft) IFRS S1 General Requirements for Disclosure of Sustainability-related Financial Information". In this draft version they comment on biodiversity related risk and they refer to the already published CDSB framework for biodiversity and water related risks and opportunities and welcome feedback in this first draft for further development of their standards.

4.9 World Economic Forum

The World Economic Forum (WEF) concluded in their global risk report for 2019 that destruction of ecosystems and biodiversity due to environmental disasters can lead to disruptions of supply chains and business operations. Interruptions to production and distribution of goods and services have surged by 29% since 2012 due to nature risks (WEF 2019).

In WEF's Global Risk Report for 2020, the five most likely long-term risks were all environmental:

1. Extreme weather
2. Climate action failure
3. Natural disaster
4. Biodiversity loss
5. Human-made environmental disasters

In 2020, WEF published "The New Nature Economy Series", aimed at creating a public momentum before COP15. However, due to COVID-19, COP15 was postponed until 2021 (CISL 2020). COP15 took place in China in the autumn of 2021, and the development of the post-2020 biodiversity framework is scheduled to be done in 2022 during the second phase of the convention (CBD 2021). An adoption of a new framework at COP15 has the potential to initiate stricter nature policy measures incorporated into national legislation.

4.10 United Nations Environment Programme (UNEP) & collaborators

United Nations Environment Programme (UNEP) and Global Canopy posted a report in 2020 called "Beyond 'business as usual': Biodiversity targets finance. Managing biodiversity risks across business sectors". The publication was part of a research project to enhance ENCORE to enable financial institutions to align their portfolios with biodiversity targets. *"All businesses depend and impact on biodiversity, the ecosystem services it inherently underpins, and other natural capital assets either directly through their operations or indirectly through their supply chains"*. The paper provides a practical guide for how financial institutions can contribute to achieving CBD's post-2020 global biodiversity framework by creating SMART (Specific, Measurable, Ambitious, Realistic and Time-bound) biodiversity targets (UNEP, 2020). In 2021, UNEP Finance and United Nations Development Programme (UNDP) published the report "Reporting on Nature-related Risks, Impacts and Dependencies". They consider the biggest challenge to be: *"The materiality of nature-related risks is often invisible because the realized or potential costs, associated with nature degradation or loss, are transferred onto consumers, citizens, society at large or other third-parties, rather than built into the balance sheets and income statements of companies. Such costs are considered externalities to the economy under the current regulatory and fiscal systems. Improved understanding of the financial materiality, whilst defining standards, data and metrics to measure nature-related dependencies and risks is necessary to address this challenge."* The document was prepared for the G20 sustainable finance working group meeting. It is argued that it will be most effective to prioritize the sectors with

the highest impacts and dependencies on nature. This might be more doable for reporting entities, instead of attempting doing all at once. Furthermore, financial flows that invest in countries with vulnerable high value biodiversity should be prioritized before others. Public finance with connection to private finances should also be part of the disclosure. The paper from 2021 uses the term nature-related risk or nature-related financial risks, and elaborates on the TNFD framework (UNEP FI 2021).

4.11 Tools and Framework with relevance for nature risk assessment

Title	Developed by	Description	Relevance	Available
ENCORE	Natural Capital Finance Alliance	The ENCORE tool visualises economic nature dependency and the risks for businesses arising from environmental change. The database covers 167 economic sectors and 21 Ecosystem Services	Cross-sectoral	Yes
The Nature of Risk	WWF	Report and framework aiming to catalyse the incorporation of nature-related risks into private-sector decisions in a manner that facilitates sustainable development at all scales	Business sector	Yes
IBAT	Birdlife International, Conservation International, IUCN, UNEP-WCMC	Gives access to data and information on biodiversity, by combining and giving access to geospatial data from three global databases: Key Biodiversity Areas, Protected Areas and The IUCN Red List of Threatened species	Cross-sectoral	Yes
Natural Capital Protocol	Natural Capital Coalition	Decision-making framework helping business managers incorporate natural capital into internal decision making (Not a formal reporting framework)	Mainly the business sector	Yes
Science-based targets for nature	The Science Based Targets Network	The framework is going to provide companies with guidelines for how to set, measure and achieve company-specific targets that reduces the risks of biodiversity and nature loss	Mainly business and finance sectors	Under development
SEEA	United Nations	System of Environmental-Economic Accounting is a framework that integrates environmental and economic data, and is aligned with the System of National Accounts. There are different frameworks: SEEA-CF and SEEA-EEA	Cross-sectoral	Yes
STAR	IUCN and Birdlife International	Species threat abatement and restoration metric, a tool to quantify how different actions at a given location contributes to global targets on species extinction, facilitates a way to prioritize and setting targets	Cross-sectoral	Yes
Corporate Ecosystem Services Review	World Resources Institute	Guidelines for identifying business risks and opportunities arising from ecosystem change	Business and finance sectors	Yes

5. USE AND APPLICATION OF NATURE RISK WITHIN CIVIL SOCIETY ORGANIZATIONS AND ACADEMIA

Civil society organizations (CSOs) can play a pivotal role in developing and promoting new approaches to framing or managing major global challenges within the sustainability agenda. CSOs can provide critical attention and can also be a source of support for, and hold accountable, governments in their efforts to integrate sustainability in planning and policy-making processes, as well as private sector companies striving to act more sustainably.

In the process of developing and disseminating nature risk, CSOs have been among the frontrunners. The main organizations and initiatives are presented in this section: WWF, Network for Greening the Financial System, and TNFD.

5.1 WWF and collaborators

World Wide Fund for Nature (WWF) actively uses the term nature risk and was one of the first initiators that called for developing a framework to better assess nature risk and to make nature risk an integrated part of risk assessment.

WWF has published, authored and co-authored reports on the topic of nature risk. In WWF's report "The Nature of Risk: A Framework for Understanding Nature-Related Risk to business" they make the following distinctions: *"This report uses the term nature-related risk, while other use environmental risk and biodiversity risk. We understand environmental risk to be the over-arching category capturing nature-related and climate change-related risks, and biodiversity risk can be understood as a subset of nature-related risks"*. They define nature-related risk as: *"Nature-Related Risk (NRR) – refers to risks which arise when a change in a business' impacts or dependencies on nature becomes a threat to that business's operations and profitability due to factors of exposure and vulnerability."* (WWF 2019). According to the report, actions mitigating nature loss have been fragmented. It is concluded that this is partly because of the multiple competing guidelines and frameworks available for understanding the financial materiality of nature, and due to the fact that a clear vision for how to proceed is lacking.

Other reports from WWF on the topic of nature risk are "Naturrisiko: Tap av naturmangfold som finansiell risiko" published by the Norwegian department of WWF that also elaborates on the risks faced by the financial sector as a result of biodiversity and nature loss, and "Nature is too big to fail, Biodiversity: the next frontier in financial risk management" from January 2020. The latter uses the terms biodiversity risk/ biodiversity-related risk. The report suggests using the TCFD

framework as a template for establishing a nature-related taskforce. In line with this suggestion, Global Canopy published "The case for a task-force on nature-related financial disclosures" together with Vivid Economics in September 2020. The report stated that: *"The deterioration of nature, and society's response to it, creates systemic and material risks to financial institutions – risks that are still largely not understood"* (Global Canopy 2020).

In 2021, WWF was one of the founding organizations of TNFD.

5.2 The Network for Greening the Financial System

Eight central banks and supervisors established the Network for Greening the Financial System (NGFS) at the "One Planet Summit" in Paris in 2017. Today, the network has 102 members. A review of their publications shows that the main focus has been climate-related financial risks in the first years of publishing. Later, the scope has broadened to include other types of environmental risks. In their first progress report from 2018, it is stated that NGFS members have acknowledged that climate-related risks are financial risks, and that some of the NGFS members have extended their analyses to include environmental risks as well as they consider environmental risks a source of financial risks in line with climate change. They recommend using environmental risk assessment (ERA) to assess these types of risks (NGFS, 2018).

In 2019, the reports of NGFS distinguish between climate-related risks and environmental-related risks. The report "A call for action: Climate change as a source of financial risk" divides environmental risks into i) credit, ii) market, iii) operational, and iv) legal risks. The risks are stated in the report to be *"posed by the exposure of financial firms and/or the financial sector to activities that might cause or be affected by environmental degradation (air pollution, water pollution, land contamination, reduced biodiversity, deforestation), and actions taken to address these environmental challenges"*. For comparison, climate-related risks are defined in the report as: *"(...) risks posed by the exposure of financial firms and/or the financial sector to physical or transition risks caused by or related to climate change (such as damage caused by extreme weather events or a decline of asset value in carbon-intensive sectors)"*. The scope of the report is climate change, but it is stated that environmental risks will become a larger part of the scope in the future.

In 2020, NGFS published the report: "Overview of Environmental Risk Analysis by Financial Institutions". The report presents the methodologies for environmental risk assessment that are currently available and applicable for the financial sector. In conclusion, the report calls for further initiatives to close the data and methodology gaps. NGFS also published "Case Studies of Environmental Risk Analysis Methodologies" in 2020. They present the following definition for environment-related risks: *"Environment-related risks refer to risks (credit, market, operational and legal risks, etc.) posed by the exposure of financial firms and/or the financial sector to activities that may potentially cause or be affected by environmental degradation (such as air pollution, water pollution and scarcity of fresh water, land contamination, reduced biodiversity and deforestation) and actions to address these environmental challenges. Climate-related risks refer to risks posed by the exposure of financial firms and/or the financial sector to physical or transition risks caused by*

or related to climate change (such as damage caused by extreme weather events or a decline in the asset values of carbon intensive sectors)." (NGFS 2021a). The NGFS considers environment a category of risks; climate-related risks are a subset of this category.

In May 2021, NGFS used the phrase *"environmental and nature-based risks"*, but only as a side note in their report *"Progress report bridging the data gap"*. In their most recent report from October 2021, environmental risk is still the main term in use, but nature-related risks also appear. TNFD is mentioned several times as a framework under development and the report presents TNFD's definition: *"Nature-related financial risks and opportunities are understood as all financial risks and opportunities to the entity as a result of impacts and/or dependencies on nature"* (TNFDa, 2021).

The report does not elaborate on whether NGFS considers there to be a difference between environmental-related risk and nature-related risk. Based on their approach to the risks it seems to be considered the same. However, in another report published in 2021, they make further distinctions between the different terminology in use. In the report *"Biodiversity and financial stability building: the case for action"* they apply the term biodiversity-related financial risks, but also comment on the use of nature-related financial risks: *"This report uses the term biodiversity-related financial risks but notes there is a recent trend within the academic literature and within policy circles to favour the use of the term nature-related financial risks when considering the financial risks associated with economic dependencies and impacts on nature. We see these risks as a subset of environment-related financial risks, with strong interconnections with climate-related financial risks."* (NGFS 2021b). This report was the result from a study group created by NGFS and INSPIRE on biodiversity and financial stability. The report divides biodiversity-related risks in physical and transitional risks. Another paper published earlier by the study group: *"Biodiversity and financial stability: exploring the case for action"*, comments on double materiality, which they consider to be a very important factor for approaching to biodiversity-related financial risks. Both papers comment on TNFD.

In 2022, NGFS published the final report of the NGFS-INSPIRE Study Group: *"Central banking and supervision in the biosphere: An agenda for action on biodiversity loss, financial risk and system stability"*. The report provides guidance for central banks and financial supervisors on how to address biodiversity loss. Furthermore, it gives recommendations on how to conduct assessments of impact and dependency on nature, and what scenario-relevant models that can be used in scenario-analysis and stress tests. The report also underlines the importance of financial institutions and banks developing better skills and capacity to address nature-related financial risks (NGFSa 2022).

The NGFS also published a statement on Nature-Related Financial risks in 2022, stating that even though governments bear the main responsibility for halting biodiversity loss, the financial sector still has an important role to play. They say that: *"the NGFS is of the view that nature-related risks, including those associated with biodiversity loss, could have significant macroeconomic implications, and that failure to account for, mitigate and adapt to these implications is a source of risks for individual financial institutions as well as for financial stability"*. At the end of the statement, NGFS announced that they will create a task force to mainstream the consideration of nature-related financial risks across its activities (NGFSb 2022).

5.3 Science Based Target Network

The Science Based Target Network (SBTN) is part of the Global Commons' Alliance. The SBTN aims at setting science-based targets for Earth's systems by 2022 by getting businesses to map and commit to reduction targets for their biodiversity footprint. This is inspired by SBTN's work in recent years, establishing international standards for GHG-reductions in alignment with the Paris-agreement. By building on experiences from establishing and implementing targets for climate change, SBTN aims at doing the same for the global commons of water, land, biodiversity and ocean. On their webpage, SBTN describes that part of their mission is to: *"Work to embed adoption of science-based targets within capital markets by partnering with policy makers, financial institutions and service providers such as benchmarkers and credit agencies."* (SBTN 2021). The targets will be aligned with global initiatives such as UN's SDGs. To ensure that companies committing to science-based targets for the environment deliver progress, SBTN will develop a framework that companies can use.

5.4 Nature Risk in Academia

Since the first call to establish nature risk as a concept equalling climate risk, a few academic studies have been conducted. 'The economics of biodiversity: the Dasgupta review' by Partha Dasgupta is one of the most comprehensive studies published so far. The report was commissioned by the department of the government of the United Kingdom. The report is a synthesis of earlier published reports by the author and new work. One chapter is dedicated to NRRF and TNFD specifically. The author argues that biodiversity loss results in unstable ecosystems which affect ecosystem services negatively and lead to negative financial outcomes. He uses nature-related risk as the financial side to biodiversity loss and uses the term biodiversity risk throughout the report. He criticises the tradition of compartmentalizing nature-related risks, when assessed at all, and calls for a joint risk assessment of the biosphere, to mitigate negative feedback loops. He operates with CBD's definitions of nature and biodiversity (see glossary). He concludes that our unsustainable management of natural resources and other ecosystem services poses an "extreme risk", and our demands are currently bigger than nature's ability to supply them. He also states that a new measure of economic wealth is needed instead of GDP, since GDP does not take natural capital into account, and that both market-based and legislative approaches are needed to solve the crisis, and he underlines the importance of the financial system: *"A significant portion of the responsibility for helping us to shift course will fall on the global financial system"* (Dasgupta, 2021).

"Handbook for nature-related financial risks: Key concepts and a framework for identification" was published by University of Cambridge Institute for Sustainability Leadership (CISL) in 2021. The handbook is based on the Dasgupta review, and is a practical guide targeting financial actors.

The Institute for Innovation and Public Purpose at University College London aims to rethink how public value is created, nurtured and evaluated in order to achieve sustainable economic growth (UCL, 2020), and they have published several papers

concerning nature-related risks. In 2020 they published: "Managing nature-related financial risks: a precautionary policy approach for central banks and financial supervisors". The report concludes: *"Businesses across sectors and regions are embedded within the environment via their impacts and dependencies upon the natural world. Through lending, advisory and investing activities, financial institutions are exposed to business dependencies and are also responsible for facilitating negative impacts. Environmental risks may be amplified by the financial system, presenting potentially systemic threats to financial and economic stability"* and: *"We argue that market-fixing approaches, such as the recently announced Taskforce for Nature-related Financial Disclosures (TNFD), are also unsuitable for managing the systemic risks posed by environmental breakdown. As a series of interconnected, non-linear threats involving the interaction of multiple environmental and socioeconomic sub-systems, environmental breakdown is an even more complex set of phenomena than climate change and it poses extraordinary challenges for financial risk modelling. It is not clear that quantitative methodologies can be sufficiently advanced within the limited time window left for transformative action"*.

The paper both uses the term nature-related risks, environmental risks and nature-related financial risk. There is no clear distinction between nature-related risks and environmental risks, they are used interchangeably. In 2021 they published "Quantitative easing and nature loss: Exploring nature-related financial risks and impacts in the European Central Bank's (ECB) corporate bond portfolio". The paper uses the ENCORE framework (Exploring Natural Capital Opportunities Risks and Exposures) to map financial dependencies and impacts on nature. They examine the European Central Bank's corporate bond purchase operations, both first-order impacts and dependencies. To account for this, they analyse the case of deforestation. The dependencies and impacts from deforestation which might cascade through the global supply chain and impact ECB, is assessed. The report states: *"Businesses are imbedded within the environment via their dependencies and impacts upon the resources provided by nature"* and argues that due to the high uncertainty and complicated impact pattern a precautionary approach is advisable. Furthermore, it is suggested that voluntary frameworks such as TNFD, or similar frameworks should be made obligatory, especially when considering that there is an imminent risk of reaching ecological tipping points, that can lead to irreversible changes. They mainly use the term nature-related financial risk (Kedward et al, 2021).

5.5 A view across the development of Nature Risk

Nature risk is, as mentioned, widely modelled after the financial concept of climate risk. Defining the risk anew, and modelled after an already established concept (climate risk), can be seen as an attempt to make the concept more visible for the targeted sector, here being the business and finance sector also by distinguishing it from earlier approaches to environmental, biodiversity and ecosystem risk. The different terms have both been used simultaneously and interchangeably, not always with an explicit definition and also in other contexts than risk assessments for business and finance. However, as the literature study shows, the scope of these concepts is largely similar and the risks arise from the same drivers of nature/

biodiversity loss.

Furthermore, as the TNFD describes in their first beta version, the terminology and interrelationships between biodiversity, ecosystems and ecosystem services might be a new field of knowledge for investors, therefore it might make sense to 'relaunch' the risk under a new name, by choosing nature all the other concepts are included by default as being subsets of nature.

The primary focus in nature risk is in a financial context. There are especially two reasons why the financial sector is so important in addressing nature risks. Firstly, numerous financial actors are exposed to nature risks through loans and investments to the business sector. Secondly, the financial sector can play a pivotal role in reducing nature risk by influencing economic trajectories and catalysing behavioural changes for their clients. However, biodiversity is often overlooked compared to climate change and other environmental topics. The Climate Disclosure Standards Board (CDSB) reviewed 50 European companies' reporting in 2020, showing that 46% provided some information on biodiversity, whereas all provided information on climate change (CDSB 2021).

6. USE OF THE TERM NATURE RISK IN ENVIRONMENTAL POLICIES

The financial sector and CSOs have been ahead of the political sector in terms of initiatives for nature risk, and both call for the political sector to step up and provide better guidance within the nature risk agenda. For example, the Business for Nature Coalition calls for more political leadership in addressing the nature crisis and reverse nature loss¹⁰. Together with 200 companies, Business for Nature have developed five policy recommendations, and the general recommendation to: *"Align policy frameworks and transform economic and financial systems to accelerate business action"* (Business for Nature 2022). They urge to include their recommendations in the Post-2020 Global Biodiversity Framework¹¹.

According to the 2021 'The Economics of Biodiversity: The Dasgupta Review' several of the financial actors do not feel equipped to guide their clients in nature risk assessments, and feel there is a lack of clarity and available data that hinder proper assessments. The financial actors are hesitant to develop the assessments further without more guidance from the political sector, seeing that many of the most ambitious initiatives are not legislative, but only suggestive (Dasgupta 2021).

6.1 OECD

It has not been possible to identify any reports on nature risk for environmental policies or any examples of countries applying the term in their environmental policies, but several reports concerning biodiversity risks were found. The OECD published the report "Biodiversity, Natural Capital and the economy: A policy guide for Finance, Economic and Environment ministers", and the report generally uses biodiversity risk and nature-related risks specifically in relation to the financial sector. The report offers many recommendations for what can be done from a political side. Several of the instruments already exists, this was also pointed out by IPBES, for instance:

- Biodiversity should be assessed coherently and implemented in all parts of political planning e.g. national risk assessments, economic plans, development strategies.
- Make it common practice to assess and ensure alignment of different policy objectives by inter-ministerial coordination. This might also help to enhance synergies between the biodiversity agenda and other sustainable development

10. Business for Nature: <https://www.businessfornature.org/recommendations>

11. The post-2020 global biodiversity framework builds on the Strategic Plan for Biodiversity 2011-2020 and sets out an ambitious plan to implement broad-based action to bring about a transformation in society's relationship with biodiversity.

strategies.

- Use regulatory, economic, and information instruments to internalise the external costs by applying pollution standards, taxes, biodiversity offsets and ecolabeling:
- Increase the use of economic instruments available such as taxes, fees, payments for ecosystem services
- Remove or alter budgetary and fiscal support to environmentally harmful sectors. Countries ought to conduct national assessments identifying their public subsidies that are harmful to nature.
- Improve the sustainability and traceability of supply chains.

(OECD 2021)

The overall conclusion is that even though the business and finance sectors depend on nature, biodiversity and ecosystem services for profitability, and their activities often have adverse impacts on nature, these dependencies and impacts are largely uncompensated for by the responsible sectors. Biodiversity risks are not just relevant for environment ministers, but just as crucial for economy and finance ministers. The report also concludes, in line with others, the necessity for aligning relevant frameworks and goals on an intergovernmental level, and to develop consistent and cross-country comparable indicators. The OECD believes the TNFD initiative can contribute to obtaining this (OECD 2021).

6.2 Article 29 of the French law on Energy and Climate

As the first country in the world, France has made it obligatory to disclose risks related to biodiversity. A new decree under article 29 of the French law on Energy and Climate makes it mandatory for French financial institutions (including banks, investors and insurers) to disclose biodiversity related risks as well as climate related risks and impacts. The new decree adopts the concept of double materiality, so financial institutions shall disclose both how their financial activities depend on nature (and climate), but also how their activities impact nature (and climate). Furthermore, the financial institutions also have to disclose strategies for reducing biodiversity impacts and align with international biodiversity goals (TNFD 2022).

6.3 Initiatives and policies from the European Union.

A number of EU regulations or amendments to regulations regarding "sustainability risks" have recently (2021) been adopted by the European Commission (EC) as a part of the European Green Deal (EC 2021). Sustainability risks, in this context, encompasses both environmental, social and governance aspects, and the inclusion of this term in policy can therefore cover a wider span than inclusion of the term nature risk. Mentioned regulations relate to the finance and insurance sector and are supposed to promote sustainable activities in these sectors.

Other risk terms that are closely related to nature risk are included in EU policy. The new Biodiversity Strategy from the EU partly incorporates the terms biodiversity risk

and land-use change risk, especially related to energy production from biobased sources (EC 2020). The European Commission is currently working to assess the supply and demand of biomass globally and in the EU to conclude on the sustainability, biodiversity and climate risk. Also, the EC has reviewed data on biofuels that bring "high indirect land-use risk", meaning that the risk of contributing to negative land-use change such as deforestation or draining of wetlands is especially relevant.

In EU's nature conservation policy, which mainly consists of the Habitats Directive and the Birds Directive, nature risk is not included as a concept (Directive 92/43/EEC, Directive 2009/147/EC). Meanwhile, the purpose of the regulations is to conserve threatened habitats and species. It can therefore be said that these regulations support the lessening of nature risk at a European level by outlining the legal requirements for conservation of nature areas and species within the EU.

There are also other examples of EU policy that relate to the concept of nature risk, although the term nature risk is not used explicitly in the policy documents. One example of this can be the Environmental Impact Assessment Directive, which outlines the requirements for assessing the impacts of environmental effects from private or public projects (Directive 2011/92/EU). For example, use of natural resources such as land, soil and biodiversity are assessed, as well as potential adverse effects such as pollution and disturbance of habitats. The actor carrying out the project is responsible for avoiding, preventing, reducing, and offsetting any negative effects on the environment, which can be interpreted as decreasing nature risk for the actor itself and other affected stakeholders.

The European Food Safety Authority (EFSA) has a framework for estimating environmental risk caused by activities in the food sector, for example through spread of plant species, introduction of substances in food and feed production or use of GMO (EFSA 2021). EFSA are responsible for carrying out the risk assessment based on EU legislation, including several regulations and directives outlining the food sector. Environmental risk still covers a wider scope than nature risk, but many factors are assessed that are relevant for both terms. For some areas, the EFSA also includes risk management options in their assessment, providing guidance on how to mitigate the environmental risk of different food safety related issues.

Another relevant initiative from the EU is the new taxonomy regulation (Regulation 2020/852). It will provide a common classification framework that establishes which objectives economic activities can contribute to, and when the contribution is considered sustainable. The six objectives are:

- a. Climate change mitigation
- b. Climate change adaptation
- c. The sustainable use and protection of water and marine resources
- d. The transition to a circular economy
- e. Pollution prevention and control
- f. The protection and restoration of biodiversity and ecosystems

The economic activity is qualified as environmentally sustainable when it:

- a. Contributes substantially to one or more of the six environmental objectives

- b. Does not significantly harm any of the six environmental objectives
- c. Is carried out in compliance with the minimum safeguards for human rights and labour rights
- d. Complies with the technical screening criteria that have been established by the commission

The taxonomy regulation is going to align what member states and other EEA countries consider as sustainable, since there currently is a lot of variation. The taxonomy regulation is also meant to help finance actors avoid funding 'green washing' activities and increase sustainable investments. The first two objectives came into force at the beginning of 2022, and the last four are to follow in 2023 (EC 2020).

All of the above indicates that big shifts are underway in the regulative regime both in Europe with the new taxonomy regulation and globally with initiatives such as the SDG's, and the expected results from the CBD. These initiatives are likely to increase transitional risks for many companies.

The focus from an international perspective has so far been to incorporate the nature risk concept in financial risk assessments and disclosures. Governments' policy actions are just as important and can take a different approach aiming at mitigating nature risks. There are numerous interventions that governments can apply to tackle nature loss. When governments or transnational organisations develop regulation to prevent nature loss and the physical risks that arise from nature loss, it will increase the transitional risks faced by the finance and business sector. This is important to be aware of, however, to reduce physical risk in the long run, it is necessary to increase transitional risks in the short run.

7. RELEVANCE OF THE TERM NATURE RISK IN FINANCE AND BUSINESS SECTOR APPROACHES

This chapter assesses the relevance of the nature risk concept for the finance and business sectors. Since the nature-related risk concept mainly has been developed in a financial context, some of the sources covered in the historical account, chapter 5, are also cited in this section in order to make it possible to read it independently.

Nature risk is the risk posed on businesses and organisations from degradation of nature's resources and supporting mechanisms in providing ecosystem services, and the transitional risks arising from changing regulations, consumer preferences etc. Within this context, organisations' impact on nature is also included in the term. Today's world economy is strongly dependent on nature and its provision of ecosystem services, including physical natural resources (provisional) as well as the supporting, regulating and cultural services. According to World Economic Forum (2020) more than half of the world's economy is dependent on nature. A policy report from IIPP (2021) suggests that over 40% of the corporate bond portfolio of the European Central Bank is potentially exposed to high or very high dependencies upon ecosystem services and that over 70% of the portfolio in the Corporate Sector Purchase Program (CPPA) contribute to key drivers of biodiversity loss.

Overexploitation of natural resources and other human activities have resulted in a major loss of biodiversity and nature risk has become a more central part of the long-term risk assessments for organisations and governments. In a handbook for nature-related financial risks, the authors argue that a business' dependence on ecosystem services imposes a vulnerability to investors, lenders, insurers, governments, companies and, by extension, a source for financial instability (University of Cambridge Institute for Sustainability Leadership (CISL), 2021).

Global Canopy (2020) defines nature risk in relation to business as *"the risk of loss of value, profits or revenue on an investment or business venture that stems from the investment's relationship to nature, including biodiversity and natural capital assets."* In addition, they state that *"currently, capital is systematically misallocated because financial decision-making fails to account for material nature-related financial risks."* The deterioration of natural capital can potentially have serious implications for financial stability from a macro-level perspective (UNDP, 2021). The COVID-19 pandemic has become a great reminder of the potential magnitude of nature-related systemic risks and the subsequent impacts on financial markets.

In Global Canopy (2020), three main types of nature-related risks are presented: i) Physical, ii) transitional, and iii) systemic risks. The physical risks include risks to operations and commodity, supply chains, real estate, and business value risk as well as resilience against natural disasters. Transitional risks relate to regulatory, market, reputational and legal liability risks. It includes risks of reporting obligations,

regulations that interfere with business-as-usual, and risks of increased pricing of nature. The market risks relate to shifts in supply and demand due to change of social norms and emerging products, services, business models and technologies with nature-neutral focus. Reputational risk relates to shifting stakeholder sentiments and sector stigmatization. Legal liability risks relate to legal actions against companies for environmental damage and, for example, removal of licenses. The systemic risk is an overall category that relates to intrinsic risk for our global institutions, infrastructure, and health, for example pandemic outbreaks and war. It covers all the other risk categories and can be viewed as the general risk on society, emerging from impacts of nature- and biodiversity loss.

One of the earliest studies identified related to nature risk was a study conducted by KPMG, Fauna and Flora International and United Nations Environmental Programme Finance Initiative in 2011, "*Sustainable Insight – The Nature of Ecosystem Service Risks for Business*". The study lays out three different aspects of risks and why it is important for the business sector to assess these risks. The risks are the same as illustrated in figure 4 to the right. The report explores to what extent companies are prepared for and reflect on the challenges that corporations face regarding biodiversity and ecosystem services. It also discusses and analyses the risks that corporations are exposed to as well as how corporations respond to them. This report has most likely had impact on later literature and research (KPMG, 2011).

One of the most comprehensive studies of nature risk is "Indebted to nature: Exploring biodiversity risks for the Dutch financial sector" from 2019. The study was conducted by De Nederlandsche Bank in collaboration with Netherlands environmental assessment agency. They used the ENCORE database that provides estimates for 21 ecosystem service dependencies for 86 business processes. Dependencies for the investments made by Dutch financial institutions were estimated, a total of EUR 510 billion was highly or very highly dependent on one or multiple ecosystem services, and this analysis only considered first-order dependencies (De Nederlandsche Bank, 2020). Another Dutch bank, ASN, calculated their biodiversity footprint. ASN estimated that their investments had caused a loss of biodiversity equivalent to 64,849 hectares (Dasgupta, 2021).

The interconnections between business activities and nature-related risks are often complex and there is a need for developing adequate methods and measures for evaluation of businesses exposure and response to nature-related risks as well as measures to understand the business' own impact on degradation of natural capital and biodiversity. One approach to evaluate businesses' financial risk is to identify the exposure to nature-related risks and evaluate possible future scenarios. From this evaluation, the exposure and scenario outcomes in terms of costs can be translated into financial risk. The more critical part of the risk assessment is identification of exposure as well as constructing future scenarios.

Numerous consortia, for example the TNFD, have been established to start evaluating financial risks from degradation of natural capital and biodiversity, bringing attention to the issue. Investor communities have signalled increasing demand for solid reporting frameworks, allowing investors to identify and evaluate impacts on nature in potential investments. Better awareness of the impacts and dependencies will be an important element in assessing both short-, and long-term

business-related risks. In "Reporting on Nature-related risks, impacts and dependencies", UNDP (2021) provides an overview of aspects of nature that should be covered in company risk reporting, as well as suggestions for how to choose sectors, financial flows, and approaches.

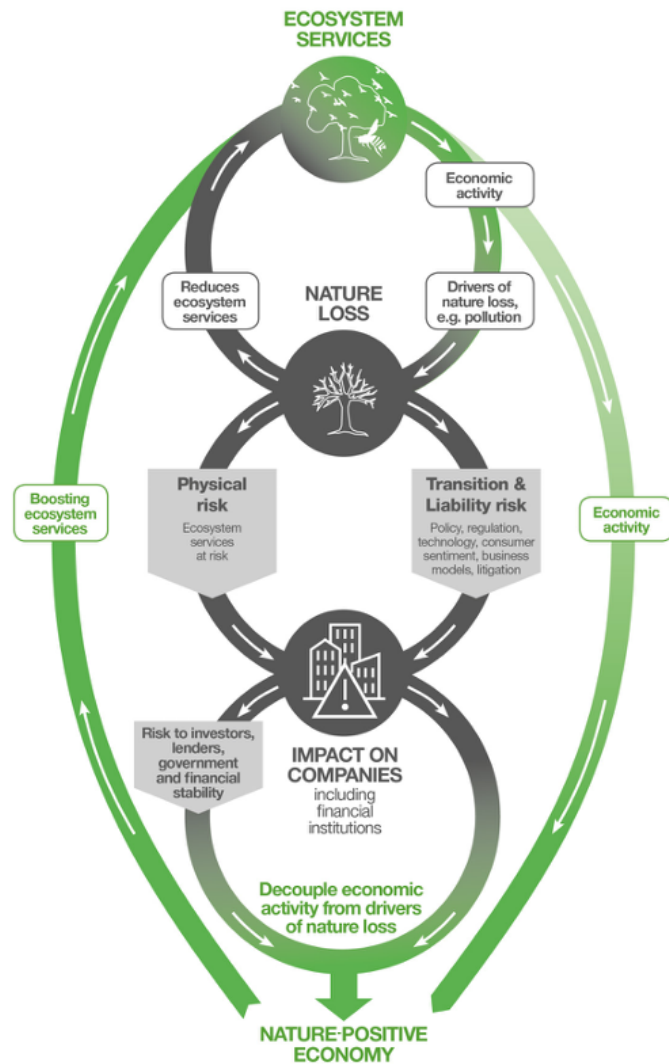


Figure 4: Illustration of the connections between economic activity, nature, and financial risk. *University of Cambridge Institute for Sustainability Leadership, 2021.*

8. USE OF THE TERM NATURE RISK IN THE NORDIC COUNTRIES

In the Nordic countries, the policy makers and authorities have a well-established tradition and approach of combining hard regulatory measures such as legislation and taxations with soft measures and incentives such as voluntary agreements, certification schemes, and provision of tools and guidance. In alignment, Nordic private sector companies are in general quite advanced in proactive approach to environmental regulations and frameworks.

The sections below present the current use of nature risk in the environmental regulation and the business/finance sectors of the Nordic countries.

8.1 Norway

In the Nordic region, Norway is the country where nature risk as a concept is most widely established. The concept of nature risk is used both in the financial and political sector, and by CSOs. Nature risk is occasionally used to describe natural hazards in risk assessments, but there seems to be consensus concerning the scope of the concept that is in line with the approach of this study.

Norwegian Policies and Legislation

In December 2021, Stortinget passed new legislation on sustainable finance¹². The new legislation will be put into force when incorporated into the European Economic Area-agreement (EEA). As part of this, the Norwegian Government has endorsed EU objectives ensuring sustainable investments. Moreover, the Norwegian Government is preparing to adopt the EU measures for sustainable economic activity. The objective is to establish a common understanding of which activities and investments can be considered sustainable in line with the EU's long-term climate and environmental goals; including the biodiversity agenda.¹³

In the Norwegian Financial Markets Report 2021 (Meld. St. 31 (2020 – 2021), Norwegian Ministry of Finance) Report to Stortinget (white paper)) it is stated that *"Improved disclosures from companies is necessary to enable financial undertakings and investors to assess and price climate- and environmentally-related risk. Furthermore, improved disclosures from corporates enables supervisory authorities to better assess the climate-related risk exposure of financial undertakings. In the EU, the non-financial reporting directive lays down the rules on disclosure of environmental matters and other non-financial information by large companies. The European Commission aims to amend the regulation in order to improve*

12. <https://www.stortinget.no/no/Saker-og-publikasjoner/Vedtak/Beslutninger/Lovvedtak/2021-2022/vedtak-202122-021/>

13. <https://www.regjeringen.no/contentassets/01932e015f9d4a7792e19fab6ca901b9/en-gb/pdfs/stm202020210031000engpdfs.pdf>

sustainability disclosures from corporates. A survey conducted by Finanstilsynet in 2020 shows that Norwegian companies' sustainability and climate risk disclosures are inadequate, and the results will form the basis for Finanstilsynet's further supervisory activity. The Government expects large Norwegian companies to disclose how they are affected by and manage climate risk, as well as on the impact of their activities on the climate and the environment, as part of their corporate reporting."

The Norwegian governmental webpage announces the government's ambition to make Statens Pensjonsfond Utland (SPU) (the Norwegian Government Pension Fund Global), the leading pension fund for sustainable management and climate- and nature risk management. The government published their ambitions on the governmental platform: "Hurdalsplattformen" in autumn 2021. The platform mentions nature risk; first in relation to SPU, and secondly in the section for managing nature sustainably so it may benefit future generations, "Forvalte nature for fremtidens velferd". The government wants to:

- For SPU: "Allow SPU to invest more in renewable energy infrastructure and other climate technology within the objective of getting the highest possible return at moderate risk" (Arbeiderpartiet & Senterpartiet, 2021)
- For nature management: Carry out a study of nature risk for the Norwegian economy using the Climate Risk Commission as a model and establish a list of options for various measures that contribute to maintaining ecosystems in good ecological condition" (Arbeiderpartiet & Senterpartiet, 2021)

Members of Arbeiderpartiet in Stortinget proposed to establish a Nature Risk Commission in spring 2020, but did not get majority (Stortinget 2021). It is instead now included in "Hurdalsplattformen". Other nature relevant initiatives from Hurdalsplattformen are a long-term and sustainable management of natural resources to ensure biodiversity and vulnerable ecosystems and increase efforts to save pollinators and threatened species. Furthermore, they mention developing better methods for ecosystem accounting.

Nature risk is also used in the municipal sector. Kommunesektorens Organisasjon (The municipal sector's organisation) has for instance had a webinar with the title: "Webinar: What significance does the nature – and the climate crisis hold for the municipal sector".

The Research Council of Norway (Norges Forskningsråd)

The Research Council of Norway is the national funding agency for research and experimental development. In the research council's strategy for 2020–2024, published in 2020, they have a section concerning `Green Transition`, where they state that they want to invest further in research and innovation that promote: "*A sustainable bioeconomy and responsible management of the environment, natural resources, nature and land areas*" and "*A competitive business sector that delivers green energy, climate and environmental solutions to global markets*". (Forskningsrådet 2020). In 2021, the Research Council published a portfolio plan for land-based food, environment and bioresources, with an ambition to support relevant research topics. One priority is for: "*Society to manage and use nature, nature's resources and ecosystem services within planetary boundaries*"

(Forskningsrådet 2021). In this section, they account for the current status, what needs to change in the future, and the obstacles for change. In both publications they conclude the necessity for better inclusion of nature and bioresources by increasing their monetary value in models for socioeconomic sustainable investments. However, the existing tools for assessing the value of natural capital and nature risks are inadequate. Better tools are needed to improve management, and a transition to a green economy is not possible without improving the state of biodiversity. Investing in biodiversity and the environment is expected to have long term positive benefits for the society (Forskningsrådet 2020; Forskningsrådet 2021).

The Research Council of Norway also granted money to the Norwegian institute for Nature Research (NINA) in 2020 to a project called "Covid-19 og naturrisiko" (Covid-19 and nature risk). The scope of the project was to assess the importance of green spaces when encountering altered societies, which many experienced under lockdown. So far, two research articles have been published within the project. Furthermore, the project analyses opportunities for societal change that are offered by a pandemic (Forskningsrådet, 2020). NINA is also partnering with WWF, and Storebrand to put Nature risk on the public agenda.

Academia

Several members from Norwegian academia have published chronicles, opinion pieces and given interviews within nature risk related themes. In spring 2021, four professors published the article: *"The climate crisis and the nature crisis need to be solved together"*, in which they criticise that the current climate plan does not consider the nature crisis sufficiently, and the tendency to approach the nature crisis and the climate crisis as two independent crises. Instead, they claim, we need to apply solutions that benefits nature as well as climate. They call for acknowledging the negative effects of land-use change not just for biodiversity, but for climate change as well. (Sverdrup-Thygeson et al 2021).

It has not been possible to identify any published peer-reviewed research.

The Financial Sector

In 2019, WWF Norway published the report "Nature risk as a financial risk". In the report, WWF defines nature risk to be: *"The connection between nature loss and economy"* (WWF, 2019). WWF conducted interviews with 10 financiers from Norway in order to map their understanding of the concept, and whether they took any measures to mitigate nature risk, without necessarily calling it nature risk. The report also identified potential barriers that could keep financiers from taking action. All of the financiers acknowledged that their activities could impact nature negatively. Their understanding of nature risks was primarily connected to the risk of damaging the parts of nature that are seen as high value areas such as world heritage sites or biodiversity dense regions, and not ecosystems and its services. Potential risks were categorized as operational, reputational and political. All of the interviewees had guidelines or expectations they used in dialogue with their investees concerning potential impacts on biodiversity and nature. Most of the banks had guidelines to hinder financing severe environmental degradation. Some of the

banks used guidance tools for biodiversity available from the International Finance Corporation (IFC). All interviewed participants could identify sectors that have the greatest negative impact. However, their risk assessment and selected data were somewhat skewed, since they did not take many of the risks connected to nature loss into consideration, and there was a general focus on major accidents or disasters. Acknowledgements of the company's own dependencies on nature were mainly lacking or non-existent. Even though all interviewees acknowledged nature dependency, none of them had taken any measures to assess how nature loss could pose a financial risk.

The 2019 report resonated throughout the finance sector, and nature risk was mentioned in numerous news articles, and by financial actors afterwards. There was a general consensus that other types of environmental risks than just climate risk need to be better assessed. Finans Norge, the organisation for financial industry in Norway, called for acknowledgement of nature risk as a financial business risk, and called for it to be assessed as such (Finans Norge, 2019).

The Norwegian financial group Storebrand wrote in their annual report for 2020 that: *"Loss of biological diversity is a priority for Storebrand. The value of natural goods is estimated to be more than NOK 100,000 billion globally, and the loss of nature can have major financial consequences for the business community. For us, it is important to establish nature risk as a concept, in the same way as climate risk. Internationally, we have been invited to work with governments, companies and other financial institutions to establish Task Force on Nature-related Financial Disclosures that will establish standards for better corporate reporting on biological diversity."* (Storebrand, 2020). Storebrand was part of the TNFD informal working group, and has joined forces with the Norwegian business Grieg Seafood to test the best tools for reporting on nature risk. The TNFD taskforce members from Storebrand mentions the importance of including double materiality in TNFD compared to TCFD: *"Companies and institutions must not only report how they impact nature, but equally how nature loss will affect their business models"* (Saugestad & Isciel 2021). This comment is from an article written by Storebrand's taskforce members; the article was published in "Energi og Klima", an online newspaper initiated by the Norwegian think tank Norsk Klimastiftelse (Norwegian Climate Foundation). The foundation also published a report commenting on the EU's plan for sustainable finance that is part of "Green Deal"; it entails an action plan for all EEA members, which include Norway.

The Norwegian bank Sparebank1 Østlandet has several policies for sustainable finance, and expects that their clients are conscious of climate risks, respect international agreements, and actively works for reducing their negative impact on climate and environment. In their annual report for 2019, nature risk is mentioned twice. First when accounting for the topics most important to their stakeholders, nature risk is listed as a priority topic for NGO's. Secondly, nature risk is mentioned in a review of guidelines for responsible loans implemented in 2019. It is stated that risk assessments shall cover climate and environmental, this includes: *"nature risk: how projects affect vulnerable ecosystems"* (Sparebank1 2020).

Most of their expectations concern minimizing business activities' negative impact on nature, and prevent negative impacts in IUCN and UNESCO registered areas (Sparebank1 2022). But in a document for sector specific standards there is an

acknowledgement of the risks nature loss pose to companies "*Minimise harm to business from biodiversity loss, including supply chain vulnerabilities*" (Sparebank1 2022). Sparebank1 participated in a seminar at the Norwegian parliament in 2020, together with other actors including WWF. The speaker accounted for why nature risk is a financial risk: "*There are increasingly strict regulations in this area. If customers and banks are not aware of what is coming, they risk ending up with projects that cannot be done*" and also stated that: "*Customer preferences change. This can lead to customers choosing not to buy goods and services that have a negative impact on nature, also when the supply-chain is far away from Norway*". Also relevant, the speaker concluded that: "*Most industries depend to some degree on ecosystems in their production of goods and services, even though many are not aware. If ecosystems are destroyed, the foundation for value creation and profitability will also be destroyed.*" According to the speaker, Sparebanken1 have positive experiences when discussing nature risk with their customers (Sparebank1 2020).

The financial services group DNB in Norway has developed a Sustainable Product Framework in line with internationally recognized principles. They do not consider nature risks in their framework, but there are several parts of the framework directive that benefits nature by either approving activities that improve the state of nature or exclude activities harmful to nature. For instance, under the theme "Sustainable food, agriculture and forestry" the following is listed:

Eligible activities:

- Afforestation (plantations) on non-forested land
- Reforestation on previously forested land
- Forest management activities that mitigate the impact of forestry. An example could include activities that increase in soil carbon stocks, or biodiversity and biosphere conservation activities, such as monitoring systems.

Excluded activities are commercial forest activities related to non-FSC or non-PEFC certified forests and "*Infrastructure for which the negative environmental impact outweighs the positive impact of climate change mitigation*". This is important, since climate mitigation activities will not necessarily reduce other environmental problems and since we are facing both a nature and a climate crisis it is detrimental if in trying to solve one, we damage the other. There are of course scenarios where trade-offs are inevitable, but with the dominating focus on climate change, it is important to take this into account. Furthermore, the DNB also state an ambition to increase awareness of nature risk both to their clients and in guidelines for relevant sectors. The framework does not include nature risk, and mainly focuses on climate change and limiting GHG emissions, but biodiversity is mentioned, mainly in relation to sustainable forest management, which is also seen in the above citation.¹⁴

Norges Bank Investment Management (NBIM), who for one thing manages SPU's assets, has published the document: "Biodiversity and ecosystems – Expectations of companies". The document outlines how they as investors expect companies to manage and disclose on environmental matters:

14. DNB. (2020). *Sustainable Product Framework*. Retrieved from https://www.dnb.no/portalfont/nedlast/no/om-oss/samfunnsansvar/2020/Sustainable_Product_Framework_2020.pdf

- A. *Integrate material dependencies and impacts on biodiversity and ecosystems into strategy*
- B. *Integrate material biodiversity and ecosystem risks into risk management*
- C. *Disclose material nature-related dependencies, and report associated metrics and targets*
- D. *Engage responsibly with policymakers and other stakeholders*

In February 2022, Deloitte published the report: *"The nature agreement and nature risk – significance for Norwegian business and industry"*. The report informs stakeholders about the nature crisis. It provides guidance on how the sector should respond and what to expect from future EU directives, Norwegian initiatives as well as the new nature agreement to be adopted in 2022. The paper explains the risks and negative impacts caused by the nature crisis, as well as the opportunities a sustainable transformation of society provides and how to engage and report on the topic. One example to illustrate the severity of the crisis presents two scenarios for how ecosystem service value generation for some ecosystem services will have changed by 2050 compared to 2011. The first scenario is "business as usual". In the second scenario, global conservation efforts and policies have been implemented. The losses are substantially smaller in the second scenario and some services like pollination and carbon storage will have positive net outcomes instead of net losses (which is currently the case). The report confirms that there is a clear expectation of nature risk becoming a bigger part of companies' risk assessments in the future. Companies can expect that they in the future are obliged to report how they affect and are affected not only by the climate crisis but also the nature crisis. This is to minimize physical risks, but especially also to reduce transition and reputational risks.

8.2 Sweden

Based on the definitions and scope of this study, the term "nature risk" (naturrisk) is used to a very limited extent in Sweden. When risks connected to natural disasters and extreme weather events are excluded, which they are per definition in the scope of this study, the use of the term is even more narrow. Most of the Swedish literature that relates to nature risk falls into this category by discussing risks to society from nature-related catastrophes and climate related scenarios. The more relevant literature elaborates on nature risk using terms as "risk to biodiversity", "biodiversity risk" or more indirect discussions related to the importance of biodiversity and ecosystem services to support our economy. A few sources from the Swedish literature are connected to international literature, for example the Taskforce on Nature-related Financial Disclosures (TNFD). These sources focus on international initiatives, business perspectives and frameworks for reporting on nature risks, relating to biodiversity and ecosystem services.

Swedish Policies and Legislation

In a report from the Swedish Meteorological and Hydrological Institute (2020), conclusions from IPCC and IPBES reports on climate and biodiversity are presented

and connected to a Swedish perspective. The report has a strong focus on climate related risks and mentions risk to biodiversity as a part of the climate related risks. The term nature risk is not explicitly used, but biodiversity is mentioned as an important part of the climate related risks. The report does not discuss the business risk perspective explicitly, but discusses the importance of biodiversity to support ecosystem services and human activities and states that there is a strong interdependence between climate changes, biodiversity, and the structure of ecosystem services.

Academia

No Swedish academic literature with relevance to nature risk, as defined in this report, has been found. Most of the literature related to ecosystem services or biodiversity relates to natural disasters or ecological compensation. There are a few studies from public agencies, like the Environmental Protection Agency and the Swedish National Board of Housing, Building and Planning that use the wording nature risk (naturrisk), but the context also refers to what in this report is defined as natural disasters.

Private Sector Initiatives

In an article from Cision (2021), a new collaboration between the Swedish company Ecogain and the Nasdaq stock exchange is mentioned. It focuses on how Ecogain will help provide data on biodiversity reporting for the Nasdaq platform ESG Datahub, which aims to provide accurate and valuable data of companies' sustainability performance, where biodiversity is one parameter. The article mentions how Nasdaq clearly signals the importance of evaluating the effect on biodiversity and the future business specific risk related to biodiversity loss. The sustainability measure will support transparency and globally comparable measures, supporting sustainable investment decisions in the financial sector.

Ecogain is also leading a collaboration project "Changing Land Use Impact on Biodiversity" (2020). The aim is to develop a standardised methodology to evaluate biodiversity in relation to land use change. The methodology will help companies to quantify the direct impact (both negative and positive) on biodiversity. Large Swedish companies are part of the project e.g., Vattenfall, LKAB, Cementa, Boliden and Södra. There are in total eight companies participating. In the description of the project, financial requirements are mentioned as one of the drivers to start evaluating biodiversity, but risk or nature risk is not mentioned per se. The results from the project are planned to be launched in Q1 2022¹⁵.

According to Christian Sjöland¹⁶, Biodiversity and Strategy team at Ecogain, the sustainability index that Ecogain provides helps reviewing a company's sustainability reporting on biodiversity with focus on measurable goals, time perspective and connection to scientific evidence. The index consists of 23 qualitative and quantitative indicators. Christian Sjöland states that companies within mining and energy have come furthest in reporting on biodiversity while companies with products further downstream in the value chain have not come as far. It is important to note that the index measures to what extent a company addresses the issue of

15. <https://www.ecogain.se/climb>

16. Interviewed 13th January 2022

biodiversity related to their own business rather than measuring the actual impact. According to Christian Sjöland, there is a huge interest from the financial sector in addressing biodiversity related questions in the risk assessment as a part of the investment analysis. With the new EU taxonomy, Christian Sjöland believes that it will become mandatory for businesses to report on biodiversity impacts and that the first Key Performance Indicators (KPI) have already been released.

An article from Aktuell Hållbarhet (2021) mentions the initiatives from the Taskforce on Nature-Related Financial Disclosures (TNFD) and how the working group is aiming to create a framework for reporting on financial risks of biodiversity loss and ecosystem services. It states that the initiative has gotten wide support from ministers, banks, and other financial institutions as well as from corporations.

The international firm KPMG performed a survey on sustainability reporting in 2020, focusing on the sustainability reports from the 100 largest companies in Sweden. In an article "Svenska bolag missar att rapportera om biologisk mångfald" (2020), KPMG concludes that only a third of these companies care to report on how their business affects nature and ecosystems and that only 5% have identified loss of biodiversity as a risk to their own future business. The author also presents arguments for why it is important for businesses to care about their own work on biodiversity. The article states that climate related risks are more frequently reported than biodiversity related risks and that biodiversity risk should become more prioritized in the reporting frameworks. The author also argues that it is important to understand the business own impact on biodiversity as well as nature's impact on the business through the provision of ecosystem services (KPMG, 2020).

The steel industry in Sweden published a handbook in 2017 about ecosystem services and the industry's dependence on them as well as the relevance to the industry production. The handbook explains and guides the companies in how to map the impact and dependence on ecosystem services. The guidance is based on the tool "Corporate Ecosystem Services Review" (ESR), that has been developed by World Resource Institute, World Business Council for Sustainable Development and Meridian Institute. The tool helps the company to integrate ecosystem services in the environmental standard ISO 14001, but also how to do environmental impact assessments are addressed. The word risk, however, is only mentioned on a more general level, referring to how future risks can be avoided by measuring ecosystem services and how that can lead to a positive environmental impact and reduced financial costs. It is also discussed how degradation of ecosystem services will lead to lower social welfare and living standards (Enetjärn Natur, 2017).

Mistra, a foundation for strategic environmental research, released a report in 2020 "Aligning markets with biodiversity". The paper analyses how to overcome the critical gaps existing in the market today between the global economy and the need for biodiversity. Markets dependency on biodiversity as well as how market growth is incentivising, and financing destruction of biodiversity is discussed. One section in the paper discusses biodiversity finance, where the concept of risk is addressed. Four different risk aspects are considered: i) Transition risks, ii) physical risks, iii) liability risks and iv) systemic risks. Transition risks are about the risks related to the transition to an economy that instead of degrading biodiversity, conserves and restores it. Risks to businesses are discussed here, where this transition could lead to higher costs, lower revenues and litigation risks. Physical risks are the direct physical impacts from biodiversity loss to businesses and investors. This section is referring to resource dependency, scarcity, and quality and both risk in terms of natural disasters

as well as depletion of natural resources over time are mentioned. Liability risks relate to the legal framework and reporting on biodiversity loss. Systemic risks cover the overall systemic impact from biodiversity loss. For example, when a natural system no longer functions, risks towards investors can occur at portfolio level rather than at organisational level and the overall financial stability. Based on the analysis, tools and methods to be able to screen and evaluate the risks are asked for. The report is mentioning the TNFD, and that action is taken to "create a framework for organisations to report on nature-related risk" (Mistra, 2021).

The Financial Sector

The Swedish bank Handelsbanken published a presentation in 2021 called "Biologisk mångfald ur ett finansierings- och investeringsperspektiv – ansvar, risk och möjligheter", which translates to "Biodiversity from a finance and investment perspective – responsibility, risk and opportunities". The presentation focuses on why and how biodiversity is relevant to a bank when investing in companies. The same four risks mentioned in the Mistra report are also referred to here. Handelsbanken state that loss of biodiversity due to human industrial activities leads to financial risk and recommend that these risks are priced into financial calculations. The sectors considered having the highest impact as well as the highest dependence on biodiversity are also listed (Johansson, J 2021).

Handelsbanken Equity Research¹⁷ started in 2021 to gather information regarding biodiversity risk to understand how and why this is important to investors in investment analysis. It is a mix of upcoming regulations and pressure from the market that drives the agenda. For example, the EU Taxonomy includes new requirements for green financing. Among the six overarching goals in the taxonomy, biodiversity is one of them and during the first half of 2022, specific Key Performance Indicators (KPI) will be released to benchmark against. Another driver is the customers. More customers are signing up to "Finance for Biodiversity Pledge" for example, where investors can sign up to learn more about best practices within the field and targets under development.

For the assessments, both impact and dependence are analysed, also called double materiality. However, there are still no existing frameworks or tools to use for these kinds of assessments, but this is something that Handelsbanken is following closely, to be up to date on potential evaluation methods and policy development. For the time being, Handelsbanken has done an initial assessment of the forest industry. The assessment investigates potential increased costs for the industry to cultivate the forest and how that in turn will affect the forest companies in the long run. In the end, Handelsbanken aims to use these types of analyses to assess the impact on equities and companies as well as sectors. The assessment is an outcome of the new forest strategy released by the EU Commission in 2021.

According to Josefin Johansson, Head of Sustainability at Handelsbanken Equity Research, it is difficult to carry through these types of assessments properly, because of lacking transparency due to lacking methodologies and frameworks. This makes it difficult to scrutinize and compare results. There are few companies that use KPIs and if they do, the KPIs are often reported differently. Yet, some industries have come further in their work with biodiversity assessments than others, for

17. The insights in this section are based on an interview with Josefin Johansson, Head Sustainability at Handelsbanken Equity Research, 12th January 2022

example the forest and mining industry. In general, companies that have a more direct dependence and impact on nature and natural resources are ahead of other sectors where the dependence and impact might seem more distant.

In general, most banks in Sweden are, according to Josefin Johansson, still at an early stage in working with biodiversity risks, and the sector tends to use the phrases biodiversity and biodiversity risk, not nature risk. They are, however, following the work done by TNFD closely to see how that will impact their business.

8.3 Iceland

Nature risk is not a term identified in use in the Icelandic environmental regulation, in academic research or in the private/financial sector. Biodiversity risk, ecosystem risks, and Ecosystem Services risks are in use.

Icelandic Policies and Legislation

Iceland adopted their first national biodiversity strategy in 2008, and an action plan for implementing the strategy was finally approved in 2010. In 2019, "Iceland's Implementation of the 2030 Agenda for Sustainable Development" was published by the Icelandic government.

In 2021, the Ministry of Finance and Economic Affairs published "Iceland's Sovereign Sustainable Financing Framework". The report highlights that Iceland has incorporated the SDGs in its national budgetary process, and developed a sustainable financing framework for how to achieve the ambitions from the Paris Agreement on climate change, and the UN SDGs, which is highly relevant in a nature risk context. This was done in recognition of the role capital markets can play in transitioning the economy in a sustainable direction. The framework has been developed so it aligns with Green Loan Principles, Sustainability Bond Guidelines and the draft of EU's Green Bond Standard, amongst others. In report section "1.2 Environmental and climate objectives", climate change is predominantly in focus. The primary risks identified are: *"glacier retreat, reduction and shifts in pelagic fish populations, ocean acidification (higher than the global average), and potential for hazards (such as landslides and floods)"*. Section "1.5 Ocean and seafood objectives" outline the same challenges for the sector, as outlined in the SDG report, for SDG 14: Life below water in 2019. The sustainable financing framework itself lists multiple objectives that relate to nature, biodiversity and ES, the ones that concerns nature, biodiversity, and ecosystems are listed in the table below. The report does not mention nature risk directly, but the sectors addressed are some of those identified to be the most damaging to nature.

In 2017, OECD published the report: "OECD: The political economy of biodiversity policy reform". The report investigates the possibility of transferring knowledge from the implementation of environmental policy reforms, to better implement biodiversity policy reforms. The goal is to make it more approachable to implement more ambitious policy reforms targeting biodiversity specifically. The report case study from Iceland evaluates the individually transferrable quota (ITQ) management system for the Icelandic fisheries. The Icelandic fishing industry is an important part

of the country's economy, especially in the rural regions. In 2015 the fishing industry accounted for 5% of GDP. The waters around Iceland hold a wide array of marine life, 270 fish species have been identified, and around 150 of these spawn in the Icelandic waters. The implementation of the ITQ system began in 1984, and were gradually introduced and reformed in the following decades. The ITQ system was implemented after it became apparent that business as usual would lead to a collapse of fisheries, which due to the economic importance fisheries constituted at the time, was a threat to the entire country's economy. The incentives that led to the transformation of the industry were economic, most notably the bad economic performances by the fisheries and commercially important fish stocks in poor state. The major stakeholders in the implementation of the ITQ systems were scientists, politicians and public servants.

The OECD conclude that the Icelandic ITQ system have resulted in an economically sustainable and sufficient system, though some problems have arisen and led to later adjustments of the ITQ system. The system is thoroughly regulated, and generally follows the recommendations from the Marine Research institute, also when deciding on TAC allowances (Total Allowable Catch).

The effect on biodiversity is harder to determine, and is not a distinct target of the ITQ system. However, several of the commercially important species have recovered or increased in recent decades. Furthermore, permanent quotas have managed to create a proper incentive for the fishermen to safeguard and partake in rebuilding fish stocks, to ensure their own future income, hereby avoiding tragedy of the commons. The Icelandic ITQ system has also always been accompanied by nature management measures such as temporarily closing spawning grounds, or areas with juveniles etc. In the Icelandic national strategy for sustainable development from 2010, it is stated that fish stocks should be harvested sustainably and a cautionary management approach should be adopted, to ensure the fish stocks also can be harvested in the future. It is also specified that the interplay by nature and biodiversity need to be acknowledged and the negative impacts caused by fisheries on other parts of the ecosystems need to be minimized.

The OECD report offers several recommendations for how to overcome obstacles to ensure successful implementation of biodiversity protective reforms, based on the case studies analysed.

- Seize opportunities to advance biodiversity related reforms: from crisis to public concern.
- Build alliances between economic and environmental interests
- Devise targeted measures to address potential impacts on competitiveness and income distribution.
- Use a robust evidence base to build support for reform and provide resistance to pressure from vested interests.
- Encourage stakeholder engagement to build broad and durable support for reform
- Consolidate gains to ensure that reforms are sustained over time.

(OECD, 2017)

8.4 Finland

In Finland, the term "nature risk" (*luonnonriski*) is typically used to describe risk associated with catastrophes and other events in the nature. Alternative translation for the term "nature risk" as *luontoriski* is not used in Finnish literature to such an extent in the context of this study that it could be considered relevant. It is worth noting that although multiple search words and terms were used as part of this work, only very few relevant articles, reports or the like were identified. However, it should also be noted that the majority of Finnish scientific research is reported in the English language, which reduced the number of relevant articles and reports written in Finnish. Furthermore, articles/reports may discuss biodiversity in relation to businesses, but do not use a specific term for the associated risks (e.g. Teknologiateollisuus ry, 2020, news articles discussing the Dasgupta Review). Based on these findings, it is concluded that there is not an established translation for the term "nature risk" in the Finnish language. The term "biodiversity risk" (*biodiversiteettiriski*) appears to be the only term identified as part of this work to match the definition of "nature risk" as provided in Chapter 4.

In Finnish articles and reports, the term "dependence on nature" (*luontoriippuvuus*) is primarily used to describe humans' overall dependence on the nature and being psychologically addicted to nature, neither of which is considered relevant for the scope of this work.

The Dasgupta Review (2021) was widely covered in online articles published by various Finnish actors in the field. However, the articles do not use the term "nature risk" or any derivative thereof for the risks discussed in the Dasgupta Review. (Ecobio, Sitra, Bios, Finnish Environment Institute, 2021)

As part of this study, one Finnish financial group (bank), one large investment company investing in venture capital and private equity funds, and one pension insurance company were contacted in order to set up interviews. Only one of the contacted companies responded and stated they could not take part in an interview within the given schedule. The two other companies did not answer.

Academia

In a master's thesis from 2017, the term "biodiversity risk" (*biodiversiteettiriski*) is defined through the definition given by PwC and the World Economic Forum (2010). Thus, biodiversity risk is defined as a risk that is associated with direct or indirect effects or dependency on biodiversity and ecosystem services, and more broadly as business risks related to biodiversity. These risks may be for example decline in productivity, disturbances in production processes, lack of resources, restricted access to resources, resource use compensation schemes, and legal proceedings. Consequently, the term biodiversity risk is considered to describe a risk caused by changes in the nature or environment to businesses. The risks can be divided into physical and legal risks. The thesis studied biodiversity reporting by large Finnish listed companies. According to the thesis, some of the studied companies identified loss of biodiversity as a risk to the planet but did not report any negative impacts on the companies themselves. Furthermore, all companies except for one (in total 25 companies were studied) reported the potential risks on biodiversity caused by the companies' operations but did not consider the negative impacts of loss of biodiversity to the companies. (Nummela, 2017)

In a master's thesis from 2021, the term "negative biodiversity impact" or "ecosystem degradation" (*luontohaitta*) is used for negative biodiversity impacts caused by different operations. The thesis defines negative biodiversity impact as harm on biodiversity caused by human activities, e.g. ecological impact on forests caused by logging. The aim of the thesis was to establish a method to estimate and assess biodiversity impacts caused by operations at an organizational level, and the impacts of the University of Jyväskylä were assessed as a case study. (Vainio, 2021)

In a master's thesis from 2016, the term "nature damage" or "environmental damage" (*luontovahinko, ympäristövahinko*) is defined as a significant negative impact on achieving or maintaining a favourable level of protection of the environment. The thesis studies the general prohibition of degradation from a remediation liability perspective within a legal context. The full text is not available online and therefore the definition of the term cannot be discussed in more detail. (Larsen, 2016)

In a master's thesis from 2008, the term "nature risk" (*luonnonriski*) is equated with risks relating to natural catastrophes in the context of insurances. The referred nature catastrophes relate to extreme weather events and earthquakes. (Huttunen, 2008). In a report by the Finnish Environment Institute from 2021, the term "nature risk" (*luonnonriski*) is equated with catastrophe risk and more particularly floods. Hence, the report uses the term nature risk to refer to risks to human activities and societies originating from the nature events. (Parjanne & Marttunen, 2021) In a master's thesis from 2016 focusing on a topic outside of the scope of this Work, the term "nature risk" (*luonnonriski*) is defined as a risk brought about by an event in the nature. The term "environmental risk" (*ympäristöriski*) is defined as a risk relating to the dependence between human and nature. (Rekonen, 2016)

8.5 Denmark

Nature risk (*naturrisici/naturrisiko*) as a concept is little known in Denmark. It has not been possible to find literature from Denmark that applies the nature risk concept. There are a few examples of nature risk being used in natural hazards contexts, which is not relevant for this report. However, there are a few comments in articles about either TNFD or the increasing focus on nature risks/ biodiversity risks in the financial sector. There is a general expectation that the focus on these types of risks will increase in the future, partly as a natural extension of climate risk assessments (Børsen 2021; Finans 2021).

Financial sector

Finance Denmark published a 2020 sustainability review in the beginning of 2021, where they released the results from a questionnaire survey answered by 40 different banks and mortgage banks on what initiatives they had taken on sustainability. The report does not mention nature risk, but sustainability is a general topic. In the report, they refer to EU's green taxonomy for when to consider an activity sustainable. Several taxonomy goals consider nature directly, and their goals are in line with necessary steps to mitigate nature risks, without applying the term. However, the main focus of the report is climate change and climate mitigation, and

Finance Denmark recommends clients to report on climate in relation to the TCFD-principles that are endorsed by the Danish government. Since climate change is one of the main threats against nature, initiatives with a climate focus can also play a role in mitigating nature risks. Furthermore, Finance Denmark generally expresses ambitions to continue alignment with EU initiatives, and they have contributed to the development of the EU green taxonomy that is highly relevant in a nature risk context (Finance Denmark 2020). Generally, they emphasize the importance of keeping common ground when addressing the sustainability agenda, and also refer to the UNEP FI's Principles for Responsible Banking (PRB), and UNEP FI's Principles for Responsible Investment (PRI).

Publishing a report that accounts for the sector's progress towards sustainability annually was suggested by the advisory Forum for Sustainable Finance. The Forum was set up by Finance Denmark, after it was decided in 2018 to contribute more to the implementation of the UN SDGs. The forum included multiple representatives across different sectors, as well as representatives from universities and NGO's. In 2019, the Forum handed over 20 sustainability recommendations to Finance Denmark. In the report's introduction the CEO Ulrik Nødgaard states: *"(..) the financial sector is well underway in implementing the recommendations made by the Forum for Sustainable Finance. Many financial institutions have incorporated sustainability into their business strategy, risk management and advisory services and are developing sustainable loan and investment products for their customers."* (Finance Denmark 2020). The result from the interviews in the report from Finance Denmark shows that there is a general awareness of sustainability in the Danish financial and business sector, 90% of the interviewees have begun working with the recommendations from forum for sustainable finance. 83% already have or have started developing a sustainability strategy for their business. 79% experienced a rise in customer demands for sustainable products, mainly from private customers, but 28% said they received requests from both private and financial customers. When asked whether they had started further educating their staff, 50% answered yes, and 25% of the ones answering no explained they were waiting for joint sector initiatives (Finance Denmark 2020).

CSO Initiatives

The Danish green think tank Concito published an opinion piece commenting on the pledges made at the 2021 G7 summit. Even though Concito generally does not consider the results to be ambitious enough, especially in relation to the climate crisis, they welcome the "G7 2030 Nature Compact". This is an initiative that targets nature and biodiversity loss and investigate the synergies of the climate crisis and the nature crisis.

As a conclusion, the article suggests four initiatives for the Danish government to implement as a response to the summit. Two of them are directly relevant for nature risk (translated from Danish):

- "A new Danish development policy strategy that fully integrates climate and natural capital." (Concito 2021)
 - It is stated that Denmark should change their development strategy and

acknowledge that climate- and nature policy failures in the Global South make a sustainable development impossible over time. Furthermore, Concito also considers Denmark to have a moral duty to assist the global south and ensure nature policies, partly due to the average Danish citizen's large footprint

- "Denmark should be inspired by the G7 summit to put their own house in order" (Concito 2021)
 - Concito argues that Denmark needs to improve the protection of nature and biodiversity. Risk assessments of portfolios and value chains should be mandatory and detailed for larger businesses and financial institutions.

Nature risk is not directly mentioned in the article, but nature loss and biodiversity loss are mentioned. Moreover, the article comments on "G7 2030 Nature Compact", which includes a commitment on embedding nature in risk assessments and politics, and better protection of nature, biodiversity and ES in recognition of nature's pivotal role.

9. THE EVOLUTION OF THE NATURE OR BIODIVERSITY RISK CONCEPT OVER TIME

The Table below provides an overview of how the nature-related risks have been defined over time. Not all organizations and initiatives reviewed provide a clear definition of nature risk or nature-related risks. Some do, where others provide short descriptions of the different categories of nature risks such as physical, transitional, market or reputational. Others provide both a definition of nature risk and more detailed descriptions of what the different types of risks entail.

The timeline below the table illustrates the increasing focus and concerns regarding nature risk in recent years.

2004	Insight Investment Management	Biodiversity risk	"We use this term to refer to two categories of business risk that extractive and utility companies may face unless they demonstrate high standards with respect to the conservation of biodiversity, and the corresponding business opportunities associated with good practice. The first is the risk that they may face difficulties accessing resources in new sites and capital for new investments, likely through competitive disadvantage relative to others with better practice. The second category of business risk is loss of revenues through incurring liabilities, damage to reputation and increased operating costs. The risks to biodiversity from companies' operations ('biodiversity impacts'), and more broadly the risks to society from the current unprecedented global loss of biodiversity to which companies' operations contribute are of great importance, but are not what we mean by the term 'biodiversity risk' as used in this report"
2010	WEF	Biodiversity Risks	"In this paper we use the term 'biodiversity risk' to refer to business risks related to biodiversity in the broadest sense. This includes risks as a result of direct impacts or dependencies on biodiversity and ecosystem services, as well as regulatory, financing, reputational and supply chain risks that arise due to business's relationships with biodiversity and ecosystems"
2019	WWF	Nature-Related Risk	"Nature-Related Risk (NRR) – refers to risks which arise when a change in a business's impacts or dependencies on nature become a threat to that business's operations and profitability due to factors of exposure and vulnerability"
2021	CDSB	Biodiversity-related financial risks	"Financial risks to organisations and the wider financial system resulting from biodiversity loss and ecosystem degradation due to human activity that drives nature loss. This includes physical, transition and liability risk types, aligned to the TCFD. Biodiversity related financial risks may include expenses/liabilities resulting from implementing mitigation hierarchy principles for biodiversity impacts, impairment of assets linked to biological resources and the associated access/use right/quotas (e.g. fishing rights, forestry concessions) and/or increased costs/decreased revenues resulting from changes in availability of resources."
2021	Dasgupta	Nature-related financial risk	"Financial risks that arise from changes in the stock and/or condition of natural capital and from societal responses to those changes. These risks can arise from three channels or 'risk factors' physical, transition and litigation"
2021	UNDP and SIF	Nature-related risks	"The risks related to climate change and natural hazards, together with risks from broader environmental issues such as pollution, desertification and water depletion make up nature-related risks"

2022	NGFS	Biodiversity-related risk. Nature-related financial risk	"We define biodiversity-related risk as a financial or economic risk related to biodiversity loss. By nature-related financial risk, we mean a financial or economic risk posed by any natural process, including climate, weather and biodiversity loss, or a combination of these and other natural phenomena"
2022	TNFD	Nature-related risks	"Potential threats posed to an organisation linked to its and other organisations' dependencies on nature and nature impacts. These can derive from physical, transition and systemic risks"

2004	F&C: <i>Is Biodiversity a material risk for companies? An assessment of the exposure of FTSE sectors to biodiversity risk</i>
2005	MEA: <i>Ecosystems and Human Well-being – Opportunities and Challenges for Biodiversity and Industry</i>
2008	TEEB: <i>The Economics of Ecosystems and Biodiversity, The TEEB Interim Report is launched</i>
2010	WEF: <i>Biodiversity and business risk</i>
2015	CAFF: <i>The Economics of Ecosystems and Biodiversity (TEEB) for the Arctic: A Scoping Study</i>
2017	TCFD: <i>Final Report – Recommendations of the Task Force on Climate-related Financial Disclosures</i>
2019	Finance watch: <i>Making Finance serve Nature</i> IPBES: <i>Global assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services</i> WWF: <i>Naturrisiko Tap av naturmangfold som finansiell risiko</i> WWF: <i>The nature of risk – A framework for understanding nature-related risk to business</i>
2020	De Nederlandsche Bank: <i>Indebted to nature – Exploring biodiversity risks for the Dutch financial sector</i> Mistra: <i>Aligning Markets with Biodiversity</i> NGFS: <i>Biodiversity and financial stability building – the case for action</i> WWF: <i>Nature is too big to fail, Biodiversity: the next frontier in financial risk management</i>
2021	Dasgupta, P.: <i>The Economics of Biodiversity</i> Norges Bank Investment Management: <i>Biodiversity and Ecosystems. Expectations of companies</i> WWF: <i>Bringing it down to earth: Nature Risk and Agriculture</i>
2022	Deloitte & WWF: <i>Naturavtalen og naturrisiko. Betydning for norsk næringsliv</i> NGFS: <i>Central banking and supervision in the biosphere: An agenda for action on biodiversity loss, financial risk and system stability</i> TNFD: <i>TNFD framework beta v0.1</i>

Figure 5: Timeline of major published reports on the topic

10. CONCLUDING REMARKS AND RECOMMENDATIONS

10.1 Nature risk in environmental policies

Nature risk is not a term or concept frequently used in environmental policy or in other policy areas. It is mainly a financial concept. However, the financial sector and others have expressed the need for policy action in regard to legislation and better nature risk frameworks in relation to finance and business. There is also a need for a more holistic approach that addresses nature risk and works to reduce nature loss across different policies, and ensure alignment across different policy areas and objectives.

Nature risk is today perceived as more complex and harder to describe and assess than climate risk, complicated further by the lack of globally agreed metrics. Decisionmakers and governments can play a significant role in different ways. One way is to implement policies and regulations that halts nature loss and the drivers causing it. Another is demanding risk assessments and reporting from companies and organization, as France has done with article 29 in their energy and climate law. Another is to promote alignment with initiatives for better risks assessments or initiatives combating nature loss in general.

Policies to reduce nature loss and thereby nature risk by proxy can help minimize the physical risks that companies face. It is likely to increase transitional risks for companies, however, as mentioned earlier, to avoid or minimize physical or systemic risks in the long run, transitional risks are inevitable in the short run. Short term transitional risks might also decrease the risk of transitional risks in the long term.

A notable development has been seen in recent years. Numerous initiatives are in development, namely the TNFD, and many have great expectations to the outcome of the second CBD Conference, expected to take place in 2022. Multiple initiatives are being implemented from the EU level, relevant for tackling and mitigating nature risks. Those especially relevant in a nature risk context are the biodiversity strategy that hopefully will contribute to reducing nature loss and the Environmental Impact Assessment Directive and the new taxonomy regulation that will demand better nature risk valuation and reporting.

In conclusion, after conducting the literature review it might seem more relevant that policy actions focus on interventions aiming at nature risk valuation and reporting, for example assessments of price externalities, and pave the way for better traceability and sustainability in supply chains and put an end to subsidies harmful to nature.

The business and finance sector calls for indicators that can be applied in line with the CO₂ -equivalents used when reporting on climate change. Developing a similar indicator for nature risk is difficult due to the complexities, interrelationships and dynamics of the different components of nature risk. There is little doubt of the need for action. Due to the complexity and the uncertainties several calls for taking immediate action, taking a precautionary approach, and acting according to worst-case scenarios.

10.2 Nature risk in the business sector

It can be concluded that the concept of nature-related risk is growing relatively fast in the financial and business sector. As part of financial stakeholders' endeavours to assess risks, the nature-related risks, through exposure and dependency, are increasing in a world where natural capital and biodiversity deteriorates at high speed. Challenges lie in assessing a business exposure to nature-related risks as well as its own impact on the deterioration of natural capital. Several initiatives such as the Taskforce on Nature-related Financial Disclosures are actively seeking methods to assess impacts, exposure, and dependencies on ecosystem services and to create a common framework to report and set targets on these issues. The financial sector expresses a strong demand for solid reporting frameworks and tools to assess these risks, both in terms of dependency on ecosystem services as well as the business' own impact, which is sometimes referred to as double materiality. In parallel with that, showing responsibility for protecting nature along the value chain is also seen as a growing trend among companies leading on sustainability.

It appears from literature that nature-related risk and measures are considered more complex than climate-related risks. There has been some resistance towards assessing nature-related risks as connections between mechanisms of ecosystems and the business' activities may appear complex. However, there is an opportunity to build on the experience from initiatives on climate-related risks to further develop frameworks and push for transformational change. Nature-related targets and indicators are important for businesses to start reducing their impact and dependency on ecosystems, but it should be stressed that the absence of such indicators should not promote inaction. Businesses have an opportunity to start evaluating their impacts and dependencies from a qualitative perspective to better understand their own impact and potential risks from nature loss. There are existing tools to start evaluating impacts on ecosystems throughout the value chain, for example the DPSIR framework which has been adopted by the EEA.

It is likely that the risk analysis will be driven both from the businesses interest and even more so from the investor community, where standards for how to report on nature-related risks will be set. From a business perspective, policy and regulations can help create common frameworks and international standards for how to report on these issues, but incentives are likely to be driven by the interest to assess risks in relation to the business and to keep up with requirements on transparency from the financial sector. Financial supervisors and banks are expected to have an important role in addressing the risks from nature loss. It is likely that, in a near future, companies will face tougher requirements to report on how their activities and products impact ecosystems and take action against unsustainable activities. There is much work to be done in developing a better understanding of the nature-related risks and it is important to keep a holistic approach, meaning that nature-related risks are not only relevant for businesses, but for our society in its entirety, through the physical, transitional and systemic risks.

From what has been found among international sources and literature, there are several ongoing initiatives on macrolevel, both policy-wise but also for developing common methodologies and reporting frameworks for the business sector. The EU Taxonomy puts further pressure on reporting requirements, and action from

businesses as well as governments. Other initiatives like The Taskforce on nature-related financial disclosures and Science Based targets Network are actively seeking to provide guidance and frameworks to be used by businesses, e.g. definition of the term nature risk, data and other metrics that can be used to measure and evaluate nature risk. Since the financial sector is a main driver of the agenda on nature-related risk, TNFD and SBTN will play vital roles in aligning the business sectors' long-term goals.

The demand for a uniform reporting standard is strong and a lot of hope and pressure is put on the ongoing initiatives to bring clarity and bridge the reporting gap between climate and biodiversity. Since the financial sector is interconnected on a global level, it is vital that standards and requirements cover not only specific countries, but on a larger scale ensure a level playing field and uniformity. To enable the work going forward, initiatives need to secure alignment between financial institutions such as central banks and policy institutions.

There is a great opportunity to use knowledge and experience from climate risk for the development of nature risk frameworks. It can enable a faster development and implementation globally, but at the same time it is important to build from existing knowledge, e.g., like adding the double materiality approach. By rethinking instead of repeating, the development of nature risk frameworks can hopefully be even more resilient and provide long term sustainability for nature as well as business.

10.3 Status of the term nature risk in the Nordic countries

Our study concludes that there is little use of the term nature risk across the Nordic countries. Norway is furthest ahead on the nature risk agenda, with adoption of the term across CSO's, academia and government policy. Nature risk related concepts were identified in all studied countries, and all countries participate in international collaboration that aims to develop the nature risk concept (e.g. through the Nordic Council of Ministers). However, our analysis shows a lack of usage of the term in government policy, reporting frameworks and methodologies for the business sector as well as absence of concrete initiatives addressing nature risk in the Nordic countries.

Table 2: Adoption and status of the term Nature risk in the Nordic countries.

Status of the term Nature risk in the Nordic countries					
Use of the term Nature risk	Denmark	Finland	Iceland	Norway	Sweden
Related concepts identified	✓	✓	✓	✓	✓
Identified as term		✓		✓	
National definition					
In use by CSO's				✓	
In use in academia	✓			✓	✓
In use in government policy				✓	
International collaboration	✓	✓	✓	✓	✓
Concrete initiatives in place				✓	✓

10.4 Recommendations for the Nordic Council of Ministers

The Nordic Council of Ministers can disseminate knowledge, promote common, Nordic approaches, and ensure an ongoing mainstreaming of nature risk in related policy activities. Specific recommendations for the Nordic Council of Ministers are:

- Promote a concise definition of the term nature risk with special attention to the concept of double materiality and existing definitions of similar terms such as biodiversity risk and environmental risk. A clear definition can ease the adoption and use for policy making and in the business sector in a standardized manner.
- Promote cooperation between the Nordic countries when defining, and implementing the term nature risk. Common guidelines for the Nordic countries will allow for comparison of nature risk policy intervention, collaborative learning, and easier monitoring.
- Address the business actors. Support platforms where expert knowledge can be exchanged, and where mutual learning between the private sector and public institutions is promoted. Support can be given to already existing networks or to the creation of new knowledge platforms.

10.5 Recommendations for national government level in the Nordic countries

Concept development and implementation

- Implement and mainstream the concept of nature risk
- Implementation within the policy area may include a nature risk strategy.
- Promote inter-governmental coordination between ministries to ensure that the nature risk concept is implemented in all relevant policy areas, such as finance, economy, and infrastructure, and not limited to the Ministry of Environment.
- Study nature risk aspects of the national economy. Carrying out a study of

nature risk at national level or including nature risk into the national environmental accounts can provide insight into the magnitude and location of the issues and direct where to place future mitigation efforts.

- Make an action plan on how to implement the nature risk concept in relevant policies, regulations and sectors.

Objectives and monitoring

- Integrate the concept of nature risk into existing environmental objective frameworks. This will provide incentive for monitoring the development of nature risk issues. Alignment needs to be ensured with national and international goals for nature preservation.
- Promote the international frameworks such as TNFD, due the similarity to the TCFD, the structure should be familiar to many.
- Promote increased traceability in global supply chains which is a criterion for sufficient monitoring.

Mitigation

- Follow the international development on nature risk and related policy areas, such as COP-15, the EU Taxonomy, and the TNFD to learn from good examples and ensure that national policy is aligned with the international agenda.

LIST OF REFERENCES

- ACBE. (2000). *Value, Growth, Success – how sustainable is your business? A briefing note for directors*. Advisory Committee on Business and the Environment.
- Arbeiderpartiet & Senterpartiet. (2021). *Hurdalsplattformen: For en Regjering utgått fra Arbeiderpartiet og Senterpartiet 2021–2025*, Retrieved from: <https://www.regjeringen.no/contentassets/cb0adb6c6fee428caa81bd5b339501b0/no/pdfs/hurdalsplattformen.pdf>
- Berger, J., Goedkoop, M., J., Broer, W., Nozeman, R., Grosscurt, C., D., Bertram, M. and Cachia, F. (2018). *Common Ground in Biodiversity Footprint Methodologies for the Financial Sector*. Paris: Actiam, ASN Bank, CDC Biodiversité. Retrieved from <http://www.mission-economie-biodiversite.com/publication/1833>.
- Bios. (2021). *Mitä Dasgupta raportti sanoo luonnosta ja taloudesta?*. Retrieved from <https://bios.fi/dasguptan-raportti/>
- Borsen. (2021). *Investorer stiller krav om biodiversitet: Disse aktieselskaber fremhæves for deres arbejde*. Retrieved from: <https://borsen.dk/nyheder/baeredygtig/faa-biodiversitet-i-portefoljen-mens-cop26-aftalerne-indgaas>
- Business for Nature. (2022). *Nature is Everyone's business*. Retrieved from <https://www.businessfornature.org>
- Cision. (2021, June 29). Nasdaq and Ecogain in new collaboration for sustainable investments. *Cision*. Retrieved from <https://news.cision.com/dk/ecogain/r/nasdaq-and-ecogain-in-new-collaboration-for-sustainable-investments,c3375838>
- Climate Disclosure Standards Board (CDSB). (2022). *CDSB FRAMEWORK for reporting environmental & social information*. Retrieved from https://www.cdsb.net/sites/default/files/cdsb_framework_2022.pdf
- Concito. (2021). *Fire bud på dansk modsvar til et G7 topmøde med historisk gode signaler, men skuffende resultater*. Retrieved from <https://concito.dk/concito-bloggen/fire-bud-paa-dansk-modsvar-til-g7-topmoede-med-historisk-gode-signaler-men>
- Conservation of Arctic Flora and Fauna (CAFF). (2015). *The Economics of Ecosystems and Biodiversity (TEEB) for the Arctic: A Scoping Study*. Akureyri, Iceland. Retrieved from <https://www.caff.is/assessment-series/323-the-economics-of-ecosystems-and-biodiversity-teeb-for-the-arctic-a-scoping-study>
- Convention on Biological Biodiversity. (2021). *First draft of the post-2020 Global Biodiversity Framework*. Retrieved from <https://www.cbd.int/doc/c/abb5/591f/2e46096d3f0330b08ce87a45/wg2020-03-03-en.pdf>
- Dasgupta, P. (2021). *The Economics of Biodiversity: The Dasgupta Review*. London: HM Treasury. Retrieved from <https://www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review>
- De Groot, R., Costanza, R., Braat, L., Brander, L., Burkhard, B., Carrasco, L., Crossman, N., Egoh, B., Geneletti, D., Hansjuergens, B., Hein, L., Jacobs, S.,

Kubiszewski, I., Leimona, B., Li, B., Liu, J., Luque, S., Maes, J., Marais, C., Maynard, S., Montanarella, L., Moolenaar, S., Obst, C., Quintero, M., Saito, O., Santos-Martín, F., Sutton, P., Van Beukering, P., Van Weelden, M. and Willemen, L. (2018) RE: Ecosystem Services are Nature's Contributions to People, *SCIENCE*, 359 (6373), 270–272. DOI: [10.1126/science.aap8826](https://doi.org/10.1126/science.aap8826)

Deloitte (2022) Naturavtalen og naturrisiko. Betydning for norsk næringsliv. Retrieved from https://mkto.deloitte.com/rs/712-CNF-326/images/deloitte_naturavtalen_naturrisiko_rapport_2022.pdf.

De Nederlandsche Bank. (2020). *Indebted to nature – Exploring biodiversity risks for the Dutch financial sector*. Retrieved from <https://www.dnb.nl/media/4c3fqawd/indebted-to-nature.pdf>

Directive 92/43/EEC of the European Parliament and of the Council 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. European Parliament, Council of the European Union. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043>

Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds. European Parliament, Council of the European Union. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32009L0147>

Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment. European Parliament, Council of the European Union. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32011L0092>

DNB. (2020). *Sustainable Product Framework*. Retrieved from https://www.dnb.no/portalfont/nedlast/no/om-oss/samfunnsansvar/2020/Sustainable_Product_Framework_2020.pdf

Earthwatch Institute. (2002). *Business and Biodiversity: The Handbook for Corporate Action*. Retrieved from: <http://www.iucn.org/fr/node/28495>

Ecobio. (2021). *Luonnon monimuotoisuuden raportti yhdistää luontovarallisuuden talousmittareihin*. Retrieved from <https://ecobio.fi/luonnon-monimuotoisuuden-raportti/>

EFSA. (2021). *Environmental Risk Assessment*. Retrieved from <https://www.efsa.europa.eu/en/topics/topic/environmental-risk-assessment>

Enetjärn Natur (2017) Handbok - integrera ett ekosystemperspektiv i stålbranschen Jernkontoret. Retrieved from https://www.jernkontoret.se/globalassets/publicerat/handboker/handbokstalforetagens ekosystemtjanster20171006_webb.pdf

European Commission. (2020). Communication/2020/380. EU Biodiversity Strategy for 2030. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590574123338&uri=CELEX:52020DC0380>

European Commission. (2021). Sustainable Finance Package. Retrieved from https://ec.europa.eu/info/publications/210421-sustainable-finance-communication_en

European Commission. (2019). *Guidelines on non-financial reporting: Supplement on reporting climate-related information (2019/C 209/01)*. Retrieved from <https://eur->

[lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019XC0620\(01\)&from=EN](http://lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52019XC0620(01)&from=EN)

EU Technical Expert Group on Sustainable Finance. (2019). *Financing a Sustainable European Economy. Taxonomy. Technical Report*. Retrieved from https://www.ecologic.eu/sites/default/files/publication/2021/3567-190618-sustainable-finance-teg-report-taxonomy_en.pdf

Finans. (2021). *Det stopper ikke ved CO2: Nu kommer biodiversitet buldrende*. Retrieved from <https://finans.dk/debat/ECE13400866/det-stopper-ikke-ved-co2-nu-kommer-biodiversitet-buldrende/?ctxref=ext>

Finans Norge. (2020, January 20). Tap av natur som finansiell risiko. *Finans Norge*. Retrieved from <https://www.finansnorge.no/aktuelt/nyheter/2020/01/tap-av-natur-som-finansiell-risiko/>

Finance Denmark. (2021). *Sustainability Report 2020*. Retrieved from <https://financedenmark.dk/media/47773/finance-denmark-sustainability-report-eng.pdf>

Finnish Environment Institute. (2021). *Mitä opimme luontoarvoista?*. Retrieved from [https://www.syke.fi/fi-FI/Ajankohtaista/Uutiset/Mita_opimme_luontoarvoista\(60640\)](https://www.syke.fi/fi-FI/Ajankohtaista/Uutiset/Mita_opimme_luontoarvoista(60640))

F&C Management. (2004). *Is biodiversity a material risk for companies? An assessment of the exposure of FTSE sectors to biodiversity risk*. Retrieved from: <http://www.businessandbiodiversity.org/pdf/FC%20Biodiversity%20Report%20FINAL.pdf>

Forskningsrådet. (2020). *Empowering ideas for a better world: Strategy for the Research Council of Norway 2020-2024*. Retrieved from https://www.forskningsradet.no/contentassets/6ccb7b14c18a48ee974acd78fc64efba/strategi_2020-2024_en_utskrift.pdf

Forskningsrådet (2021): *Porteføljeplan: Landbasert mat, miljø og bioressurser*. Retrieved from <https://www.forskningsradet.no/om-forskningsradet/portefoljer/landbasert-mat-miljo-og-bioressurser/portefoljeplanen-for-landbasert-mat-miljo-og-bioressurser/>

Global Canopy. (2020). *The Case for a Task Force in Nature-related Financial Disclosures*. <https://globalcanopy.org/wp-content/uploads/2020/11/Task-Force-on-Nature-related-Financial-Disclosures-Full-Report.pdf>

Global Commons Alliance. (2021). *What are the global commons*. Retrieved from <https://globalcommonsalliance.org/global-commons/>

Grigg, A., Cullen, Z., Foxall, J., Crosbie, L., Jamison, L. & Brito, R. (2009). *The Ecosystem Services Benchmark. A guidance document*. Fauna & Flora International, United Nations Environment Programme Finance Initiative and Fundacao Vargas. Retrieved from https://www.unepfi.org/fileadmin/documents/ecosys_benchmark.pdf

G20. (2015). *Communiqué G20 Finance Ministers and Central Bank Governors Meeting 16-17 April 2015, Washington D. C., US*. Retrieved from <http://www.g20.org.tr/wp-content/uploads/2015/04/April-G20-FMCBG-Communique-Final.pdf>

Huttunen, M. (2008.) Ilmastonmuutos ja luonnonkatastrofiriskeiltä suojautuminen.

Tampere University.

Icelandic government. (2019). *Iceland's Implementation of the 2030 Agenda for Sustainable Development*. Retrieved from https://sustainabledevelopment.un.org/content/documents/23408VNR_Iceland_2019_web_final.pdf

Iceland's Ministry of Finance and Economic Affairs. (2021). *Iceland's Sovereign Sustainable Financing Framework*. Retrieved from <https://www.government.is/library/Files/Iceland%20Sovereign%20Sustainable%20Financing%20Framework.pdf>

IPBES. (2019). *Global assessment report of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*, Brondizio, E. S., Settele, J., Díaz, S., Ngo, H. T. (eds). Bonn, Germany: IPBES secretariat. Retrieved from <https://www.ipbes.net/global-assessment>

ISIS. (2004). *Are extractive companies compatible with biodiversity? Extractive industries and biodiversity*. A survey by ISIS Asset Management plc.

IUCN. (2021). The IUCN Red List of Threatened Species. Version 2021-3. Retrieved from <https://www.iucnredlist.org>

Johansson, J. (2021, May 20). *Biologisk mångfald ur ett finansierings- och investeringsperspektiv – ansvar risk och möjligheter* [Powerpoint slides]. Retrieved from <https://nmc.a.se/wp-content/uploads/2021/05/Handelsbanken-NMC-biodiversitet-20-maj-2021.pptx>

Kedward, K., Ryan-Collins, J. and Chenet, H. (2020). *Managing nature-related financial risks: a precautionary policy approach for central banks and financial supervisors*. UCL Institute for Innovation and Public Purpose, Working Paper Series. Retrieved from <https://www.ucl.ac.uk/bartlett/public-purpose/wp2020-09>

Kedward, K., Buller, A. and Ryan-Collins, J. (2021). Quantitative easing and nature loss: exploring nature-related financial risks and impacts in the European Central Bank's corporate bond portfolio. UCL Institute for Innovation and Public Purpose, IIPP Policy Report. Retrieved from <https://www.ucl.ac.uk/bartlett/public-purpose/pr21-02>

Koumbarakis, A., Hirschi, S. and Meier, K. (2020). *Nature is too big to fail. Biodiversity: the next frontier in financial risk management*. PWC and WWF. Retrieved from https://wwf.panda.org/wwf_news/?358290/Nature-is-too-big-to-fail

KPMG. (2011). *Sustainable insight – The Nature of Ecosystem Service Risks for Businesses*. Fauna & Flora International, United Nations Environment Programme Finance Initiative and KPMG. Retrieved from https://www.unepfi.org/fileadmin/documents/Sustainable_Insight_May_2011.pdf

Larsen, F. (2016). *Yleinen heikentämiskielto ennallistamisvastuun kynnyksenä*. University of Helsinki.

Mace, G.M., Barrett, M., Burgess, N.D., Cornell, S.E., Freeman, R., Grooten, M. and Purvis, A. (2018). Aiming higher to bend the curve of biodiversity loss. *Nature Sustainability*, 1(9), 448–451. DOI: <https://doi.org/10.1038/s41893-018-0130-0>

Millennium Ecosystem Assessment, (2005). *Ecosystems and Human Well-being: Opportunities and*

- Challenges for Business and Industry*. Washington, DC: World Resources Institute
- Mistra. (2021). *Aligning Markets with Biodiversity*. Retrieved from <https://www.mistra.org/wp-content/uploads/2021/06/mistra-bp-aligning-markets-with-biodiversity-2021.pdf>
- Natural Capital Coalition. (2016). *Natural Capital Protocol*. Retrieved from www.naturalcapitalcoalition.org/protocol
- NGFS. (2018). *NGFS First Progress Report*. Retrieved from <https://www.ngfs.net/sites/default/files/medias/documents/818366-ngfs-first-progress-report-20181011.pdf>
- NGFS. (2019). A call for action: climate change as a source of financial risk. Retrieved from https://www.ngfs.net/sites/default/files/medias/documents/synthese_ngfs-2019_-_17042019_O.pdf
- NGFS (2020a): *Overview of Environmental Risk Analysis by Financial Institutions*. [Online]. Network for Greening the Financial System. Retrieved from https://www.ngfs.net/sites/default/files/medias/documents/overview_of_environmental_risk_analysis_by_financial_institutions.pdf
- NGFS (2020b): *Case studies of Environmental Risk Analysis Methodologies*, [Online]. Network for Greening the Financial System. Retrieved from https://www.ngfs.net/sites/default/files/medias/documents/case_studies_of_environmental_risk_analysis_methodologies.pdf
- NGFS (2021a): *Progress report on bridging the data*. Retrieved from https://www.ngfs.net/sites/default/files/medias/documents/progress_report_on_bridging_data_gaps.pdf
- NGFS (2021b): *Biodiversity and financial stability building: the case for action*. Retrieved from https://www.ngfs.net/sites/default/files/medias/documents/biodiversity_and_financial_stability_building_the_case_for_action.pdf
- NGFS (2021c): *Scenarios in Action: A progress report on global supervisory and central bank climate scenario exercises*. Retrieved from <https://www.ngfs.net/sites/default/files/medias/documents/scenarios-in-action-a-progress-report-on-global-supervisory-and-central-bank-climate-scenario-exercises.pdf>
- NGFS (2022a): *Central banking and supervision in the biosphere: An agenda for action on biodiversity loss, financial risk and system stability*. Final Report of the NGFS-INSPIRE Study Group on Biodiversity and Stability.
- NGFS (2022b): *Statement on Nature-Related Financial Risks*. Retrieved from https://www.ngfs.net/sites/default/files/medias/documents/statement_on_nature_related_financial_risks_-_final.pdf
- Norges Bank Investment Management (2021). Biodiversity and ecosystems. Expectations of companies. Retrieved from https://www.nbim.no/contentassets/f1fa22a3a6c54ed88cf18607f75953c0/nbim_biodiversity_2021_web.pdf
- Nummela, J. (2017). Biodiversiteettiraportointi suomalaisissa pörssiyrityksissä. Tampere University.
- OECD. (2017). *The Political Economy of Biodiversity Policy Reform*, Paris: OECD Publishing. DOI: <http://dx.doi.org/10.1787/9789264269545-en>

OECD. (2021). "Biodiversity, natural capital and the economy: A policy guide for finance, economic and environment ministers", *OECD Environment Policy Papers*, 26. DOI <https://doi.org/10.1787/1a1ae114-en>

Oman, W. & Svartzman, R. (2021). Sustainable Finance: Current Needs, Measures and Impacts, *CESifo Forum*, 22(3), pp. 3-11. Retrieved from https://www.cesifo.org/DocDL/CESifo-forum-2021-3-oman-svartzman-what-justifies-sustainable-finance-measures_0.pdf

Parjanne, A. and Marttunen, M. (2021). *Luonnonmukaiset tulvariskien hallintaratkaisut Itämeren alueella*. Finnish Environment Institute. Retrieved from <https://helda.helsinki.fi/handle/10138/325482>

Regulation 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088. European Parliament, Council of the European Union. Retrieved from <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0852&from=EN>

Rekonen, J. (2016). Talvirakentamisen riskien ja kustannusten hallinta. Tampere University of Technology. Retrieved from <https://trepo.tuni.fi/handle/123456789/24586>

Rounsevell, M. D. A., Harfoot, M., Harrison, P. A., Newbold, T., Gregory, R. D. and Mace, G. M. (2020). A biodiversity target based on species extinctions. *SCIENCE*, 368(6496), p. 1193.

Saugestad, J. E. and Isciel, E. (2021, July 1). Tap av biologisk mangfold er en ny form for finansiell risiko. *Energi og Klima*. Retrieved from <https://energiogklima.no/meninger-og-analyse/kommentar/tap-av-biologisk-mangfold-er-en-ny-form-for-finansiell-risiko/>

Science Based Target Network (SBTN). (2021). *About us*. Retrieved from <https://sciencebasedtargetsnetwork.org/about-us/>

Sitra. (2021). *Uraauurtava talousraportti julki - tässä 10 + 1 asiaa, jotka siitä on hyvä tietää*. Retrieved from <https://www.sitra.fi/uutiset/uraauurtava-talousraportti-julki-tassa-101-asiaa-jotka-siita-on-hyva-tietaa/>

Sparebank1. (2020). *Aarsrapport 2019*. Retrieved from https://www.sparebank1.no/content/dam/SB1/bank/ostlandet/omoss/investor/rapporter/SB1O_aarsrapport_2019.pdf

Steffen, W., Richardson, K., Rockström, J., Cornell, S. E., Fetzer, I., Bennett, E. M., ... and Sörlin, S. (2015). Planetary boundaries: Guiding human development on a changing planet. *Science*, 347(6223). DOI: 10.1126/science.1259855

Storebrand. (2020). *Storebrand ASA. Årsrapport*. Retrieved from <https://www.storebrand.no/om-storebrand/eierstyring-og-selskapsledelse/arsrapporter>

Stortinget. (2021): *Representantforslag om oppnevning av et offentlig naturrisikoutvalg*. Retrieved from <https://www.stortinget.no/no/Saker-og-publikasjoner/Saker/Sak/?p=78775>

Suttor-Sorel, L. (2019): *Making Finance Serve Nature*. Brussels: Finance Watch. Retrieved from <https://www.finance-watch.org/wp-content/uploads/2019/05/>

Making-Finance-Serve-Nature_Finance-Watch-Report_24May2019_web.pdf

Sverdrup-Thygeson, A., Hessen, D. O., Teien, K. T. & Vandvik, V. (2021, March 26). Klimakrisen og naturkrisen må løses sammen, *NRK*. Retrieved from <https://www.nrk.no/ytring/klimakrisen-og-naturkrisen-ma-loses-sammen-1.15431412>

TCFD. (2017). Final Report: Recommendations of the Task Force on Climate-related Financial Disclosures. Retrieved from <https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-2017-TCFD-Report-11052018.pdf>

TEEB. (2007). *The Economics of Ecosystems and Biodiversity, Timeline*, Retrieved from <http://teebweb.org/about/timeline/>

TEEB. (2012). *The Economics of Ecosystems and Biodiversity in Business and Enterprise*. London and New York: Earthscan. Retrieved from <http://teebweb.org/publications/teeb-for/business-and-enterprise/>

Teknologiateollisuus ry. (2020). *Biodiversiteettiselvitys*. Retrieved from https://teknologiateollisuus.fi/sites/default/files/inline-files/Biodiversiteettiselvitys_Teknologiateollisuus.pdf

TNFD. (2021a). *Nature in scope*. Retrieved from <https://tnfd.global/wp-content/uploads/2021/07/TNFD-Nature-in-Scope-2.pdf>

TNFD. (2021b). *Proposed technical scope: Recommendations for the TNFD*. Retrieved from <https://tnfd.global/wp-content/uploads/2021/07/TNFD-%E2%80%93-Technical-Scope-3.pdf>

TNFD. (2021c). *France's Article 29: biodiversity disclosure requirements sign if what's to come*. Retrieved from: <https://tnfd.global/news/frances-article-29-biodiversity-disclosure-requirements-sign-of-whats-to-come/>

TNFD. (2022a). *The TNFD Nature-related Risk & Opportunity Management and Disclosure Framework, Beta v0.1 Release*.

United Nations. (1992). *Convention on Biological Diversity*, Preamble. Retrieved from <https://www.cbd.int/convention/articles/?a=cbd-00>

United Nations Environment Programme, UNEP Finance Initiative and Global Canopy. (2020). *Beyond 'Business as Usual': Biodiversity targets and finance. Managing biodiversity risks across business sectors*. Cambridge: UNEP-WCMC. Retrieved from <https://www.unepfi.org/publications/banking-publications/beyond-business-as-usual-biodiversity-targets-and-finance/>

United Nations Environment Programme Finance and United Nations Development Programme (UNEP Fi & UNDP). (2021). *Reporting on Nature-Related Risks, Impacts and Dependencies*. Retrieved from <https://g20sfwg.org/wp-content/uploads/2021/08/2021-UNEP-UNDP.-Reporting-on-Nature-related-Risks-Impacts-Dependencies.pdf>

University of Cambridge Institute for Sustainability Leadership (CISL). (2021). *Handbook for Nature-related Financial Risks: Key concepts and a framework for identification*. Retrieved from <https://www.cisl.cam.ac.uk/centres/centre-for-sustainable-finance/nature-related-financial-risks/download-the-handbook-for-nature-related-financial-risks>

Vainio, V. (2021). *Assessing Biodiversity Impacts on an Organizational Level – Case JYU*. University of Jyväskylä.

- World Economic Forum. (2010). *Biodiversity and business risk*. Geneva: World Economic Forum. Retrieved from <https://www.pwc.co.uk/assets/pdf/wef-biodiversity-and-business-risk.pdf>
- World Economic Forum. (2019). *The Global Risks Report 2019*, 14th Edition, Geneva: World Economic Forum. Retrieved from <https://www.weforum.org/reports/the-global-risks-report-2019>
- World Economic Forum. (2020a). *The Global Risks Report 2020*, 15th Edition, Geneva: World Economic Forum. Retrieved from <https://www.weforum.org/reports/the-global-risks-report-2020>
- World Economic Forum. (2020b). *Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy*. Geneva: World Economic Forum. Retrieved from <https://www.weforum.org/reports/nature-risk-rising-why-the-crisis-engulfing-nature-matters-for-business-and-the-economy>
- World Economic Forum. (2020c). *Embracing the New Age of Materiality Harnessing the Pace of Change in ESG. In collaboration with Boston Consulting Group*. Retrieved from https://www3.weforum.org/docs/WEF_Embracing_the_New_Age_of_Materiality_2020.pdf
- World Economic Forum. (2021). *The Global Risks Report 2021*, 16th Edition. Geneva: World Economic Forum. <https://www.weforum.org/reports/the-global-risks-report-2021>
- World Resources Institute (2003). *Millennium Ecosystem Assessment. Ecosystems and human well-being: A framework for assessment*. Washington DC: Island Press.
- WWF. (2019). *Naturrisiko Tap av naturmangfold som finansiell risiko*. Retrieved from <https://media.wwf.no/assets/attachments/WWF-2021-Bringing-It-Down-To-Earth-Nature-risk-and-agriculture.pdf>
- WWF. (2019). *The nature of risk: A framework for understanding nature-related risk to Business*. Retrieved from https://files.worldwildlife.org/wwfcmprod/files/Publication/file/8t5tn2hsfl_WWF_Nature_of_Risk.FINAL2.pdf?_ga=2.92435096.443526545.1645627526-886368921.1645627525
- WWF. (2020). *Nature is too big to fail, Biodiversity: the next frontier in financial risk management*. Retrieved from https://wwfint.awsassets.panda.org/downloads/nature_is_too_big_to_fail_en_web.pdf
- WWF. (2021). *Bringing it down to earth: Nature Risk and Agriculture*. Retrieved from https://wwf.panda.org/wwf_news/?2660466/nature-finance-risk-and-agriculture

About this publication

NATURE RISK

An analysis of use and applicability in the Nordic countries

Amalie Engelbrecht Hansen, Rikke Fischer-Bogason, Elvira Borgman, Linda Stafsing, Alexander Eriksson, Salla Hossi

ISBN 978-92-893-7373-9 (PDF)

ISBN 978-92-893-7374-6 (ONLINE)

<http://dx.doi.org/10.6027/temanord2022-547>

TemaNord 2022:547

ISSN 0908-6692

© Nordic Council of Ministers 2022

Cover photo: Rahbek Media / Unsplash

Published: 19/9/2022

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