



# **Biodiversity as decision criteria when investing in listed equity - Insights of Nordic pension investors and ESG specialists**

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<p><b>Tiivistelmä – Referat – Abstract</b></p> <p>Among financial institutions, there is a growing concern about risks in their portfolios related to biodiversity, and its closely related affiliate, climate change. Investors are demanding greater transparency and biodiversity management in order to make informed investment decisions in listed equity and to act as responsible shareholders. The aim of this thesis is to explore, from the Nordic pension investor point of view, how the risk related to biodiversity loss is assessed and managed in the financial markets.</p> <p>Following qualitative approach, primary data was collected with 14 semi-structured in-depth interviews of two target groups: pension investors in the Nordic countries and ESG specialists which refers to specialists in sustainable finance or biodiversity related sustainability fields. The results were analyzed using template analysis.</p> <p>The results show that taking biodiversity into consideration in investment processes is constantly evolving and Nordic pension investors are paying close attention to the topic. Among drivers to incorporate biodiversity into investment decision-making, risk management was the most important. ESG specialists' experience of institutional investors' means to influence biodiversity loss mitigation differed from pension investors' perspective. Nordic pension investors are not fully aware of the existing methods for analyzing the risks and impacts of biodiversity loss in their own investment portfolio. However, they are highly motivated to find reliable ways to manage portfolio risks.</p> <p>Integrating biodiversity risks and impacts into the investment process can be challenging due to a lack of investment tools and best practices. Investors are preparing for increasing statutory and voluntary regulation. Both ESG specialists and Nordic pension investors see that lack of comparable, transparent, reliable data is an essential barrier when it comes to listed-equity investments and biodiversity loss mitigation. The data available lacks financial materiality and the impacts of biodiversity loss on the real-world return expectations, and return-risk-profiles are unknown. To solve problems regarding the lack of data in general and especially transparent and comparable data, companies are expected to disclose material nature-related dependencies and impacts, and report associated metrics and targets.</p>			
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<p><b>Tiivistelmä – Referat – Abstract</b></p> <p>Luontokadon aiheuttamat riskit voivat vaikuttaa sijoittajien portfolion tuotto-odotuksiin. Sijoittajat ovat alkaneet vaatimaan sijoituskohteiltaan parempaa läpinäkyvyyttä ja biodiversiteettiriskien hallintaa, jotta olisi mahdollista tehdä rationaalisia sijoituspäätöksiä ja toimia vastuullisina omistajina. Tämä tutkielman tavoitteena on tutkia, kuinka luontokadon aiheuttamia riskejä arvioidaan ja pyritään hallitsemaan pohjoismaisten eläkesijoittajien näkökulmasta.</p> <p>Laadullisen tutkimusmenetelmän mukaisesti aineisto kerättiin 14 puolistrukturoidulla haastattelulla kahdesta kohderyhmästä: pohjoismaisista eläkesijoittajista ja ESG-asiantuntijoista. Jälkimmäinen ryhmä koostui kestävään rahoitukseen tai luonnon monimuotoisuuteen erikoistuneista asiantuntijoista. Tulokset analysoitiin teemoittain hyödyntäen laadullista sisältöanalyysimenetelmää (engl. template analysis).</p> <p>Tulosten perusteella luonnon monimuotoisuuden huomioon ottaminen sijoitusprosesseissa kehittyi, ja pohjoismaiset eläkesijoittajat ovat teemasta hyvin kiinnostuneita. Riskien hallinta nähdään tärkeimpänä ajurina luonnon monimuotoisuuden huomioon ottamiselle sijoituspäätöksissä. ESG-asiantuntijoiden ja eläkesijoittajien näkemykset institutionaalisen sijoittajan keinoista vaikuttaa luontokadon ehkäisyyn poikkeavat toisistaan. Osa pohjoismaisista eläkesijoittajista ei tunne olemassa olevia keinoja arvioida salkkujensa riskejä ja vaikutuksia luonnon monimuotoisuuteen, mutta he ovat hyvin motivoituneita löytämään siihen tehokkaita ja luotettavia keinoja.</p> <p>Biodiversiteettiriskien ja -vaikutusten sisällyttäminen sijoitusprosessiin on haasteellista, sillä keinot ja työkalut ovat kehitysvaiheessa. Sekä ESG-asiantuntijat että pohjoismaiset eläkesijoittajat kokevat suurimpana esteenä vertailtavan, läpinäkyvän ja luotettavan tiedon puuttumisen, kun noteerattujen osakesijoitusten suoriutumista arvioidaan suhteessa luontokadon ehkäisyyn. Vaikka ympäristötietoa on saatavilla hyvin, eläkesijoittajan näkökulmasta tiedon avulla on vaikea arvioida vaikutuksia tuotto-odotuksiin ja tuotto-riskiprofiileihin. Analyysin perusteella eläkesijoittajat odottavat tulevaa sääntelyä ja valmistautuvat siihen. Luotettavan ja läpinäkyvän tiedon puutteen ratkaisemiseksi sijoituskohteilta edellytetään olennaisten luontoriippuvuuksien ja -vaikutusten raportoimista niihin liittyvien mittarien ja tavoitteiden avulla.</p>			
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## List of Abbreviations

ABMB	Aligning Biodiversity Measures for Business
CBD	Convention on Biological Diversity
CFA	Chartered Financial Analyst
CISL	Cambridge Institute for Sustainability Leadership
CSRD	Corporate Sustainability Reporting Directive
ESG	Environmental, Social and Governance
FSB	Financial Stability Board
GDP	Gross Domestic Product
IPBES	The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
MPT	Modern Portfolio Theory
NCFA	Natural Capital Finance Alliance
NFRD	Non-Financial Reporting Directive
OECD	Organization for Economic Co-operation and Development
PBAF	Partnership for Biodiversity Accounting Financials
PES	Payments for ecosystem services
RI	Responsible Investment
SBTN	Science-based Targets Network
SFDR	Sustainable Finance Disclosure Regulation
SI	Sustainable Investment
SRI	Socially Responsible Investment
TCFD	Task Force on Climate-related Financial Disclosures
TNFD	Taskforce on Nature-related Financial Disclosures
UNEP- WCMC	The UN Environment Programme World Conservation Monitoring Centre
UNPRI	United Nations -supported Principles for Responsible Investment
VaR	Value at Risk
WEF	World Economic Forum
WWF	World Wide Fund for Nature

# 1 Introduction

## 1.1 The status of biodiversity

Biodiversity refers to the variety of life on Earth, including plants, animals, fungi, and microorganisms, as well as the habitats and ecosystems in which they live. The concept of biodiversity is defined by the Convention on Biological Diversity (CBD) as “*the variability among living beings from all sources including inter alia, aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species and of ecosystems*” (CBD, 2006). Biodiversity provides us with food, materials, medicines, recreation, health, and wellbeing. This is because biodiversity provides important ecosystem services: they prevent soil erosion and depletion, clean the water, pollinate the crops, filter air and water, absorb carbon, regulate the climate, provide us with medicine, and deliver many of the fundamental elements for industry (European Commission, 2020).

Biodiversity is vital for ecosystems and its ability to provide ecosystem services as it creates resilience to both external and internal change. In this context, resilience refers to the ability of species and ecosystems to respond to, and recover from, changing conditions while maintaining their well-being and productive capacity. (Pörtner et al., 2021) Biodiversity can be seen as an assurance: the larger the range of species in an ecosystem, the more likely some of them will remain viable, allowing the ecosystem to continue to function even in the event of disturbances (Pörtner et al., 2021).

According to The IPBES Global Assessment Report on Biodiversity and Ecosystem Services (2019) the health of ecosystems on which we and all other species depend is deteriorating more rapidly than ever. The report states that we are demolishing the foundations of our economies, livelihoods, food security, health, and quality of life worldwide. (IPBES, 2019b) The Dasgupta Review, published in February 2021, shows that the stock of natural capital has decreased by 40% per capita between 1992 and 2014. Thus, the interconnections between people, the planet, and the economy cannot be overlooked (Dasgupta, 2021). Natural capital refers to the world’s stocks of natural assets which include geology, soil, air, water and all living things (CDP, 2021). The hidden cost of liquidating natural capital assets is described as a constraint for long-term value generation in the Dasgupta Review (2021). According to Dasgupta (2021), there has been an institutional failure to account for the externalities nature provides. Failure to address biodiversity loss is expensive. Global estimates show that between 1997 and 2011, the globe lost USD 4-20 trillion per year in ecosystem services

due to land-cover change and land deterioration costs about USD 6.3-10.6 trillion each year. (Costanza et al., 2014; ELD Initiative, 2015). Meanwhile, inadequate ocean management (e.g., invasive marine species brought in ship ballast water, over-exploitation of fisheries, and nutrient pollution) costs at least USD 200 billion each year (UNDP and GEF, 2012). According to OECD (2019), given present trends in biodiversity loss, economic costs may continue to rise, potentially exponentially, because ecosystems are complex systems with tipping points. Failure to address biodiversity loss may jeopardize other policy goals, such as climate change mitigation, food and water security. (OECD, 2019)

## **1.2 Biodiversity and ecosystem services finance**

Viewed from a traditional economic perspective, our planet's biodiversity and natural systems are essentially a capital stock that provides a flow of ecosystem services to people (Deutz et al., 2020). Nature is the world's most important asset, as natural capital underpins all economic activities and human well-being. According to the World Economic Forum (2020), more than half of the world's GDP is moderately or highly dependent on nature and its services. This means that biodiversity loss is not only a threat to our planet but also a business risk and an investment risk. Currently, humanity's demands on natural capital are unsustainable. All economic activities both depend on and affect nature. Biodiversity loss creates physical, transitional, systemic, litigation and regulatory risks for businesses (UNPRI, 2020). The loss of biodiversity is not only generating significant risks to the economy and the financial sector but also the well-being of present and future generations. (OECD, 2021)

Climate change and biodiversity loss are currently the two biggest challenges to sustainable finance (Euromoney, 2021). The growing awareness of biodiversity loss and the rapid deteriorating of ecosystem services has highlighted the need to initiate policies and mechanisms to ensure biodiversity conservation (IPBES, 2019a). According to IPBES (2019a), it takes resources to stop environmental degradation and promote businesses and initiatives that are compatible with conservation, as well as economic initiatives to raise public and private funding to protect biodiversity. Biodiversity and Ecosystem Services Finance is the activity of raising and managing capital, as well as applying financial incentives to support the long-term management of natural capital. It refers to private and public financial resources used to conserve biodiversity, commercial investments that produce

positive biodiversity outcomes, and the value of transactions in biodiversity-related markets. (UNDP, 2018; Arlaud et al., 2018).

However, there is a large financing gap between available resources and the financial requirements needed to maintain and restore natural habitats and ecosystem functions. According to OECD (2020), global biodiversity finance is estimated at USD 78 - 91 billion per year (2015-2017 average). This consists mostly of public domestic expenses (US\$ 67.8 billion per year) and smaller contributions from international public expenses (US\$ 3.9–9.3 billion per year) and private spending on biodiversity (US\$ 6.6–13.6 billion per year). (OECD, 2020) The gap between public expenses and private spending is US\$ 63,5 billion per year at most. The urgency of the challenge with biodiversity loss will require collaboration between investors, policy makers, businesses and NGOs. Regarding international co-operation for biodiversity protection, governments at the COP15 Conference (Conference of the Parties, held in Montréal in December 2022) agreed to conserve and manage at least 30% of the world's lands, inland waters, coastal areas, and oceans under the Kunming-Montreal Global Biodiversity Framework. With a focus on areas of critical importance for biodiversity, ecosystem functioning, and ecosystem services. (UNEP, 2022b) This global meeting was expected to result in the endorsement of the post-2020 Global Biodiversity Framework, also known as the "Paris Agreement for Nature."

The finance sector is proceeding towards stricter requirements on the topic of biodiversity, and it is essential for companies that they can meet these requirements to secure loaning and other kinds of financing. According to Lammerant et al. (2021), an increasing number of businesses and financial institutions are committing to different biodiversity targets, such as 'becoming nature positive' or 'zero net loss' by a specific timeline. This reflects an increased acknowledgement of the importance of nature, which is also driven by initiatives such as the EU Taxonomy for Sustainable Finance, the EU Non-Financial Reporting Directive, and the EU Green Claims initiative. (Lammerant et al., 2021) However, these are still in a development stage.

According to Lammerant et al. (2021), financial institutions require biodiversity data solutions that enable them to report and manage their biodiversity impact. The term "impact" in the context of nature refers to changes in the state of nature, which may result in changes to the capacity of nature to provide ecosystem services. Impacts can be positive (e.g. nature restoration) or more commonly negative (e.g. a potential loss of biodiversity). They might be the direct, indirect, or cumulative



effects of an organization's actions. (SBTN, 2022) The data solutions are required to (i) be quantitative, (ii) be based on scientific approaches (iii) be focused on the most material issues, (iv) be based on available information, and (v) allow for the identification of the best and worst performers based on their impact on biodiversity as compared to businesses within the same sector, allowing investors to make financing decisions based on their performance. (Lammerant et al., 2021)

Even though biodiversity and ecosystem services relate to all economic activity, some industries are especially dependent on it. For example, the World Economic Forum (WEF) (2020) estimates that nature and the ecosystem services it offers provide USD 44 trillion in economic value, accounting for more than half of the world's GDP. Food and beverages, agriculture and fisheries, and construction are the most dependent industries, according to the World Economic Forum, and thus the most vulnerable to biodiversity loss. Despite their enormous value to society, most ecosystem services are not priced in the market since they are public commodities, resulting in externalities. An externality is a cost or benefit created by a producer that is not financially incurred or received by that producer. As a result, there are insufficient economic incentives for producers and consumers to conserve, sustainably use, and restore biodiversity. Subsidies and uncompetitive marketplaces frequently distort ecosystem services that are paid for (for example, provisioning and some cultural services). (OECD, 2021)

### **1.3 Financial solutions towards biodiversity conservation**

In Responsible Investing (RI), the investor takes into account environmental aspects, issues under social responsibility and governance issues (ESG) next to financials in such a way that the risk and return profile of the investment portfolio improves (see Section 2.1). In RI, profit and ESG issues are not set against each other. By combining both aspects, risks and opportunities related to investment targets are better identified. (Hyrskke et al., 2020) Responsible investing has traditionally been done through direct equity investments but is nowadays practiced across asset classes.

This thesis focuses on listed-equity investments only. This is because assessing biodiversity impacts and dependencies of companies, and therefore also assessing risks, is more straight forward with the existing information available in listed-equity. In addition, listed companies are required to disclose and report on more information than unlisted companies. Many future regulations will specifically apply to listed companies. Listed-equity investments are mainly made as direct investments, in which

case the investor decides on the selection of investment objects themselves, or through investment funds, in which case the fund's portfolio manager makes decisions on the selection of investment objects. In direct listed-equity investing, the investor can classify companies based on the responsibility criteria that are considered important. The shareholder can also use their ownership rights in annual general meetings and influence the company's operations. The easiest way for an investor to gather information about the responsible operation of companies is from the corporate responsibility reports published by the companies. In addition to their own studies, investors can also purchase ESG information and expertise from consultants specializing in corporate responsibility analysis. (Hyrskke et al., 2020)

There are several approaches available for an investor when considering sustainability issues through their investment activities. In listed equity, an investor can invest in responsible and sustainable development-themed funds and indices, prefer asset managers that utilize responsible investment practices, invest in responsible companies considered responsible based on the investor's analysis, avoid shares in certain companies, act as an active owner and influence the company's operations, and prefer index investments based on ESG evaluation (Hyrskke et al., 2020). Consideration of biodiversity in investments follows the process of responsible investing, and biodiversity is included in consideration of environmental issues in the ESG evaluation (see Figure 1).

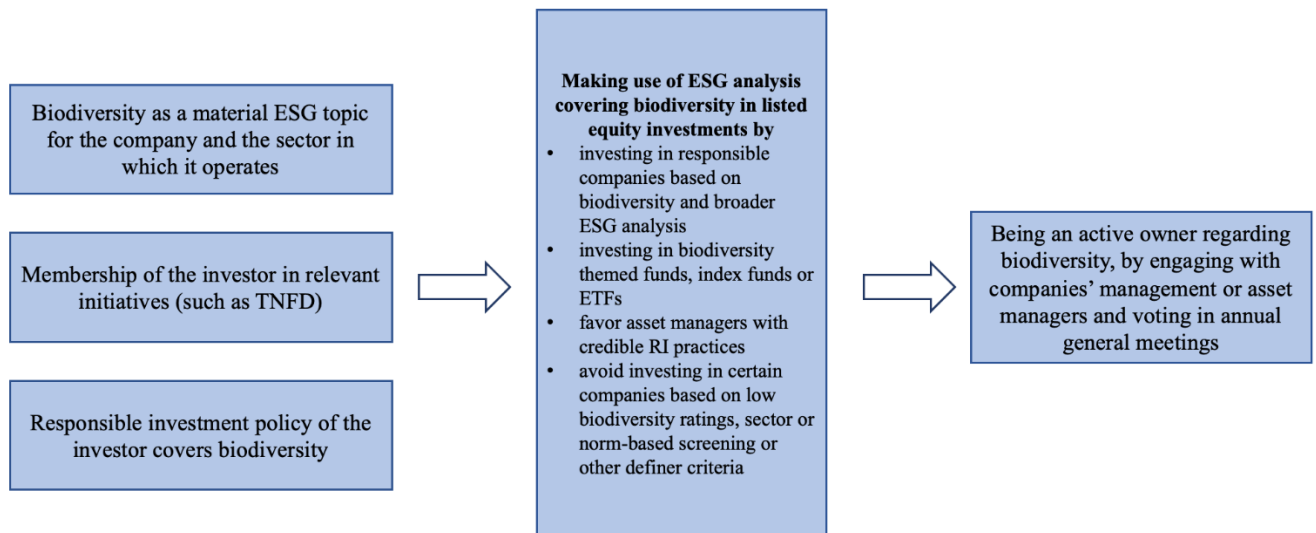


Figure 1: Potential ways for an investor to consider biodiversity in listed equity

Finance and economics are important perspectives for creating a strong business case for biodiversity investments. The number of available finance solutions is growing, and the ways in which resources

are mobilized and spent are becoming more diverse. Approaches to "blended" finance that benefit from collaborations among public, philanthropic, and private actors have become common. Nevertheless, this accounts for only a marginal part of investors and investments since blended finance is not a mainstream form of financing. The value of green finance markets is increasing, partly due to the development of green bonds and more innovative forms of venture capitalism and impact investing. (Arlaud et al., 2018) According to Tobin-de la Puente & Mitchell (2021), different mechanisms can be used in cooperation to increase biodiversity conservation outcomes. In order to include a biodiversity finance mechanism into a financial solution, conservation program criteria must be understood. In addition, planning to achieve effectiveness, scale and impact is required. (Tobin-de la Puente & Mitchell, 2021)

International and domestic public finance is the largest funding source for biodiversity conservation. Nevertheless, in recent years there has been growing interest and activity in biodiversity finance. Because of this shift, public, philanthropic and private sources of financing are no longer viewed as mutually exclusive alternatives. (Tobin-de la Puente & Mitchell, 2021) According to Tobin-de la Puente and Mitchell (2021), in addition to profitable financial returns for investors, different financial debt and equity products can be used to deliver positive biodiversity impacts. These financial products give investors a wide range of options to finance biodiversity conservation due to their different risk-return profiles. Green financial products include green bonds, green equity and green lending (sustainability-linked loans, and credit facilities) (Tobin-de la Puente & Mitchell, 2021). In addition to green financial products, there are biodiversity finance mechanisms that act as support or capital that flow towards biodiversity conservation. These include biodiversity offsets, biodiversity tradable permits, natural climate solutions and carbon markets, debt-for nature swaps, and the EU Taxonomy (see Section 2.7). (Tobin-de la Puente & Mitchell, 2021)

## **1.4 The scope and goal of the thesis**

The aim of this thesis is to gain a better understanding of the consideration of biodiversity loss when investing in listed-equity in the Nordic pension investor context. The thesis aims to explore the existing tools regarding investing in biodiversity and to look at how investors could better use them in terms of preventing biodiversity loss. In more detail, the aim is to gain a better understanding of the consideration of biodiversity loss when investing in listed equity, how biodiversity is currently measured, and what targets can be set for taking biodiversity into account in investment decisions.

This thesis aims to identify and define the gap between the current understanding and future needs on how to take biodiversity into account in investment decision-making.

The research questions of the thesis are:

- i) What is relevant for institutional investors in analyzing biodiversity risks of stock-listed companies? How do ESG specialists see the relevancy of biodiversity as part of institutional investors' investments?
- ii) How to develop the current tools for institutional investors to better take biodiversity into account in investment decisions?

The data are gathered by interviewing two target groups. Both Nordic pension investors and ESG specialists are interviewed on the topic of how biodiversity is assessed, and the interviews provided insights into both research questions. The first target group represents ESG specialists, and the second target group represents pension investors in four Nordic countries. The focus is on pension investors providing mandatory pension insurance and on listed equity investments.

This thesis was carried out in co-operation with Mutual Pension Insurance Company Varma and Gaia Consulting Oy. Varma is the second largest mutual pension insurance company in Finland, with a 50 billion investment portfolio. Gaia is a sustainable business consulting company that supports organizations in the green transition towards responsible growth.

## **2 Literature Review - Investors and biodiversity**

### **2.1 Responsible investing**

In recent years, there has been a rapid increase in investments that consider environmental, social and governance (ESG) investing in their decision-making (Mori & Mader, 2021). According to Finland's Sustainable Investment Forum (Finsif), responsible investment refers to environmental issues (E), factors related to social responsibility (S) and governance issues (G) - i.e. the so-called Consideration of ESG (Environment, Social and Governance) issues - in investment activities so that the return and risk profile of the portfolio is improved. The term Responsible Investment can be used interchangeably with sustainable investment and socially responsible investment, among other terms, while acknowledging that there are differences and regional variations in its interpretation and use (GSIA, 2020). Responsible Investment (RI), also known as Socially Responsible Investment (SRI) or Sustainable Investment (SI) in the academic literature, is accomplished through investment screening, engagement with companies, shareholder activism, community investing, and social venture capital funding. This thesis focuses on the environmental issues of ESG and delves into a specific environmental topic: biodiversity loss.

In listed-equity investments, investors invest in organizations and thus are shareholders. “Environment” covers how organizations impact, and are impacted by, environmental issues like biodiversity. Climate change reporting is quickly becoming commonplace. Global reporting standards are emerging, backed by international agreements on underlying climate policy. Beyond climate, the data required to support broader environmental goals is less developed. However, this is changing thanks to initiatives such as the Task Force on Nature-related Financial Disclosures (TNFD). (HM Government, 2021) “Social” factors range from modern slavery to worldwide development. Investors have historically considered these issues in their investment decisions, and many actively engage with investee companies on these issues. Globally agreed reporting standards may take longer to evolve, although existing frameworks may serve as a foundation for future global standard setting. “Governance” refers to how a firm is controlled and directed, most commonly through a Board of Directors. It is the most established sector for investor involvement, and corporations already give considerable transparency through current company law and other requirements. (HM Government, 2021)

There is no one-size-fits-all approach to responsible investing, and each investor chooses the right tools for their own investment strategy. An investor can consider ESG issues in their investment activities based on different approaches (see Section 1.3) and responsible investment is possible in all types of assets (Finsif, 2021).

ESG issues are perceived as useful in risk management and investors require clarification on how responsibility issues are considered in business and investment decisions. The combination of ESG issues, return and risk can be described as an equilateral triangle where all three factors are equally important. All sides of the triangle are needed for a balanced result, and none of them is more important or weaker than the others (Hyrskel et al. 2020). “Fiduciary duty” can be explained as the responsibility of the investor – both asset owner and institutional investor - towards its clients and beneficiaries. In academic studies, there has been reflection on whether responsible investing is in line with the fiduciary duty of institutional investors. The background to this consideration is that institutional investors should act in accordance with the interests of their clients and beneficiaries, which has typically been seen as seeking the best return. According to the views of Finnish and Dutch pension investors and asset managers, responsible investing is in line with fiduciary duty. (Hyrskel et al., 2020) Asset owners are under pressure to answer stakeholder questions about the responsibility of investing. In order for investors to understand how companies operate in different areas of responsibility, corporate reporting requirements have increased (Puttonen & Puttonen, 2021).

## **2.2 Financial risks from biodiversity loss**

Managing risk is important for investors. The World Economic Forum has identified biodiversity loss to be the third most severe risk for the next decade (World Economic Forum, 2022). Biodiversity loss and its implications for the real economy are well known. Nevertheless, the financial risks emerging from biodiversity loss are still not sufficiently understood. (PwC, WWF, 2020) According to OECD (2019), businesses, banks and investors are likely to be facing financial risk. These include: insurance risks (such as those associated with increased insurance premiums due to biodiversity loss); access to capital (due to a higher cost of capital, or stricter lending requirements based on adverse impacts or dependencies on biodiversity); and loss of investment opportunities as investors increasingly incorporate biodiversity into their investment strategies (Girvan et al., 2018). As environmental hazards to businesses increase, businesses and financial institutions may face asset

depreciation, such as in agricultural and food production (Caldecott and McDaniels, 2014). The risk of "stranded assets" due to regulatory or market risk is expected to be lower in the case of biodiversity than in the case of climate change.

According to the IPBES (2019b), there are five direct drivers of global biodiversity loss, and two indirect drivers (IPBES, 2019b). These five main drivers are: changing use of sea and land, direct exploitation of organisms, climate change, pollution, and invasive non-native species. The identified indirect drivers are disconnect of humans with nature and lack of value and importance of nature.

Bassen et al. (2019) concluded an academic literature review and found that nature loss translates to financial risks (Bassen et al., 2019). In addition, The Dasgupta Review (2021) describes the hidden cost of liquidating natural capital assets as a constraint for long-term value creation. The loss of biodiversity creates risks for societies and businesses that can result in significant negative economic and social outcomes (see Figure 2). Taking action on biodiversity, in turn, opens up new possibilities. (UNPRI, 2020)

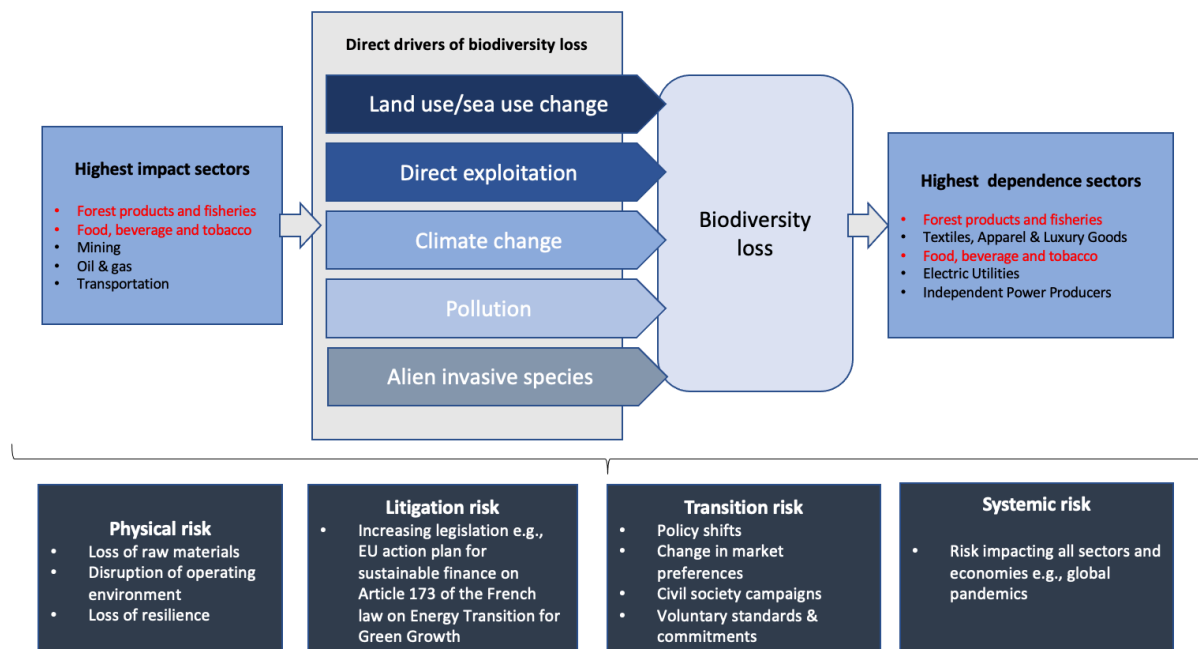


Figure 2: Nature loss, risk and implications for investors. Source: UNPRI, 2020

A report published by PwC Switzerland and WWF Switzerland (2020) suggests a typology of four financial biodiversity-related risks: physical, transition, litigation and systemic risks. PwC Switzerland and WWF Switzerland (2020) and the University of Cambridge (2021) elaborates the risks as following:

**Physical biodiversity risks** arise from material deconstruction that cause direct economic and financial losses (PwC & WWF, 2020). Much of global economic activity is dependent on natural system functioning, such as climatic stability and raw material generation. Physical risks develop when these natural systems are harmed as a result of the influence of climatic or geologic events, or when broad changes in ecosystem equilibrium, such as soil quality or marine ecology. Physical risks may be event-driven or longer-term in nature. (CISL, 2016) The primary concern is the disruption of ecological equilibria and the consequent deterioration of ecosystem services. Deforestation, for example, could diminish local rainfall, increasing operational expenses in a variety of industries. (CISL, 2021)

**Litigation risks** are created by the litigation and breach of underlying legal frameworks and changing regulation such as the European Union's action plan for sustainable finance (PwC & WWF, 2020; UNPRI 2020). According to CISL (2021), the risk connected with emerging legal cases related to biodiversity loss, which could arise if parties that suffer loss or damage from the effects of environmental change seek compensation from those they hold accountable. Potential pay-outs, fines, legal and administrative costs, insurance costs, finance charges, and reputational costs are examples of losses or damages (CISL, 2021). New regulatory frameworks create limitations on investing in activities that have an impact on biodiversity (UNPRI 2020).

**Transition risks** apply to companies to whom transition to an economy that conserves and restores biodiversity creates risks. Transition risks can be long-term price increases due to biodiversity change or increased taxes related to negative impacts on biodiversity. (PwC & WWF, 2020) These include the adoption of legislative policies in a haphazard or disorderly manner, technology innovations, shifts in consumer or investor sentiment, and disruptive business model innovation (CISL, 2016). These risks are highly linked to the process of adjustment towards a nature-positive economy. (CISL, 2021)



**Systemic risks** are risks threatening all sectors and economies e.g., global pandemics (PwC & WWF 2020; UNPRI, 2020). Systemic risk refers to market-threatening effects from biodiversity loss globally or regionally. In addition, it may also mean operational risks to businesses across the economy or reputational loss for entire industries (UNPRI, 2020).

Certain financial industry returns are linked to nature via the economic activities they support. Entities that directly or indirectly rely on nature for production inputs such as raw materials, water, energy, or pollination rely on the services provided by the financial industry. (Natural Capital Finance Alliance [NCFA], 2019). When these entities are impacted by nature risks, it has an impact on the financial industry as well. The occurrence of nature risks imposes cost on these entities, and because they depend on services from the financial industry, the risks are interconnected. In addition, businesses that depend on nature can also jeopardize nature with their activities. (Bassen et al., 2019)

Currently, financial institutions are looking for ways to integrate biodiversity into their risk assessments. The CISL Handbook on Nature-related Financial Risks and subsequent use cases (CISL 2022) provides the context for taking the first steps toward integrating nature-related risks into financial decisions. Nature-related risks refer to potential threats posed to an organization linked to its and other organizations' dependencies on nature and nature impacts. These may result from physical, transition and systemic risks. (CDSB, 2021) According to CISL (2022), to accelerate nature integration, it would be vital to: *“1) Broaden the environmental risk remit to include both nature and climate considerations, 2) Improve supply chain transparency – it remains too challenging to accurately identify risks along value chains, 3) Create tools to automate risk assessment – use cases are too time-consuming to replicate at pace, 4) Include nature in portfolio company engagement – with insufficient public data to validate nature-related assessments, conversations with portfolio companies are required, 5) Generate more open-access environmental data – intelligence about nature-related risks needs to be economy-wide, otherwise smaller companies risk being more exposed and any transition to nature-positive not inclusive, and 6) Onboard and support motivated risk analysts – without an active mindset and appropriate time and expertise, the integration of nature into financial models will not be possible”* (CISL, 2022. p. 17). Most importantly, analyzing nature-related risks demands the allocation of dedicated resources that recognize the scale of the financial materiality of nature loss (CISL, 2022).

### **2.3 Investor action on biodiversity**

The field of responsible investing has developed rapidly in recent years and there has been a significant increase in investments activities that take into consideration environmental, social and governance (ESG) issues (Hyrskke et al., 2020). As mentioned in Section 2.1, biodiversity is included in “E” that covers how organizations impact, and are impacted by, environmental issues. Global biodiversity finance needs are in the order of \$150–\$440 billion per year (CBD, 2012; IPBES, 2019), some three to eight times the current best estimate of global biodiversity finance investments (Parker et al., 2012). According to Seidl and Nunes, to realize these goals, a shift is required towards new investment and fiscal policy paradigms that better incorporate the economic value of biodiversity via ecosystem services on supporting sustainable development. (Seidl & Nunes, 2019)

There is a growing concern among investors and financial institutions about emerging risks in their portfolios related to biodiversity (UNPRI, 2020). Investors are demanding greater transparency and biodiversity management in order to make rational investment decisions. This may be because investors and financial institutions are becoming more aware of the important links, synergies and trade-offs between climate change and biodiversity. (Mori & Mader, 2021) Even though investors are focusing more on climate change and climate risk, interest in biodiversity dependencies, natural capital risk and negative impacts that these risks have across supply chains are also increasing (Tobin-de la Puente & Mitchell, 2021). Both climate change and biodiversity loss have a significant impact on businesses, and many businesses cannot be environmentally and financially sustainable without dealing with these two issues properly (Mori & Mader, 2021). The main driver of public and private collaboration in developing solutions to this issue is the recognition of the risks associated with global biodiversity loss and the resulting impacts (Tobin-de la Puente & Mitchell, 2021). In light of this, investors and financial institutions are beginning to take biodiversity into account in their investment decision-making. (Mori & Mader, 2021)

According to the OECD, natural capital refers to natural assets that serve as natural resource inputs and environmental services for economic production. Biodiversity, defined as the diversity of all living organisms at genetic, species and ecosystem level, is the living component of natural capital stock (CBD, 2006). According to Deutz et al. (2020), natural capital is complex and difficult to measure. Natural capital is not valued by financial markets unless it has a defined cash flow or asset value that can be measured by current economic systems. Consequently, the full value of using and the costs of destroying, natural systems are not sufficiently understood. (Deutz et al., 2020) Considering natural capital in investment activities can be seen to have similar characteristics to

considering biodiversity in investments. Investors evaluate the risks related to their investments through the criteria they have chosen, which can be seen to be largely coherent regarding both biodiversity and natural capital.

Because of the pressure from the financial sector and different initiatives, the private sector is increasingly looking for methodologies, tools and metrics to credibly measure its footprint and dependence on nature. However, measuring and valuing both impacts on biodiversity and natural capital and risks for an investor is a great challenge. Businesses are having difficulty identifying approaches to measuring their biodiversity performance that are both practical and pragmatic, as well as meaningful and relevant. Thus, investors do not have enough information and suitable metrics to take biodiversity into account in their listed-equity investments. Therefore, financial institutions are also looking for effective ways to evaluate the biodiversity performance (in terms of impacts, dependencies, and risks) of their investment portfolios and financing activities. (Lammerant et al., 2021)

Despite challenges in the models and instruments used to calculate the value of natural capital, several studies point to its entire potential value. According to Deutz et al. (2020), the loss of all pollinators on a global scale would result in a \$217 billion reduction in annual agricultural output. Recent climate research has shown a value of up to US\$ 600 per ton of CO<sub>2</sub> captured, implying a value of more than US\$ 100 trillion for forests alone in their role as carbon sinks. Approximately one-third of today's medications were discovered in plants and other natural sources or were synthesized from naturally existing chemicals. (Deutz et al., 2020)

According to Deutz et al. (2020), while these estimates show that biodiversity has a potentially enormous societal worth, a major challenge is that for every contribution to nature that can be assessed in monetary terms, there are many more that cannot. In other words, there are "partly known unknowns" and "unknown unknowns" when calculating the cost of biodiversity loss for the society. Given this lack of precision, any assessment of the economic cost of biodiversity loss, even if based on the worst-case scenario, is likely to underestimate the true cost. (Deutz et al., 2020)

## **2.4 Pension investors as institutional investors**

Pension funds (later referred as pension investors) are “financial intermediaries which offer social insurance by providing income to the insured persons following their retirement” (European Central Bank, 2022). According to the European Central Bank (2020), Pension investments are crucial to the

economy. They invest pension savings in financial and non-financial assets with the goal of transforming those assets into post-employment income at a later stage. Furthermore, those investments contribute to economic innovation and growth. In addition, pension investors play a role in financial markets as institutional investors. Institutional investors, in addition to pension funds, include insurance companies, sovereign wealth funds, savings institutions, endowments, and foundations (OECD, 2014). Pension investors are one of the biggest asset owner groups globally. Assets in retirement savings plans grew in 2020, surpassing USD 56 trillion globally at year's conclusion and representing an 11% rise over 2019 figures (OECD, 2021b). According to the European Central Bank (ECB), in terms of financial assets and as a share of GDP, pension investors have increased significantly in the euro area over the past 20 years. Since 2008, euro area pension investments have nearly quadrupled in size, with total assets now approaching €3 trillion and their share relative to euro area GDP nearly doubling from 13% in 2008 to 25% in 2019. (European Central Bank, 2022) In comparison, pension fund assets to GDP (%) in Finland was reported at 64.44 % in 2020, according to the World Bank. The corresponding percentages in the Nordic countries are the following: 109 % in Sweden (2020), 12,34 % in Norway (2020), 37,81 % in Denmark (2019) and 173 % in Iceland (2019). (The World Bank, 2020)

According to the European Central Bank (2022), pension investors are among the most significant and fastest-growing investors in global financial markets. Their investments vary in terms of financial instruments, industries, and geographic location. Their role in funding governments and non-financial companies through debt and equity investments in the euro area is also increasing. According to Sethi (2005), responsible investment is the greatest option for pension investors since it may play a vital role in enhancing the overall quality of corporate behavior in society. Moreover, Sethi (2005) observes that pension investors broaden their investing approach by considering long-term risks such as environmental protection and sustainability in companies. According to Juravle and Lewis (2009), this could be because pension investors are more visible to the public and less affected by conflicts of interest, such as those between the pension fund's sponsoring corporation and ethical opinions. In addition, pension investors appear to be pioneers and the most active in pension fund responsible investment (Sethi, 2005). In the context of this research, it is good to understand that pension investors do not invest solely to make an impact, but they are regulated to invest profitably and securely since it is their primary task to secure future pension payments.

## **2.5 Measuring biodiversity and existing measurement approaches**

Measuring and assessing biodiversity risks for investors requires an understanding of the links between business, changes in biodiversity and the costs, harms and/or benefits, which may arise. The measurement and valuation process will also vary depending on whether the objective is to assess the value of biodiversity to individuals and society, the economic value of ecosystem services or the value of activities through opportunity costs. (Natural Capital Coalition, 2018)

The need for measurable and comparable data on biodiversity for investors to use is critical. The landscape of biodiversity data sources and biodiversity measurement methodologies for businesses and financial institutions is rapidly evolving (Lammerant et al., 2021). An increasing amount of accounting approaches and methodologies, together with several metrics or indicators, are available for both investors and businesses to measure their dependencies and impacts on biodiversity (Lammerant et al., 2019; Berger et al., 2018; Lammerant et al., 2018). Currently, pension investors are looking for ways to analyze biodiversity risk and to understand the impacts of biodiversity loss for their investments. Nevertheless, according to UNPRI (2020), biodiversity-related risks and opportunities are often evaluated using a combination of in-house ESG methodologies and information obtained from third party data providers. This can result in the information available reflecting more the quality of management responses, as opposed to actual biodiversity impacts. Hence, to facilitate the incorporation of biodiversity criteria into investment decision making, additional metrics are required. (UNPRI, 2020)

Alignment between measurement approaches is evolving. A major reason for this are efforts such as the Common Ground paper on biodiversity footprint methodologies in the finance sector by ASN Bank, CDC Biodiversité, Actiam and Finance in Motion (Berger et al., 2018). In addition, the Aligning Biodiversity Measures for Business (ABMB) initiative has an impact on the increasing alignment between measurement approaches. (Lammerant et al., 2021) Both these contributed by creating a common understanding of several key concepts, including, for instance, business applications, organizational focus areas, boundaries of measurement, required data inputs, aggregation potential. Having a common understanding of the key concepts is essential both in decision making and when selecting tools which fit best for a company's particular context. (Lammerant et al., 2021)

However, aligning measurement approaches for biodiversity needs further development. Examples of issues which need to be solved are common understanding of biodiversity targets such as 'nature

positive’, agreement on minimum requirements in terms of biodiversity scope (e.g. only measuring habitats and species or also measuring ecosystem services and what defines this scope), and agreeing on more standardized approaches for biodiversity accounting. (Lammerant et al., 2021) The recently launched ALIGN project, funded by the European Commission and led by the World Conservation Monitoring Centre (WCMC) Europe, the Capitals Coalition, Arcadis, ICF and UNEP-WCMC, will continue resolving these issues. It is aiming to streamline and strengthen methods and metrics for measuring the biodiversity impacts and dependencies of businesses and financial institutions (The Capitals Coalition, n.d.).

Current methodologies and indicators are applicable to different segments of the value chain and organizational levels, such as products and services, projects, locations, supplier choices, corporates and portfolios, according to ongoing work by UNEP-WCMC and the EU B@B Platform. Existing measurement approaches aid businesses and investors in evaluating biodiversity performance for a variety of purposes, including strategy, risk management, impact assessment, transparency, and due diligence. (OECD, 2019) The term "measurement approach" refers to a method for assessing the impact generated by an organization (Lammerant et al., 2021). Measuring approaches rely on a combination of data collection, measurement, and valuation procedures, as well as the right interpretation to make outcomes accessible for decision-making. The landscape for businesses and financial institutions is continuously changing, in terms of both biodiversity data sources and biodiversity measuring approaches. (Lammerant et al., 2021)

Tools exist to map exposure to biodiversity-related risks and dependencies across portfolios. In addition, there are tools available that identify the impact of financed companies on nature, thereby indicating exposure to nature-related transition risks. In October 2021, the Finance for Biodiversity pledge published a guide on biodiversity measurement approaches that covers six measurement approaches and a description of the selection criteria used to support selecting a measurement approach, that are presented below. In addition, more tools exist to identify the impact of financed companies on nature thereby indicating exposure to nature-related transition risks. The guide includes only biodiversity impact measurement approaches that “1) *are relevant to, and are currently explored or used by, the financial sector, 2) include all main drivers of biodiversity loss, and 3) are scientifically robust*” (Finance for Biodiversity, 2022. p.4).

The following measurement approaches meet these criteria and are included in the guide:

- CBF – Corporate Biodiversity Footprint (Iceberg Datalab and I Care Consult as scientific partner)
- BFFI – Biodiversity Footprint Financial Institutions (CREM and PRé Sustainability, together with ASN Bank)
- STAR – Species Threat Abatement and Restoration (IUCN)
- GBSFI – Global Biodiversity Score for Financial Institutions (CDC Biodiversité)
- BIA-GBS – Biodiversity Impact Analytics powered by the Global Biodiversity Score
- ENCORE – Exploring Natural Capital Opportunities, Risks and Exposure (UNEP-WCMC, UNEP FI & NCFA)

These are presented in Appendix 1, which further includes the Partnership for Biodiversity Accounting Financials (PBAF). For further details about tools available, see the EU Business@Biodiversity Guide (Finance for Biodiversity, 2022).

In addition to the tools describes above, the University of Cambridge Institute for Sustainability Leadership (2022) presents measurement tools that measure nature-related risks across portfolios, including Moody’s Environmental Heat Map, which indicates the exposure of rated debt to nature-related risks, and SASB’s materiality map flags sectors exposed to environmental issues, such as wastewater management. Tools are also available to identify how financed companies impact the environment, suggesting exposure to transition risks associated with the environment. Figure 3 presents measurement tools according to whether it measures impacts, dependencies, or both.

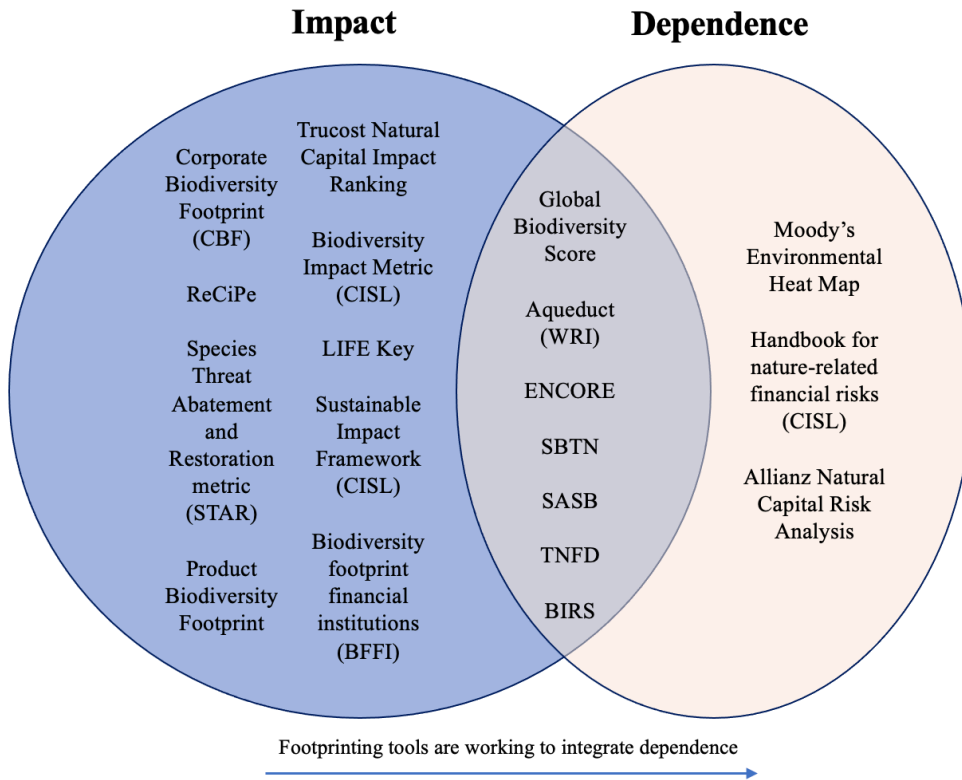


Figure 3. Summary of tools measuring the impact and dependence on nature. Source: CISL, 2022.

## 2.6 Biodiversity related regulations and frameworks

In its Biodiversity Strategy for 2030 and the Green Deal, the European Union has committed to a biodiversity recovery strategy. The EU Biodiversity Strategy for 2030 is a “comprehensive, systemic and ambitious long-term plan for protecting nature and reversing the degradation of ecosystems.” It is an essential part of the European Green Deal and of the EU’s leadership on international action for global public goods and sustainable development goals. (European Commission, 2020) According to the European Commission (2020), the 2030 Biodiversity Strategy is built on three pillars: i) protecting and restoring nature in the EU, through establishing a cohesive and effective network of protected areas and recovering degraded habitats; ii) enabling transformative change by a new governance framework to ensure shared responsibility and ownership by all key actors in meeting the biodiversity commitments, including creating financial opportunities; and iii) adopting an ambitious global biodiversity agenda that increases the EU's contribution to preventing the loss of biodiversity globally and minimizes the impact of EU resource use and consumption on other biodiversity-rich regions of the planet (European Commission, 2020).



The UN Convention on Biological Diversity has aimed to strengthen biodiversity since 1993 worldwide. The aim has been to halt biodiversity loss, first by 2010 and then by 2020. However, these targets have failed to be achieved. The first phase of the 15<sup>th</sup> meeting of the parties to the CBD, COP15, was held in October 2021. The parties negotiated the Kunming Declaration outlining a framework to stop biodiversity loss (UNEP, 2021). The framework defines the main goals and measurable objectives for protecting and revitalizing natural diversity. A new framework was prepared because the validity period of the current Aichi goals ended in 2020. The new goals are referred to as the Post-2020 Framework (Post-2020 Biodiversity Framework) (UNEP, 2021). The COP15 ended on 19 December 2022, in Montreal, with a landmark agreement to guide global action on nature through to 2030. As a result of the COP15, the Kunming-Montreal Global Biodiversity Framework (GBF) was adopted. The plan contains concrete measures to stop and back-pedal nature loss protect indigenous rights. To name a few, by 2030, 30 % of the planet and 30 % of degraded ecosystems must be put under protection, annual international financial flows from developed countries must be increased to at least US\$ 30 billion and limit the loss of areas of high biodiversity value and ecological integrity to near zero. Moreover, the plan calls for at least USD 200 billion in investment for biodiversity from public to private sources per year. (UNEP, 2022b)

Regarding sustainable finance, financial institutions play a major role in transitioning into a sustainable economy. The European Commission highlights that this transition is possible only by allocating private capital to sustainable investments by publishing their action plan “Financing Sustainable Growth” (EU Commission, 2018). According to the EU Commission, this Action Plan on Sustainable Finance has three goals: “*i) To reorient capital flows towards sustainable investment in order to achieve sustainable and inclusive growth; ii) To manage financial risks stemming from climate change, environmental degradation, and social issues; and iii) To foster transparency and long-termism in financial and economic activities*” (EU Commission, 2018. p. 2).

Moreover, in recent years, there has been a rise in awareness of, and action on, financial risks associated with biodiversity loss, leading to the establishment of frameworks or standards that are intended to create more systematic and at scale information on nature-related impacts and dependencies. Those initiatives include the Science-based Targets Network (SBTN), the EU Align project, the EU Taxonomy, the Partnership for Biodiversity Accounting Financials (PBAF) and, most recently, the Taskforce on Nature-related Financial Disclosures (TNFD). (UN Environment Programme, 2022a). In addition, the European Union is integrating biodiversity into its sustainability

reporting initiatives. The Sustainable Finance Disclosure Regulation came into force on March 10, 2021. It requires asset managers to report the sustainability risks of their investment, which includes specific metrics for biodiversity. (Euromoney, 2021) As a part of the European Green Deal, The Corporate Sustainability Reporting Directive (CSRD) is an EU legislation which requires certain large companies to publish regular reports on their environmental and social impact activities in line with the comprehensive set of disclosure guidelines created by the European Financial Reporting Advisory Group ("EFRAG"). (Directive (EU) 2022/2464)

## **EU Taxonomy**

Regarding EU Sustainable Finance, in July 2018, the European Commission established a Technical Expert Group on Sustainable Finance (TEG), with a diverse group of participants from academia, business, and the finance sector as well as members and observers from EU and international public bodies. One of the TEG's four mandates was to create a unified, clear, and detailed EU classification system for sustainable economic activities: the EU Taxonomy (TEG European Commission, 2020). The EU Taxonomy is a tool which helps investors to understand whether an economic activity is environmentally sustainable, and to navigate the transition to a low-carbon economy (TEG European Commission, 2020). The EU Taxonomy could play an important role in helping the EU scale up sustainable investment and implement the European Green Deal. The taxonomy would provide a common language between companies, investors and policymakers with appropriate definitions for which economic activities can be considered environmentally sustainable (TEG European Commission, 2020).

The six environmental goals pursued by the EU Taxonomy are as follows: “(1) *climate change mitigation*, (2) *climate change adaptation*, (3) *sustainable use and protection of water and marine resources*, (4) *transition to a circular economy*, (5) *pollution prevention and control*, and (6) *protection and restoration of biodiversity and ecosystems*” (TEG European Commission, 2020. p. 2). According to the taxonomy, an economic activity is considered environmentally sustainable if it (i) contributes significantly to at least one of the six environmental objectives; (ii) adheres to the principle of "Do No Significant Harm" to any other environmental objectives; and (iii) complies to minimal social safeguards (Lucarelli et al., 2020; UNPRI, 2020).

## **Taskforce on Nature-related Financial Disclosures (TNFD)**

The Taskforce on Nature-related Financial Disclosures (TNFD) is a global initiative that began in 2021 with the goal of developing a risk and disclosure framework which requires businesses to both disclose and act on changing natural-risk and opportunity scenarios (UNEP, 2022a). According to the UN Environment Programme (2022), it is anticipated to support a change in the direction of global financial flows, moving them away from negative outcomes and toward positive outcomes in terms of nature (UNEP, 2022a). TNFD's predecessor, the Task Force on Climate-related Financial Disclosures (TCFD). The TCFD was established in 2015 by the Financial Stability Board (FSB) and it aimed to encourage corporate disclosure of information on the financial implications of climate change (TCFD, 2017). The TNFD will not develop a new disclosure standard but will instead establish and support the adoption of an integrated risk management and disclosure framework that brings together the best tools and resources. Opposed to developing dedicated nature-only risk management and reporting, the TNFD actively promotes integrated climate and nature-related risk management and disclosures. (UN Environment Programme, 2022a)

The TNFD definition for nature-related opportunities is two-fold. They might be activities that create positive outcomes for financial institutions or corporates by avoiding or reducing impact on nature or activities that contribute to nature's restoration. (TNFD, 2022) Nature-related opportunities can occur: *"i) when organisations mitigate the risk of natural capital and ecosystem services loss; and, ii) through the strategic transformation of business models, products, services and investments that actively work to halt or reverse the loss of nature, including the implementation of nature-based solutions or support for them through financing or insurance"* (TNFD, 2022. p. 88). Similarly, nature-related risks are defined by TNFD as potential threats that an organization may face as a result of its and other organizations' reliance on nature and the effects of nature (TNFD, 2022).

According to TNFD (2021), investors benefit from the TNFD's framework by being able to make informed investment decisions. With the help of the framework, investment decisions can be transparent and reliable in terms of natural capital and environmental opportunities, and risks disclosed by a company. This results in analysts being to use environmental and natural capital-related data in determining potential revenue and, ultimately, company valuations. (TNFD, 2021) From a company point of view, according to TNFD (2021), companies can gain perspective of how climate change and natural capital can affect their performance and the necessary next steps they can take to

address the risks and opportunities by incorporating environmental and natural capital data in mainstream financial reports with climate data (TNFD, 2021; UNEP-UNDP, 2021).

### **Sustainable Finance Disclosure Regulation (SFDR)**

In 2018, as part of the action plan on financing sustainable growth, the European Commission proposed for a regulation on disclosures relating to sustainable investments and sustainability risks. (European Commission, 2021) Sustainable Finance Disclosure Regulation (SFDR) strives to make financial product sustainability profiles more comparable, transparent, and understandable to investors (Regulation (EU) 2019/2088). The regulation requires financial market participants to disclose how sustainable development has been addressed in the investment activities of financial products in pre-contractual information, web pages and periodic reporting.

The SFDR is a reaction to the lack of transparency and standardized criteria in sustainable financing. Comparing financial products in different countries in the European Union has been challenging. (Regulation (EU) 2019/2088) It has been necessary to focus on existing barriers, develop standardized frameworks, and so increase the comparability and transparency of financial products. The classification of financial products is one of the most significant elements of the SFDR for an investor. (Regulation (EU) 2019/2088). According to the European Commission, this initiative states that institutional investors and asset managers have a responsibility to consider the materiality of sustainability factors and therefore aims to improve financial stability and asset pricing.

The EU SFDR requires asset managers and investment advisers to make detailed firm-level disclosures on how they address two major considerations: Sustainability Risks and Principal Adverse Impacts (PAI). Furthermore, the SFDR attempts to assist investors in making product selections by categorizing funds into three broad categories based on the degree to which sustainability is a priority. Each category must also have binding investment requirements and specific disclosures. The categories align to Articles 6, 8 and 9 within the SFDR, namely, strategies that integrate environmental, social and governance (ESG) considerations into the investment decision making process (Article 6), promote social and/or environmental characteristics (Article 8) or have a sustainable investment objective (Article 9) (Regulation (EU) 2019/2088).

## **Corporate Sustainability Reporting Directive (CSRD)**

As a part of the European Green Deal, The Corporate Sustainability Reporting Directive (CSRD) is an EU legislation which requires large companies to publish reports on their environmental and social impact activities (European Commission, 2021). The CSRD is a continuum to the existing Non-Financial Reporting Directive (NFRD) adopted in 2014, which covers approximately 11 700 large companies and groups across the EU, including listed companies, banks, insurance companies and other corporations classified as public-interest entities by national authorities. They have had to publish non-financial information related to environmental issues and social issues. Social issues include such as treatment of employees, respect for human rights, anti-corruption and bribery and diversity on corporate boards (in terms of age, gender, educational and professional background). (European Commission, 2021) The proposal for the CSRD is planning to “1) *extend the scope of the reporting requirements to additional companies, including all large companies and listed companies (except listed micro-companies); 2) to require assurance of sustainability information; 3) to specify in more detail the information that companies should report, and require them to report on their taxonomy alignment by using mandatory EU sustainability reporting standards, and 4) to ensure that all information is published as part of companies’ management reports, and disclosed in a digital, machine-readable format*” (European Commission, 2021. p.5).

### 3 Theoretical and analytical framework

This third chapter presents the theoretical background of the research. The environmental system and the economic system are inextricably connected. The natural environment offers resources, ecological services, and amenity benefits to the economy. However, economic production can cause environmental damage. Investors must take into account various sustainability factors in order to make coherent investment decisions and manage the risk-profit profile of their investment portfolios. As the theoretical and analytical framework for this thesis, the market failure, responsible investing and investment risk are presented.

#### 3.1 Market failure

The theory of externalities is in the core of environmental economics. In 1920, Arthur Pigou noted that externalities act as a barrier to achieving equilibrium in the market. (Pigou, 1920) *Externalities arise when actors (producers, consumers, or governments) do not place all the unintended external (indirect) effects on other market participants.* (Hanley, Shogren, & White, 2001, p. 15; Ziolo, et al., 2019) For instance, in the case of a negative externality, such as biodiversity loss due to some economic activity, there is a welfare loss due to the inability of the market price to capture the true social cost. In turn, a positive externality occurs when the market action of an agent presents a benefit to another agent. According to Ziolo et al. (2019) the decisions aiming to satisfy the needs of the society, improving well-being and contributing to economic well-being by utilizing environmental resources lead to the appearance of externalities (Ziolo, et al., 2019).

For many natural resources and ecosystem services, markets do not exist. This means that negative externalities from interactions between biodiversity ecological functioning, ecosystem services and the production are not signaled by market prices. (Dasgupta, Kinzig & Perrings, 2013) According to Dasgupta et al. (2013), in some cases, markets do not exist due to too high costs of negotiation and monitoring. It should be noted that externalities do not create market failures but instead, they are a form of market failure. From an environmental economics perspective, excessive use of natural resources is usually the result of market failure. (Dasgupta, Kinzig and Perrings, 2013)

Developed by Fama (1960), the Efficient Market Hypothesis is based on the assumption that in financial markets, current security prices incorporate all available information and expectations. In an efficient market, “mispricing” do occur but not in predictable patterns that can lead to consistent

outperformance and all public information is included in the price of the security. (Fama, 1960) The traditional function of the financial markets is to direct assets to the most profitable investment targets and to multiply profits. This is reflected in the assumptions underlying the efficient market hypothesis, which, however, ignores aspects of long-term sustainable development. (Ziolo et al., 2019).

Market failure means that, as stated in the efficient market hypothesis, usually markets do a reasonable job of allocating value to resources, but in certain cases they fail. Several of these market failures occur when it comes to biodiversity and natural capital. (Deutz et al., 2020) Biodiversity can be viewed as an “open access common pool resource” that society's actors can exploit. First, many of the benefits of biodiversity are public goods. A public good exhibit two critical properties: nonrivalrous consumption— one person’s consumption of a good does not diminish the amount available for others — and nonexcludability— once the resource is provided, even those who fail to pay for it cannot be excluded from enjoying the benefits (Champ et al., 2017). These characteristics often generate that the price of biodiversity is not reflected in the market prices (Hanley, Shogren, & White, 2001). According to Champ et al. (2017), public goods suffer from the "free-rider" problem, which can disturb the development of a market for the good. The lack of pricing biodiversity leads to overexploitation of a resource. Second, third parties are impacted by the costs of biodiversity loss and the benefits of biodiversity conservation in the form of external costs and benefits. In this case, those who conserve biodiversity are not sufficiently rewarded financially and those who damage biodiversity are not financially penalized. (Deutz et al., 2020) The last market failure regarding insufficient biodiversity valuation is the lack of well-defined property rights of environmental goods and services. While biodiversity and its services are no one’s property, no one has motives to biodiversity conservation nor pays for it. Deutz et al. (2020) conclude that markets undervalue and underprovide biodiversity because of the market failures mentioned above. Also, because of markets undervaluing biodiversity, one cannot rely on market forces solving the problem of biodiversity loss.

### **3.2 Investment risk**

According to CFA Institute (2015), a critical factor in the financial performance of investments is the investor’s ability to identify drivers of the expected risk and return of investments. However, concerns that are difficult to quantify in monetary terms and do not fit into typical financial measurements can have a significant impact on investment risk and return. (CFA Institute, 2015) ESG issues such as

natural resources, climate change mitigation, as well as evolving governance regulations, play an important role when assessing investment risks because they are difficult to value in monetary terms.

According to CFA (2015), many investors have long included an assessment of reputational risk, regulatory developments, or mega-trends like the aging population in their fundamental investing research. Traditional analytical frameworks, such as Porter's Five Forces, include some ESG analysis. Modern ESG analysis, on the other hand, refers to a systematic examination of important and material ESG concerns rather than a haphazard inclusion of one or more. ESG issues are relevant throughout the investing process, from the original analysis to the buy/sell/hold decision to ongoing ownership practices, and they are a complement to (not a substitute for) traditional fundamental analysis. (CFA, 2015) As part of ESG integration processes, biodiversity-related risks and opportunities are assessed using a combination of in-house ESG methodologies and information from third-party data providers, while biodiversity filters are used to exclude companies based on various criteria, including those exposed to biodiversity-related controversies. (UNPRI, 2020)

A rising body of research has examined the materiality of environmental, social, and governance (ESG) issues from the standpoint of investors to creditors. Significant academic, private-sector, and multi-sector research and analysis has proven the link between improved ESG management and more successful risk management overall. (Henisz & McGlinch, 2019) It is critical for investors to incorporate ESG risks into their risk management systems. As a result, having consistent, comparable, and trustworthy ESG data has become a requirement for making investment decisions. (Hübel & Scholz, 2020) To adequately address biodiversity loss and capitalize on this massive opportunity, the asset management sector will require new tools and risk management methodologies. Traditional risk modeling methodologies tell us that the highest impact events are also the least likely to occur. These are frequently referred to as 'fat tail' events due to their position on the bell curve. Ecosystem collapse, on the other hand, cannot be predicted using the same mechanisms that we use to anticipate random events. (BNP Paribas Asset Management, 2021)

Modern portfolio theory, developed in 1952 by Harry Markowitz, is a practical method for selecting investments in order to maximize their overall returns within an acceptable level of risk. Portfolio theory and its applications have been a major part of financial theory and its research since the 1950s. The core of Modern Portfolio Theory is based on the efficient diversification of the investment portfolio to reduce risk. The theory provides the investor with a mathematical and statistical basis for



choosing the optimal investment portfolio to suit their preferences. As the Modern portfolio theory holds that investors can minimize volatility and optimize returns in a portfolio by combining assets from asset classes with varied levels of risk, can no longer be utilized to offset system-level risks. (Eccles & Klimenko, 2019) Investors with trillions of dollars under management have little protection against global economic downturns; in other words, they have become too big to let the planet fail. Furthermore, major asset owners, such as pension funds and other institutional investors, are compelled to have a long-term perspective. (Eccles & Klimenko, 2019)

## 4 Research design

In this chapter, the methodology and the conduction of the empirical research are presented and justified based on the academic literature and the research data.

### 4.1 Overview of the research design

The first choice the researcher made as regards to methodology is between quantitative and qualitative approach. Qualitative approach is selected, as the exploratory nature of this research calls for inductive, data-driven inquiry logic. The Research Onion Framework by Saunders et al. (2012) presented in (Derby.ac.uk, 2018) is used in this thesis. See figure 4:

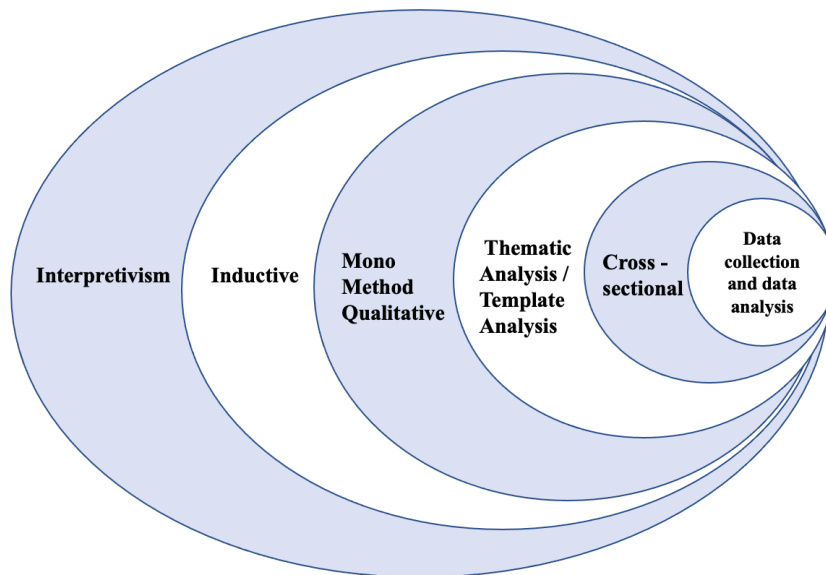


Figure 4: The Research Onion (The author, based on Derby.ac.uk, 2018)

The philosophy behind the thesis is interpretivism. Interpretivism stresses the difference between the objects of the nature science and the subjects of social science and emphasizes the importance of understanding and meaning of social research (Rose et al, 2015:397).

While deciding between deductive and inductive research approach, the researcher decided to conduct the research as inductive research. The purpose of the inductive approach is to explore and understand a phenomenon. Inductive research is appropriate when collecting data with open-ended and flexible data collection methods such as in-depth interviews (Saunders et al., 2012).

Quantitative research is effective when a large sample size is possible and the research tries to examine the selected phenomena using mathematical, statistical, or computational tools. By contrast sample sizes in qualitative research are frequently small, and the research seeks to comprehend the phenomenon by interviewing or observing people and understanding their perspectives in depth based on their experience. (Saunders et al., 2012). Qualitative approaches have a similar purpose in that they try to comprehend a specific phenomenon from the perspective of those who are experiencing it (Vaismoradi et al., 2013). The most commonly used qualitative data collection methods include interviews, observations, focus groups and document reviews (Bloomberg and Volpe, 2018). In this research, the qualitative data collection as mono method was chosen as it can produce rich data and descriptions. In addition, open-ended and semi-structured interviews were selected as the most appropriate qualitative data collection method as it offers the possibility of getting an in-depth understanding of the complex topic and it allows the researcher to ask for more information so as to collect rich data (Myers and Newman, 2007).

In this thesis, the researcher chose to use thematic analysis. Qualitative thematic analysis is classified under the qualitative descriptive design. Thematic analysis is a method for identifying, analyzing, and reporting patterns or “themes” in data and a process of interpreting qualitative data to identify patterns of meaning across the data (Braun & Clarke, 2006). In thematic analysis, the researcher considers both explicit content as theme and implicit content as category (Vaismoradi et al., 2016). Template Analysis, which is a form of thematic analysis, was implemented. It emphasizes the use of hierarchical coding while balancing a relatively high degree of structure in the process of textual data analysis with the flexibility to adapt to the needs of a specific study. (Brooks and King, 2017).

Cross-sectional study is typically chosen because of limited time resources. A cross-sectional study focuses on one specific point in time, whereas a longitudinal study is conducted over a longer period of time with many time points and an examination of changes over time (Saunders et al., 2012). In this study, a cross-sectional time horizon was selected as the regulation, metrics and practices related to the protection of biodiversity were constantly changing at that time. The interviews were conducted over a time period of three months, starting in April 2022 and ending in July 2022.

## **4.2 Data sampling**

To be able to provide depth and understanding of the preliminary research questions, the primary data was collected in one-to-one in-depth semi-structured interviews. As the objective of the research is

to investigate how the pension investors in the Nordic countries are currently approaching biodiversity loss and what needs to be developed in order for measurement approaches to better serve the pension investors' role in preventing biodiversity loss, the researcher saw it best to interview both investors and ESG specialists in the biodiversity scheme.

A sample is a representative subset of a larger population from which generalizable conclusions can be drawn. During the sampling process, a sufficient number of appropriate elements of the population are chosen so that generalizations can be made (Sekaran and Bougie, 2013). In this thesis, the researcher used a non-probability purposive sampling method because of the exploratory nature of this thesis. Purposive sampling is the purposeful selection of a participant based on the traits the subject possesses. It is a nonrandom technique that does not require underlying theories or a predetermined number of participants. Simply expressed, the researcher determines what needs to be known and then seeks out persons who can, and are willing to, supply the information through expertise or experience (Bernard, 2002). It is commonly used in qualitative research to discover and pick the most information-rich examples in order to make the best use of available resources (Bernard, 2002). This entails identifying and selecting individuals or groups of individuals who are adept and knowledgeable about a topic of interest (Creswell & Plano Clark, 2011). Bernard (2002) emphasizes the importance of availability and willingness to participate, as well as the ability to share experiences and viewpoints in an articulate, expressive, and reflective manner.

*'Non-probability sampling involves the researcher selecting a sample based on reasons other than probability, such as theoretical relevance or convenience'* (Rose et al., 2015. p. 193). In this research the selection criteria were purposive. It was important that the most information-rich examples were picked in order to make the best use of available resources (Bernard, 2002). Consequently, relevant, target group criteria fulfilling, and available samples were selected.

Regarding the sample size, Rose et al. (2015) suggest 12-15 on average in-depth interviews and a number of factors that should be considered when determining sample size. Firstly, the scope and complexity of the chosen topic needs to be considered. The larger the sample that is likely to be required to ensure that the topic is fully studied, the broader the breadth and the greater the complexity of the topic. Secondly, the larger the sample size required, the more heterogeneous the population should be. Thirdly, considering the quality of data is important. The depth and quality of the acquired data may vary greatly between respondents, requiring a larger sample size. In this research, the sample

consisted of six institutional investor representatives and eight biodiversity assessment experts to get a sufficiently diverse overall picture on the subject. Lastly, the sample size may be influenced by stakeholder expectations.

In this thesis, institutional investors were defined based on the following criteria: *“an institutional investor is a legal entity that accumulates the funds of numerous investors (which may be private investors or other legal entities) to invest in various financial instruments and profit from the process. In other words, an institutional investor is an organization that invests on behalf of its members”* (Corporate Finance Institute, 2022). In more detail, it was chosen to focus on pension investors as institutional investors in the Nordic countries. The researcher chose to interview pension investors as they are significant asset owners whose investment decisions can affect the financial market. This is because pension investors appear to be pioneers and the most active in responsible investment (Sethi, 2005). It is argued that the reason for this is that pension investors are more visible to the public and are less affected by conflicts of interest, such as those between the pension fund's sponsoring corporation and ethical opinions (Juravle & Lewis, 2009). In addition, the interviewees representing ESG specialists were experts in natural capital, risk assessment and biodiversity finance assessment. The professionals were from Finnish expert organizations and universities.

In this thesis, the ESG specialist sample was based on the interviewees' experience in biodiversity finance and natural capital. A list of biodiversity specialists was identified from which the ones specialized in biodiversity finance and knowledge in natural capital was selected to represent the final sample. Eight ESG specialists were selected (see Table 1). In addition, the Nordic pension investor sample was based on a list of the largest European asset owners, but with the focus on the Nordic countries (Godinot & Vandermosten, 2018). The researcher investigated their annual reports and websites to confirm whether biodiversity was mentioned in their strategies. Six investors were selected based on variety in size, focus on biodiversity and availability of the identified interviewees (see Table 2). The chosen interviewees were involved with responsible investment or ESG in their organization across asset classes. To collect rich data, the researcher decided to interview two different target groups. This was to ensure the richness and diversity of the collected data. As the ESG specialists typically have more in-depth understanding in biodiversity and natural capital, the researcher was aiming to collect rich data to add value to the views of the investors.

Table 1. ESG specialist interviewees

<b>Interviewee</b>	<b>Industry sector</b>	<b>Role</b>
Specialist 1	Conservation Organization	Advisor
Specialist 2	Non-for-Profit Foundation	Specialist, Climate and Nature solutions
Specialist 3	Finance	Partner, Head of Research
Specialist 4	Confederation	Chief Policy Adviser
Specialist 5	Banking	Director, Impact Investing
Specialist 6	Finance	Senior Risk Specialist
Specialist 7	University	Professor, Researcher
Specialist 8	Circular Economy	Specialist

Table 2. Nordic Pension Investor interviewees

<b>Interviewee</b>	<b>Region</b>	<b>Assets under management (2021)</b>	<b>Role</b>
Investor 1	Denmark	> 100 billion EUR	Senior Director, ESG
Investor 2	Sweden	25-50 billion EUR	Head of ESG
Investor 3	Finland	50-100 billion EUR	Responsible Investment Analyst
Investor 4	Norway	< 25 billion EUR	Interim Head of Environmental Initiatives
Investor 5	Sweden	25-50 billion EUR	Senior Manager Sustainability
Investor 6	Norway	25-50 billion EUR	Portfolio Manager, ESG

### 4.3 Research instrument and data collection

To gain a better understanding of the consideration of biodiversity loss when investing in listed-equity, the idea was to gather information from 6 to 8 Nordic pension investors on how they consider biodiversity in listed equity, and from 6 to 8 ESG specialists about their views on how the biodiversity metrics should be developed in the future to better serve the financial sector on preserving biodiversity. The aim was to choose Nordic pension investors who are taking into account biodiversity in their investments. Correspondingly, the chosen ESG specialist interviewees are

specialists in biodiversity and natural capital. The study is limited to direct listed-equity investments only.

Semi-structured in-depth interviews were conducted to collect the primary data. In-depth interviews enable the researcher to ask open-ended questions and choose words flexibly (Rose et al., 2015. p. 396). The interview questions are open ended questions favoring words ‘how’ and ‘what’. According to Saunders et al. (2012), the semi-structured interview allows for probing questions and a deepening understanding of an important issue when necessary. Furthermore, probing questions and themes allow for the acquisition of rich data, which increases the overall validity and trustworthiness of the research (Saunders et al, 2012).

Before deciding the final interview structure and the core questions, one pilot interview was conducted to assess whether the semi-structured questions were clear and understandable. After the pilot, the final interview template was designed. The semi-structured in-depth interview questions were created to provide flexibility as well as structure to thematic template analysis.

The interview questions are divided into three main thematic categories and additional background questions. The three thematic categories are: current state, assessment and targets. The background question aims to examine the importance of biodiversity to an investor. The first theme and questions regarding the current state aim to examine how biodiversity loss is seen from an investor point of view, what the key risks are and opportunities regarding biodiversity and which sectors are relevant in this theme. The second theme focuses on the assessment of biodiversity, what the current possibilities are for an investor to assess its biodiversity impacts and what the biggest challenges are when it comes to taking biodiversity into account in investing. The third theme examines the targets and next steps regarding biodiversity. The interview questions were slightly different depending on the interview group but aimed to answer the same topic. See detailed interview questions in Appendix 2.

In total 18 emails were sent to both interview groups between May – July 2022 to suggest an interview. In total 15 of them replied and 14 interviews were conducted with predesigned and semi-constructed questions. The duration of each interview was between 30 minutes and 1 hour.

Before the interview, the interviewees agreed to the interviews with the terms presented to them which included recording of the interview, confidentiality, anonymity, and data handling (see Appendix 2). When analyzing the data and reporting the results, all names, organization details, and other personal data were removed to ensure anonymity and confidentiality. The interviewees are referred to as Specialist n (ESG specialists) and Investor n (Nordic pension investors).

The interviews were conducted remotely on Microsoft Teams. All ESG specialist interviews were held in the Finnish language and investor interviews were held in both English and Finnish. Each interview was recorded and in addition the author took notes. Microsoft Teams transcribed the interviews automatically.

#### **4.4 Data analysis method**

The analysis of qualitative research data aims to identify answers to research questions by interpreting, structuring, and modeling the research material, which can be done in an inductive, deductive, or abductive approach. Data reduction and data display phases are a part of qualitative data analysis (Sekaran and Bougie, 2013). The primary analysis method in this thesis was Template Analysis which focused on understanding the topics and issues of the research data. Template Analysis was chosen because it is general enough to allow both inductive and deductive approaches and because it does not require the researcher to make any philosophical or theoretical commitments. Moreover, the thematic analysis approach was used to identify the themes that were highlighted by the interviewees (Brooks and King, 2017). Any type of textual data can be subject to template analysis, which highlights the value of being able to refer to the data in order to construct and arrange it.

Following Brooks and King (2017), seven steps of Template Analysis were followed. The first step is familiarization of the data. The initial phase of Template Analysis is familiarizing oneself with the gathered data and carefully reading the transcriptions (Brooks and King, 2017). To become familiar with the data for this study, the researcher carefully read all interview notes and transcriptions numerous times. At this stage, priori themes were identified. Second, preliminary coding, the process of coding involves the researcher finding themes in the narratives and assigning codes to them so that they may be indexed (Brooks and King, 2017). Implementing the preliminary themes relevant to the research questions and coding the first interviews. In this study, preliminary coding was completed



concurrently with the evaluation and analysis of three first interview transcripts. In order to find initial codes, additional a priori topics were identified. However, they were still sufficiently wide and loosely defined at this point, indicating just prospective characteristics of the data. Third, clustering, based on the preliminary analysis, emerging themes were clustered into meaningful groups and ordered hierarchically (Brooks and King, 2017). Nine categories were used to group emerging topics in this study. Fourth, initial template, the clustered themes form the foundation of the first edition of the coding template. A graphic illustrates the structure of the themes (see Figure 5 and Appendix 3) (Brooks and King, 2017). The researcher constructed an initial template based on the recognized issues that arose from the initial data analysis. Fifth, developing the template, the first template must be applied to additional data and updated as weaknesses are discovered (Brooks and King, 2017). Throughout the data analysis process, the researcher made changes to the initial template. New codes were discovered, and several previously identified codes were grouped into larger themes. Sixth, applying the final, once no more changes are needed and all relevant in the data is covered, the full data is coded with the final version of the template (Brooks and King, 2017). When all interviews were recorded, transcribed, and the final template was used in this study, the researcher coded the entire data set. Appendix 3 depicts the a priori template. Seventh, writing up the final template is used in organizing the presentation of the analysis. In this research all findings were based on the discoveries and data analyzed.

#### **4.5 Quality of the research**

To ensure reliability in qualitative research, an examination of trustworthiness is crucial. According to Patton (2002), validity and reliability are two elements that each qualitative researcher should consider while organizing a study, analyzing results, and rating the study's quality (Patton, 2002). According to Golafshani, when quantitative researchers speak about research validity and reliability, they are usually referring to a credible conclusion, which - in qualitative research - is dependent on the researcher's ability and effort (Golafshani, 2003). The concepts of reliability and validity are based on the idea that the researcher can gain access to objective reality and objective truth (Hirsjärvi & Hurme, 2008). According to Hirsjärvi & Hurme (2008), the concept of reliability is irrelevant in qualitative research since the question of reliability concerns measurements and hence has no significance in qualitative research. *'Abandoning presuppositions also changes the perception of reliability and validity. It might even be wise to abandon the use of these terms*

*altogether*' (Hirsjärvi & Hurme, 2008. p. 185)

It has been argued that the main issue with presenting qualitative findings is the inaccessibility of the interpretation process itself. To some extent, this issue can be alleviated by paying attention to the explanation and illustration of research methodology in the final output. (Andersen & Skaates, 2004, p. 479) According to Sandelowski (1993), trustworthiness becomes a matter of persuasion when the researcher is seen as having made those practices visible and thus auditable. It is also argued that validity in qualitative studies should not be linked to truth or value. A study is only trustworthy if the reader of the research report believes it to be so. Trustworthiness has been further divided into credibility, which corresponds approximately to the idea of internal validity; dependability, which relates more to reliability; transferability, which is a type of external validity; and confirmability, which is mostly an issue of presentation. (Sandelowski, 1993) To assure trustworthiness, the importance of triangulation must be stressed to limit the effect of researcher bias. Detail-emerging methodological description allows readers to judge how far the facts and constructions coming from it can be accepted. Furthermore, comprehensive transcription techniques, a schematic plan of systematic coding via computer programs, and counting in qualitative research are modalities to ensure rigor and reliability. (Sandelowski, 1993)

In this thesis, the transparency and trustworthiness issues were taken into account by presenting clearly the plan of systematic coding and development of the themes when collecting and analyzing the data, see Appendix 3 and figures 5 – 7.

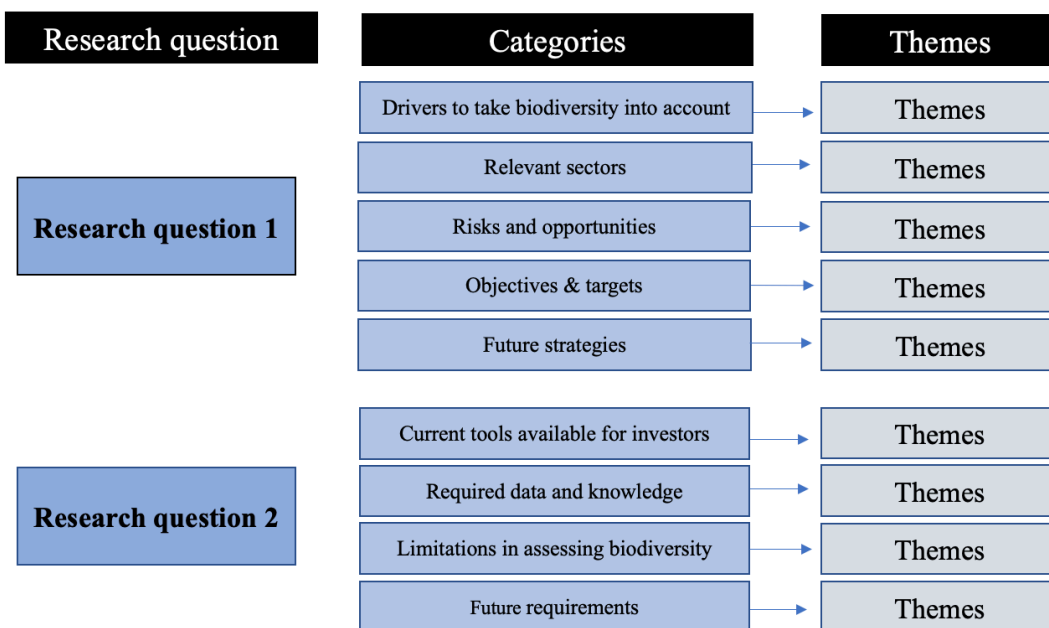


Figure 5: Illustration of the thematic analysis

## 5 Findings and analysis

This chapter presents the empirical part of the research, which aims at exploring how the financial sector is currently taking biodiversity loss into account in their investment decisions and how to further develop the tools to better support biodiversity conservation. For both research questions, the chapter presents the findings from the interviews based on the thematic analysis and the categories identified after a careful analysis of the conducted interviews. To increase the trustworthiness of this research, straight quotes from the interviews are used in the findings.

### 5.1 Relevancy of biodiversity for investors

The first research question investigates what is relevant for institutional investors and ESG specialists in analyzing biodiversity impacts of stock listed companies. Figure 6 presents the themes identified based on the conducted interviews.

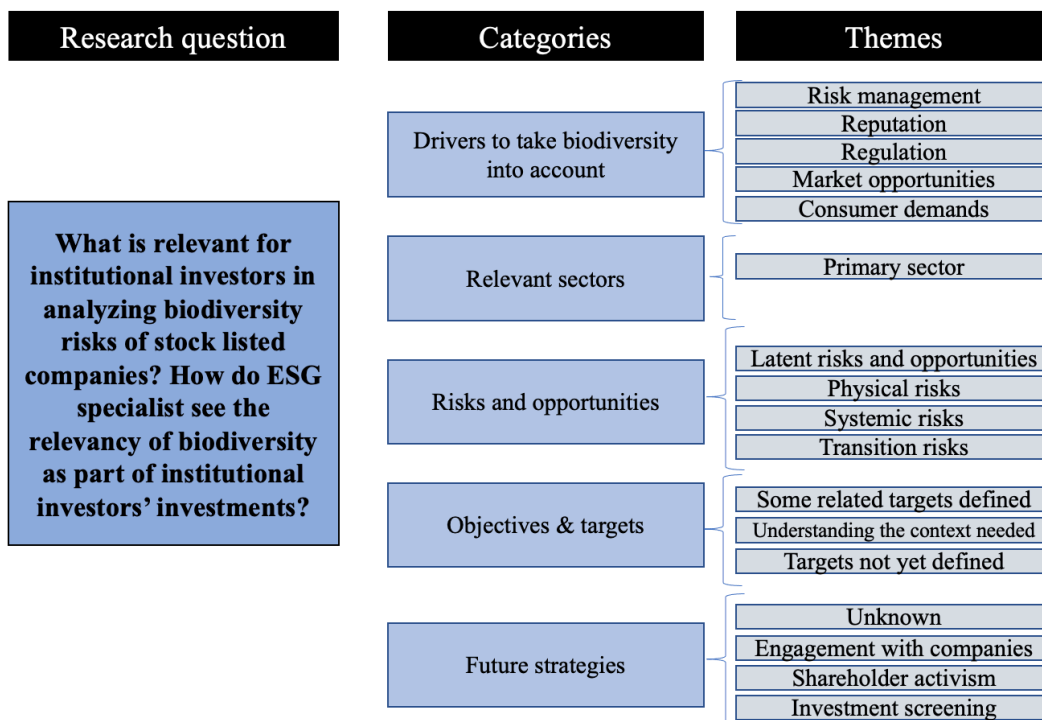


Figure 6: Themes of research question one

#### Drivers to accounting for biodiversity

The ESG specialists were asked on the role of institutional investors in addressing biodiversity loss. The majority of the specialists state that institutional investors do have a role but how specialists view

the importance of this role varies. Nevertheless, seven of the interviewees also stated that the role is currently quite limited due to the lack of measurement approaches and tools for investors to analyze their investments in relation to biodiversity loss. In addition, the role was perceived to be limited due to the mandates of institutional investors. Six ESG specialists answered that the institutional investors have a shared responsibility and role with the regulators and society in addressing biodiversity loss.

*“The role of an investor, in my view, is solely and exclusively to finance that change when the rest of the society makes it profitable to invest” (Specialist 6)*

*“Investors have a critical role with regards to biodiversity loss. They can either directly influence companies as owners or via lending decision-making processes” (Specialist 2)*

*“It is significant, but of course the main responsibility lies in the politics sector, but it is precisely the capital markets that can bring much-needed positive pressure to tackle this theme” (Specialist 4)*

Regarding drivers when considering biodiversity in investment decisions, all investors see that biodiversity loss is something that is going to affect their investments in the future, thus it is valid to consider biodiversity in their investments. The main drivers that raised were financial materiality, regulation, risk management and consumer demand, market opportunities and reputation which will have a material financial impact on companies.

*“It is important for us from a pure financial perspective in the end. Those are factors that might have implications for the risk and opportunities that our investments are facing and thus it is something that we have to address and be aware of.” (Investor 5)*

*“It’s a financial materiality lens. The importance of it is understanding what the latent risks for companies might be, often in terms of externalities, that might be internalized at some point.” (Investor 6)*

Next, both ESG specialists and investors were asked in which sectors and/or themes they see biodiversity loss as most relevant and why. The most mentioned sector was the primary production sector. These include mining, food and beverage, forestry, chemicals, and fishery. Both ESG specialists and investors see that sectors that have significant land use are the most relevant sectors

in terms of biodiversity loss. According to the interviewees, the risks and impacts of the primary production sector in relation to biodiversity are the easiest to identify as the impacts are relatively direct. Nevertheless, all of the interviewed specialists understood that biodiversity loss is a threat to all sectors through impact chains and indirect impacts.

### **Risks and opportunities**

When considering what is relevant for institutional investors in analyzing biodiversity risks of stock listed companies, the interviews continued to the key risks that biodiversity loss can cause for an investor. There are several risks that biodiversity can cause for an investor (see Section 2.1) and many of these were mentioned in the interviews. Investors see biodiversity currently mainly as a physical, transition, and systemic risk but also latent risks were mentioned several times. Similarly, most of the ESG specialists stated that risks that come from biodiversity loss are not yet understood. It is possible to identify possible risks and risk scenarios, but the tipping points are widely unknown.

According to both investors and ESG specialists, opportunities that biodiversity positive initiatives or investments may offer are still a bit unknown. Identifying risks was perceived easier than opportunities. One specialist mentioned that many of the existing nature-based private sector initiatives are relatively subjective without robust, outside verification. Nevertheless, the common view was that opportunities will increase in the future due to increased regulation and consumer demands.

*“If we want to systematically turn biodiversity loss in a nature-positive direction, it requires that we have clearly monetizable business models that genuinely and directly benefit from nature-positivity.”*  
(Specialist 4)

*“The availability of nature-positive products for investors has been very muted. Moreover, many of the existing nature-based private sector initiatives are quite subjective without robust, outside verification, so one needs to err on the side of caution. So, there are a few opportunities, but the potential is huge nevertheless.”* (Specialist 2)

### **Targets in including biodiversity protection into investment decisions**

Both investors and ESG specialists are of the opinion that understanding the phenomenon – biodiversity loss - is a vital next step for investors. Investors found setting targets in relation to

biodiversity quite difficult still due to the lack of both quantitative metrics and financial materiality. More than setting actual targets related to biodiversity, the interviewees emphasized that it is crucial to follow the regulatory frameworks and changes around this topic and as mentioned, to understand the magnitude of the context. In addition, one of the ESG specialists and all of the investors emphasized that it is important for an investor to invest according to the mandate. Therefore, pension investors, cannot set targets regarding biodiversity, if there are no investment opportunities, since investing profitably and securely is their primary task to secure future pension payments. For now, all of the pension investors stated that they do not have targets with regards to the biodiversity impact of the portfolio. Nevertheless, the majority of the investors mentioned that they have had biodiversity related targets, for example, regarding deforestation.

*“We don’t have a target that any of our portfolios will have a positive impact on biodiversity by a certain year for example. Partially because of the underlying mandates, but also partially because we don’t usually commit to something that we cannot measure properly. If we said we have this target, then we would need to be responsible for having a clear pathway to getting there.” (Investor 4)*

### **Future strategies**

Interviewed Nordic pension investors were unanimous that biodiversity will be a part of their investment strategies in the future. The majority of the investors said that biodiversity is already a part of their investment strategies through, for example, engagement with companies, shareholder activism and investment screening and will continue to be in the future. Concrete means of including biodiversity in investment strategies varied among investors. TNFD was mentioned several times, as a framework that is expected to bring clarity for the investors.

*“I see that biodiversity loss will be integrated into the policy principles of responsible investing, so it may certainly be a prospect in the exclusion and it’s already apparent that there are companies that are blacklisted because they are destroying nature. And in addition to that, we will definitely do company analyses and industry analyses.” (Investor 3)*

*“Very much focus on industry specific expertise and to challenge companies. Biodiversity has become a very kind of popular theme over the last year or two and companies want to talk about it as well and we encourage them also to try to communicate about it in financial terms as well.” (Investor 6)*

*“It’s a very important topic on our agenda as an owner and if we get better information and better understanding of it, we will be able to hopefully be more forceful in our engagement work. So actually, in influencing companies into a more nature positive direction. So in the engagement strategies, I think that’s one. And then also in the asset management strategy. So especially with regards to risk-based investments, if we get good firm decision useful data then we can actually make decisions to divest from companies that are not managing this appropriately and that are not likely to respond to engagements.” (Investor 4)*

Correspondingly, interviewed ESG specialists were asked how an investor should develop their competences related to biodiversity. All specialists were unanimous that this is a relatively new topic for the financial sector and actions around biodiversity loss are still in their infancy. Investor initiatives and associations were perceived as a worthy way of sharing knowledge and competence related to investing in biodiversity.

*“Since everything is probably still in its infancy regarding this issue, investor associations where best practices and lessons, tools and metrics are shared are effective. At least have been as far as the climate issue is concerned, precisely to raise the level of competence of the entire investment field. And of course, investment organizations’ management needs to understand this topic, its relevance and implications, and why this is an important question.” (Specialist 4)*

## **5.2 Developing the current tools for institutional investors**

The second research question investigates how to develop the current tools for institutional investors to better take biodiversity into account in investment decisions. Figure 7 presents the themes identified based on the conducted interviews.

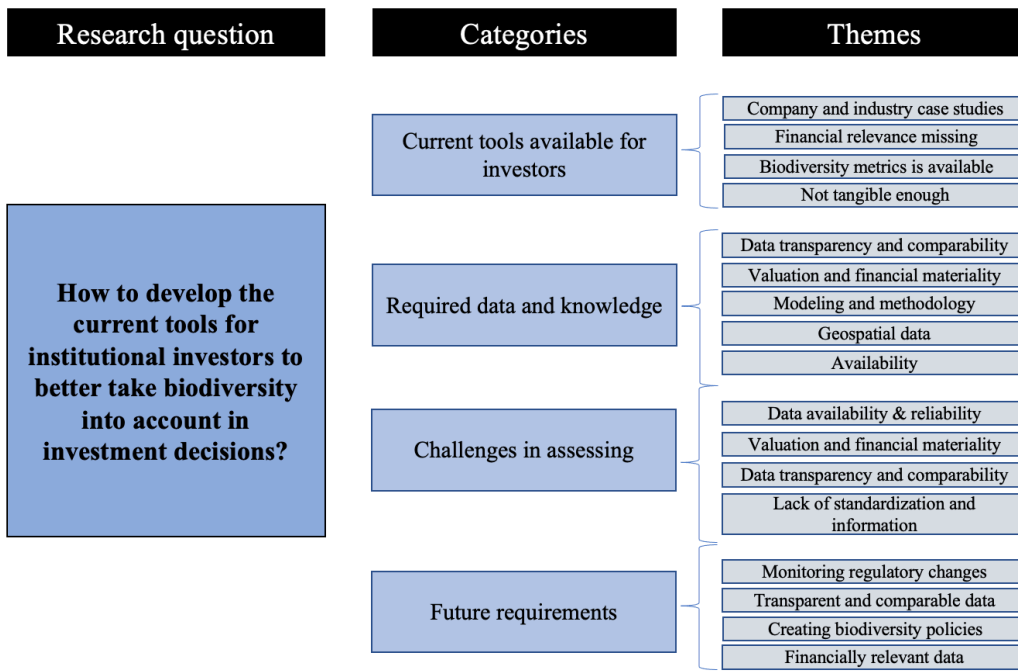


Figure 7: Themes of research question two: How to develop the current tools for institutional investors to better take biodiversity into account in investment decisions?

**Current tools available for investors**

Both investors and ESG specialists were asked whether investors have proper means to influence biodiversity loss in listed equity. The most common answer among specialists was that in this theme, as in all sustainability questions, investors have all the usual means of responsible investing at their disposal. For example, engaging with the companies as a responsible investing approach was mentioned several times. It was seen that investors have the same means to influence as in responsible investing usually, but the means are not exhaustive due to the incompleteness of the information available. Nevertheless, in comparison to investors, specialists were more strongly of the opinion that investors have significant ways to influence issues such as biodiversity loss and the environmental crisis in general. However, all pension investors saw that investors have an enabling role in preventing biodiversity loss. Five of the investors mentioned engagement and dialogue as a tool to influence when listed equity is the asset class in question, but found the opportunities limited depending on asset classes. Nevertheless, when listed equity is the asset class in question, once again the mandates pension investors have was mentioned as a limitation to influence. As the primary task of a pension investor is to secure future profits, they cannot solely focus on impacts.

*“In a way, science has come so far that we know how to measure nature damage in different organizations. And if we can mainstream the assessment of environmental hazards at the*



*organizational level, for example through financial accounting, and we can obligate all of these organizations to report not only carbon hazards but also nature hazards in the financial statements, then these investors will really have those tools.” (Specialist 7)*

*“There are tools, but they are more in theory. But at the end of the day, the investor's role is an indirect, enabling role. In the end, it is the company's task to correct its operations, so that we can direct our cash flows in a way that enables and emphasizes change in a certain way. Banks have a bigger role as financiers when it comes to this.” (Investor 3)*

Both investors and ESG specialists assessed how credibly the existing frameworks and datasets do provide the needed information of the companies' biodiversity impacts. All interviewees saw that the measurement approaches are not yet tangible enough. The common answer was that, at the moment, the existing measurement approaches are not financially relevant for an investor to use. There are existing assessment methods which are able to calculate the exposures at some level of credibility, but it was mentioned that there is a long way to go before being able to calculate credible VaR (Value at Risk) figures when it comes to biodiversity. Based on the interviews, none of the investors were familiar with existing frameworks or at least they found them inadequate or something that is in progress. Different challenges in measuring and comparing biodiversity risks and impacts was brought up.

*“It's a mixed picture. This challenge with biodiversity is that it is so location specific that it's much more difficult to kind of compare across industries even within certain companies. I've been struck by looking at even at a single forestry company, how the measurements for biodiversity vary or the context for them is so different depending on which site they're looking at. A measurement that might be just fine in one area is a sign of something going seriously wrong in another. So I think that poses a real challenge for investors.” (Investor 6)*

*“I mean this is something that is work in progress. As of today, it is far from enough. There is a lot of companies and investors that are rather confused around this, including myself. Is it with global versus local, dependence and impact, qualitative or quantitative data etc. We have taken the availability of natural resources for granted and we have not been prepared or willing to understand that we have to pay the full cost. Assessment frameworks need to integrate the risks and the values and we are not there.” (Investor 5)*

Two of the specialists saw that the next necessary step would be to calculate the financial value of the investment's exposure to nature in different risk scenarios. One of the specialists with an academic background particularly emphasized that good biodiversity metrics have been studied and developed, but they are not used effectively.

*“We have metrics, but they are not commonly used. And what you come across and what I’m sure you’ve heard about this problem that also scientists do is that we don’t have these metrics and this is so much more difficult than carbon dioxide equivalents. I’ll say it’s a bit nonsense. We have good metrics and we have all kinds of know-how but we don’t know how to use it.” (Specialist 7)*

*“If you think about the existing assessment methods, the exposures can be calculated at some level of credibility, but there is a long way to go from exposure to being able to get some euro-denominated risk figure or a VaR figure. There is data, but it is somehow not possible to combine it with any model that might bring a scenario, or any other kind of risk figure out of it.” (Specialist 6)*

Investors were asked how they assess the biodiversity impacts of their investment. Most of the interviewed pension investors do not yet have any particular biodiversity assessment across their portfolio but often biodiversity is somehow connected to other sustainability targets in the portfolios. In addition, few of the investors use either internal or external frameworks or data providers to assess their direct equity investments regarding biodiversity. The interviewed pension investors saw that biodiversity assessment is still based on case studies of certain companies or industries. Based on the interviews, it was a common perception that there is no good way to do a comprehensive analysis of biodiversity for the entire portfolio. It was mentioned that there are service providers who offer information about the best and worst companies in a certain industry to take biodiversity into account. However, it may be a very simple analysis, such as whether the company has a biodiversity policy or not. Additionally, the interviewed investors who do not yet have any particular biodiversity assessment said that assessment will be expected for the coming years. One investor particularly mentioned that in addition to a desperate need for transparent and comparable data, one would also need to be able to connect the data with the real-world impacts.

## **Required data and knowledge on biodiversity**

ESG specialists largely agreed that there is data available and commendable data sets have been developed. However, the common problem with them, according to the interviewees is that the data is lacking financial materiality. As presented in Section 2.5, there are measurement tools for investors to use. A common concern among the investors was data reliability. In particular, two investor interviewees mentioned that data needs to be highly transparent on what the data is based on, both companies' own reporting and external data providers. In addition to data transparency, data comparability was seen as an important factor to be able to analyze investments in terms of biodiversity loss. Nevertheless, it was also stated by several specialists that the lack of exhaustive measurement approaches is not an excuse not to take biodiversity into consideration in investment decisions. The specialists were of the opinion that this field needs further research and indicator development for the data to be accessible and usable for an investor.

*“Data is one thing, but then you also need to be able to connect the data with what is actually going to be relevant. And of course, disclosure is always good, but you’ll need to understand what to do with the information and what you’re going to change once you have that information. And so, companies, regulators and society needs to have a better understanding and of how we’re going to solve the issue of biodiversity loss.” (Investor 2)*

According to all ESG specialists, biodiversity assessment for investors is still developing. The themes that arose when discussing what is lacking in biodiversity assessment were 1) valuation and financial materiality, 2) modeling and methodology and 3) geospatial data of a portfolio. The majority of the investors were under the impression that it is possible to do case evaluations on what they have identified themselves regarding what would be such industries and where problems related to biodiversity could arise, but they cannot do such systematic analysis on all asset classes. Several specialists recognized that very comprehensive nature data are produced in the Nordic countries and it is a topic that is widely studied. Among the specialists in general, the lack of financial materiality of existing data was seen as a problem. One specialist specially emphasized that nature data is also very valuable on its own, but from an economic perspective it is vital to be able to connect nature data with financial materiality in order to incorporate the information into investment decision-making.

*"There exists data on nature and biodiversity, but often we haven't been able to translate that into financial materiality. In Finland, for example, we have probably the most sophisticated data about forests i.e., the volumes and types of forests across the country. However, I don't see how that forest information will flow itself into investment decision-making, unless we analyse the financial materiality of the nature data." (Specialist 2)*

*"It's about connection, so in a way it's a 'so what' question. What is the significance of the fact that in some area certain habitats or certain populations of organisms are dwindling heavily? What is the significance of that and to whom do those costs apply? After all, this is one of the most central and challenging questions, which should somehow be able to be structured. Whether or not it is the sole task of investors, it is actually a broader question than that, but it helps investors better understand the effects of their own portfolio or their own investment targets. It's about valuing nature economically and understanding what the diverse progressions of the decline in biodiversity are." (Specialist 4)*

*"There should be some kind of model or scenario analysis that could be used to figure out what those risks are in monetary terms. Only then do they become concrete for an investor." (Specialist 6)*

### **Challenges in biodiversity assessment**

As mentioned before, the interviewees pointed out that investor biodiversity assessment is still facing some challenges. These challenges concern the usability of existing frameworks and measurement approaches as well as data-related issues. The key challenges investors identified were 1) data availability and reliability 2) lack of standardization and information 3) valuation and financial materiality 4) data transparency and comparability. In addition to these, location specificity and traceability were mentioned because of the local nature of biodiversity impacts. According to pension investors, the biggest challenges are related to the subject's versatility. For example, it was mentioned that risks regarding biodiversity loss and companies might be systemic, local, industry or sector specific. Most of the investors were of the opinion that there is no sufficient data to be able to compare and analyze companies in terms of biodiversity impacts. Four investors also mentioned data reliability as a problem. It was seen that it is not often made clear what the data is built on, what is included in the data or if it is partial or selective. In addition, if data providers are relying to companies' own reporting, are the companies reporting all the relevant information.

*“One thing is the location specificity so that it’s very difficult to have kind of comparability across companies and within a portfolio and the other is just even if you knew what you were looking for to be able to compare it across companies. They don’t necessarily have a full-fledged set of metrics that really captures their biodiversity impacts. So it’s compatibility and data accessibility. -- Can we really be confident that companies are reporting all of the relevant information they should?”*  
(Investor 6)

## **Future requirements**

Based on the interviews, biodiversity loss continues to be a rather confusing topic for investors. In addition, also the interviewed ESG specialists recognize the shortcomings and steppingstones around preserving nature and halting biodiversity loss via investment decisions. As a conclusion, based on the interviews, various requirements arise that should be met so that investors are able to really influence the preservation of biodiversity through their investments in the future. The themes that were highlighted in the interviews about future requirements were: monitoring regulatory changes, the need for transparent and comparable data, financially relevant data and creating biodiversity policies.

There is a lot going on when it comes to the financial markets and its connection to biodiversity loss. Many of the interviewees mention that monitoring regulatory changes, the on-going development and discussion around the topic is a requirement for an investor to be able to increase knowledge and competence. As mentioned earlier, a few investors are waiting for the TNFD to bring clarification and lead the way in the future. According to the interviewed ESG specialists, creating biodiversity policies and setting targets regarding biodiversity is something investors should focus on. Investors on the other hand found target setting difficult due to the lack of information on the topic.

In addition, based on the interviews, issues around biodiversity data poses a lot of challenges. The need for measurable and comparable data on biodiversity for investors to use is critical. The landscape of biodiversity data sources and biodiversity measurement approaches for businesses and financial institutions is rapidly evolving, but the interviewed ESG specialists and Nordic pension investors consider the existing data and metrics to be incomplete for an investor to use properly. Data transparency and comparability was seen as a vital next step in order to be able to assess investments reliably when it comes to biodiversity hazards that companies can cause directly or indirectly.

One major topic that was mentioned multiple times during the interviews is the issue of financial materiality and relevance. It is commonly seen that biodiversity assessment is lacking financial relevance. The value of biodiversity data was not underestimated, but its usability in investment decision-making was seen as a challenge.

## 6 Discussion and Conclusions

In this final chapter, the key findings of the research are discussed, and contributions to theory are generated. Both sections are created by comparing the findings of the empirical research with prior theoretical knowledge. Additionally, this chapter is structured to present the key findings and answer the research questions. As explained in Section 1.4 this thesis set out to explore how the risk related to biodiversity loss is managed in the financial markets from the Nordic pension investor point of view. More specifically, to explore the existing tools regarding investing in biodiversity, and to look at how investors could better use them in terms of preventing biodiversity loss.

### 6.1 Summary of the findings

This sub-chapter discusses the summary of the findings in this research which reflect the current management of biodiversity loss in the financial markets and how to further develop the tools and metrics in a way, that investors can have proper means to influence biodiversity loss. These findings rose from the empirical analysis and are now compared with prior knowledge.

**Key finding 1:** *Multiple drivers in taking biodiversity loss into account in investment decisions*

While many actors in the financial sector are starting to tackle the challenge of biodiversity loss, the measures related to biodiversity loss are still developing compared to climate change mitigation and adaptation measures. All interviewees see that the importance of biodiversity is constantly rising in the financial markets, and it is gaining momentum alongside climate change in investor decision-making.

All interviewees agreed on the fact that biodiversity loss is something that is going to have an impact on them in the future. Both interview groups agreed that biodiversity loss is a significant issue that requires rapid action. Currently, Nordic pension investors' drivers when considering biodiversity in their investment activities are 1) financial materiality 2) regulation 3) risk management 4) consumer demand 5) market opportunities and 6) reputation. Despite the varying responses, the only driver mentioned in each of the 14 interviews was risk management. Thus, taking biodiversity into account in investment decisions is largely a risk management issue. Drivers for responsible investing in general are mostly part of risk management, better knowledge of the portfolio companies and striving for long-term good investment returns (Hyrskke et al. 2020). Similarly, according to Tobin-de la

Puente and Mitchell (2021), the main driver of public and private collaboration developing biodiversity financing mechanisms and global biodiversity finance is the recognition of the risks associated with global biodiversity loss and the resulting impacts. Despite investors mentioning market opportunities as a driver to considering biodiversity in investment decisions, opportunities in biodiversity investing are still considered as vaguer than risks.

In addition to risk management, regulatory and reputational factors were mentioned several times in both interview groups. In recent years, there has been a rise in awareness of, and action on, financial risks associated with biodiversity loss, leading to the establishment of frameworks or standards that are intended to create more systematic and at scale information on nature-related impacts and dependencies. This establishment is creating pressure to incorporate biodiversity loss into investment decision-making and assessment. On the other hand, while responsible investing is increasing because of its risk management potential and reputational benefits, biodiversity loss mitigation measures in investment decisions are also seen as a reputation management issue.

**Key finding 2:** *Potential risks and risk scenarios can be identified but the tipping points are widely unknown*

Currently, investors see biodiversity mainly as a physical, transition, and systemic risk but also latent risks were mentioned several times. Similarly, the majority of ESG specialists acknowledged that the risks associated with biodiversity loss are not well understood. Although potential risks and risk scenarios can be identified, the tipping points are widely unknown. Compared to previous research, the World Economic Forum has identified biodiversity loss as the third most severe risk for the next decade (World Economic Forum, 2022). Nevertheless, the financial risks emerging from biodiversity loss are still not sufficiently understood. (PwC & WWF, 2020) In addition, according to OECD (2019), businesses, banks and investors are likely to be facing financial risk. These risks include for example access to capital (due to a higher cost of capital, or stricter lending requirements based on adverse impacts or dependencies on biodiversity) and loss of investment opportunities as investors increasingly incorporate biodiversity into their investment strategies (Girvan et al., 2018). PwC Switzerland and WWF Switzerland (2020) have suggested a typology of four financial biodiversity-related risks: physical, transition, litigation and systemic risks. The empirical findings showed that both investors and ESG specialists had identified the following types of financial risks from nature loss: transition risks, physical risks and systemic risks.



As empirical findings suggested, in the perception of both interview groups, the primary production sector is the most relevant in terms of biodiversity loss because of its direct effects on biodiversity and natural resources. It is confirmed by the World Economic Forum (2022), that food and beverages, agriculture and fisheries, and construction are the most dependent industries and thus the most vulnerable to biodiversity loss.

**Key finding 3:** *ESG specialists' experience of institutional investors' means to influence differed from investors' perspective*

During interviews, the experience of investors' ability to influence in biodiversity loss varied. The ESG specialists were more of the opinion that institutional investors in general have a big role in halting biodiversity loss. It was seen by most of the ESG specialists that in general, all the means of responsible investment that institutional investors have at their disposal, are appropriate means of influencing the prevention of biodiversity loss. Institutional investors were seen as major influencers due to their role and impact in the society. It was, however, recognized that influencing possibilities are limited due to the development stage of the available means. There was only one conflicting view. One of the ESG specialists saw that it is not possible to prevent biodiversity loss solely by investing and that there needs to be a financial incentive behind it.

The Nordic pension investor interviewees generally believed that investors have influence because companies tend to listen to investors. The investors recognize they have a responsibility and have possibilities to impact the investments they own through active ownership and engagement. However, the answers included the weight of the mandates when making investment decisions, as well as the fact that money cannot change everything. When it comes to pension investors as institutional investors, they tend to make investment decisions through a financial materiality. In other words, they are primarily not investing for impact. For these interviewed pension investors, sustainability and different ESG issues are at the core of the investment strategy, but the pension investors' primary task is to invest productively and securely so that future pensions are secured.

**Key finding 4:** *There is high-quality nature data available, but its utilization in investment decision-making is difficult and incomplete*

Measuring and assessing biodiversity impacts requires an understanding of the links between business, changes in biodiversity as well as the costs, harms and/or benefits that may arise (Natural

Capital Coalition, 2018). The need for measurable and comparable data on biodiversity for investors to use is critical. The landscape of biodiversity data sources and biodiversity measurement approaches for businesses and financial institutions is rapidly evolving (Lammerant et al., 2021). Currently, financial institutions are looking for ways to assess the risk and impact they have on biodiversity via their finance and investment activities but find the available tools and frameworks intangible.

Transparent and comparable data is required so that the investors can analyze investments in terms of biodiversity loss. The interviewed investors consider existing assessment frameworks and datasets to be insufficient in providing information of the companies' biodiversity impacts. The interviewed investors stated that transparent and comparable data is required so that the investors are able to analyze investments in terms of biodiversity loss. Both interviewed groups believed the portfolio companies are not able to report enough material information regarding the impacts and dependencies of their own operations on biodiversity. Therefore, not enough material data is available for investors to utilize. According to UNPRI (2020), biodiversity-related risks and opportunities are usually evaluated using a combination of in-house ESG methodologies and information obtained from third party data providers. This may result in the information available reflecting more the quality of management responses than the biodiversity risks. Hence, as was evident in the interviews and according to the UNPRI, additional metrics and both trustworthy and comprehensive data are needed to facilitate the incorporation of biodiversity criteria into investment decision making.

Disclosing biodiversity data is still quite difficult with the known measurement and assessment methods. The data would require ability to trace the biodiversity impacts and dependencies on the entire value chain. According to Lammerant et al. (2021), financial institutions require biodiversity data solutions that enable them to report and manage their biodiversity impact. The requirements for these solutions are that they need to be “(i) quantitative, (ii) based on scientific approaches (iii) focused on the most material issues, (iv) based on available information (v) allowing to identify best performers or laggards in a sector (comparing corporates within a same sector, allowing a financial institution to make financing decisions or engage based on their performance)” (Lammerant et al., 2021. p. 2) This also supports investors' experience of what kind of data are needed to better support biodiversity conservation – reliable, transparent, and comparable data.

When discussing with the ESG specialists, it was seen that there is high-quality nature data available. When asked how credibly existing assessment framework and datasets provide the required information/analysis of the companies' biodiversity impacts, it was recognized that there are

shortcomings. Nevertheless, it is possible to combine financial accounting and natural hazards and utilize them to make an analysis of direct effects or indirect effects of corporate acquisitions. Based on one ESG specialist interview, the latter is possible by using for example Exiobase which is a global, detailed Multi-Regional Environmentally Extended Supply-Use Table (MR-SUT) and Input-Output Table (MR-IOT), and LC-IMPACT method, where the harm caused by land use per square meter in different parts of the world is in the unit pdf (potential disappeared fraction of species). In other words, when we combine financial accounting with Exiobase and further to LC-IMPACT, we know how much it causes carbon harm and how much harm it causes to nature and are able to include it in the financial accounting. However, according to the investor interviews, incorporating this kind of data into investment processes remains difficult. While there is a lot of valuable nature data available, it is lacking financial materiality and the impacts on the real-world return expectations, and return-risk-profiles. It is seen that the necessary next step would be to calculate the financial value of the investment's exposure to nature in different risk scenarios. At the core of this problem, however, are the challenges of financial valuation of ecosystem services and failure to account for the externalities nature provides. (Dasgupta, 2021)

**Key finding 5:** *Available biodiversity measurement is not yet suitable as link to financial materiality is missing*

Three investors and four ESG specialists mentioned that current biodiversity assessment is lacking financial materiality. It was underlined that while nature data is significant on its own, it is critical - from an economic standpoint - to be able to integrate nature data with financial relevance in order to incorporate the knowledge into investment decision-making. This is in alignment with the Cambridge Institute for Sustainability Leadership (2022), assessing nature-related risks requires dedicated resources that acknowledge the scale of the financial materiality of nature loss. This also has a connection to the theoretical concept of externalities. Financial materiality of the externalities is an important part of investment process. The majority of ecosystem services are not market-priced because they are public commodities, resulting in externalities, despite their invaluable contribution to society. As a result, there are insufficient economic incentives for producers and consumers to conserve, sustainably use, and restore biodiversity. (OECD, 2021a)

## **6.2 Limitations and suggestions for future research**

This research has been carried out by considering transparency and trustworthiness. However, several limitations in this research are recognized. Taking biodiversity into account in investment decision-making is a relatively new topic and therefore there is a limited amount of previous studies available.

In this thesis, trustworthiness is increased by many factors. To ensure transparency, a pilot interview was conducted to fine tune the interview questions. All of the interviews were recorded, the interviews were transcribed via automatic transcription and a priori template is presented. To enhance trustworthiness, the researcher could have used triangulation to limit the effect of bias. However, time constraints did not allow triangulation.

The research is geographically limited. The ESG specialists interviewed were Finnish and the pension investors interviewed are from the Nordic region. Biodiversity loss is a significant global problem, and its mitigation and adaptation measures may vary a lot depending on the location in question. Therefore, the results of this research cannot be generalized to a global context.

The ESG specialists interviewed responded based on their own professional skills. The ESG specialists were chosen based on their knowledge on biodiversity, natural capital and the interconnection between biodiversity loss and the financial markets. In addition, the chosen pension investors interviewed had biodiversity mentioned in their annual reports or in their websites. Therefore, it cannot be generalized that all Nordic pension investors have biodiversity on their agenda. Nor can it be generalized that the selected Nordic pension investors are the only pension investors in the Nordic region that are considering biodiversity.

It is important to note that this study includes only eight ESG specialists from Finland and six Nordic pension investors, thus the sample size is limited, and responses are not to be generalized. However, this study gives a deeper understanding as to how biodiversity is currently considered among the Nordic pension investors and concrete examples of the difficulties investors are facing. The study also indicates what the issues are for which companies are expected to provide help when it comes to disclosing information regarding biodiversity. For further research, it would be useful to expand the sample size and expand the research area outside the Nordic countries.

Although the research attempted to consider all of the interviewees' responses as precisely as possible, some crucial perceptions may have been overlooked unintentionally. The findings of this thesis are based on the researcher's interpretation of the interviews and materials. More research on this topic is required to confirm the assumptions.

This research focuses on listed-equity investments only. For further research and to create a full understanding on the topic, it would be necessary to study how other asset classes and their characteristics function in relation to biodiversity. In addition to other types of asset classes, also studying investors other than pension investors in this context could bring added value to the research of the topic. In addition, it would be interesting to do more research when more regulation comes into force, such as the Taskforce on Nature-Related Disclosure and see how the regulation affects data availability, data traceability, data transparency, data reliability and overall biodiversity assessment in investment processes.

### **6.3 Conclusions**

This thesis contributes to a better understanding of how Nordic pension investors are assessing biodiversity loss in investment decisions in listed equity and how to further develop the assessment frameworks in a way that investors can prevent biodiversity loss as part of their in daily investment activities. Therefore, this research fills the gap to increase the understanding of what information is needed to take biodiversity loss into account in investment decision-making. It is important to note that because of the non-probability purposive sampling method and a limited sample size, the findings cannot be generalized. In addition, the research is geographically limited. The interviewed ESG specialists were Finnish and the interviewed pension investors were from the Nordic region. Biodiversity loss is a significant global problem, and its mitigation and adaptation measures may vary a lot depending on the geographic location. Therefore, the results of this research cannot be generalized to a global context. Furthermore, the interviewed ESG specialists and pension investor representatives responded based on their own professional skills. Lastly, it should be noted that the interviews took place during the spring and summer of 2022 and the interviewees have answered in the light of the information available. Nevertheless, the following conclusions can be drawn based on this research.

It can be said that biodiversity is gaining momentum alongside climate change in investor decision-making. Biodiversity loss is something that is going to have a financial impact in the future and its

implications for the real economy are recognized but only partially known. Taking biodiversity into consideration in investment processes is constantly evolving and Nordic pension investors are paying close attention to the topic.

The growing empirical evidence shows that investors should and are willing to take biodiversity loss considerations into account. Nevertheless, integrating biodiversity risks into the investment process can be challenging while investment instruments, tools and best practices not yet well established. Hence, many market participants, including pension investors, find biodiversity risks difficult to price and incorporate into investment decision-making because of the systematic nature of the risks and a lack of disclosure by portfolio firms.

Data is the biggest barrier to taking biodiversity systematically into account when making investment decisions. Transparent and comparable data is required in order for investors to be able to analyze portfolio firms in terms of biodiversity loss. In order to solve the problems regarding the lack of overall data and also transparent and comparable data, companies are expected to disclose material nature-related dependencies and impacts throughout the value chain, and report associated metrics and targets. Furthermore, a lot of pressure is being put on the future regulation, such as the TNFD, and is expected to be effective in creating standardized frameworks to help evaluate portfolio firms' performance when it comes to preventing biodiversity loss. While there are some rankings available regarding biodiversity or environmental performance of portfolio firms, the analyzes are often not transparent and they are based on different metrics and therefore comparability is lacking.

Available biodiversity measurement approaches and data are not suitable from a financial materiality point of view. While there is a lot of valuable nature data available, it is lacking financial materiality and the impacts on the real-world return expectations, and return-risk-profiles. It would be important to the investors to consider the double materiality: the effect of finance and corporate activities on biodiversity loss. It is seen that the necessary next step would be to calculate the financial value of the investment's exposure to nature in different risk scenarios.

Even though biodiversity loss and all of its implications to the real economy are not well understood, it is vital to start measuring and disclosing biodiversity impacts, risks and dependencies alongside climate change. Lack of overall measurement approaches or data cannot be a limiting factor. It is vital for companies/portfolio firms to start disclosing their business dependencies and impacts on

biodiversity transparently. This way it becomes possible for investors to gain and so evaluate and compare portfolio firms with each other, for example within an industry, and to measure the effects of their own investment portfolio on biodiversity. Transparently disclosing material value chain impacts and dependencies upon biodiversity is particularly important. This is because a lot of the pressure on biodiversity is realized through value chains.

Based on the findings, investors are preparing for increasing statutory and voluntary regulation. When it comes to taking responsibility for biodiversity protection, asset owners and managers lack the strength that governments have through legislation and enforcement. However, investors have the capacity to leverage their position as shareholders to employ responsible investment strategies such as active ownership through voting and involvement, investing in responsible companies based on own company analysis, avoiding certain shares of certain companies and preferring index investments based on ESG evaluation to make a difference. However, we need strong cooperation from society's actors to achieve the common goal of halting biodiversity loss.

It is to be noted that more research is needed in order to increase the understanding of what information is needed to take biodiversity loss into account in investment decision-making. For future research, it would be relevant to conduct research with a larger sample size and broaden the research geographically. Also, since this research focused on listed-equity investments only, it could be essential to do more research on other asset classes with different characteristics and investment strategies available. Furthermore, in addition to studying pension investors, also research on other investor types could add value to the complexity of biodiversity. Additional research is also needed when more regulation comes into force, such as the EU Taxonomy or voluntary disclosure, such as the TNFD and see how the regulation affects data availability, data traceability, data transparency, data reliability and overall biodiversity assessment in investment processes.

Lastly, after rising regulation has become a reality and affects both investors and portfolio companies, it would be essential to study further the strategies and solutions of taking biodiversity into account in investment decision-making. In addition to that, it would be vital to study biodiversity indicators that are financially material for an investor to utilize and that are relevant in terms of the risk-return profile of listed-equity investments. Lastly, industry-specific measurement approaches need to be investigated so that portfolio companies are able to disclose relevant information on their performances biodiversity impacts and dependencies.

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## **Appendices**

### **Appendix 1**

**Examples of available biodiversity measurement approaches (Finance for Biodiversity, 2022. p. 12-23)**



Name	Organisation behind	Purpose	Benefit for financial institutions
Corporate Biodiversity Footprint (CBF)	Iceberg Data Lab (IDL) and I Care Consult as scientific partner	Designed to “assess the annual impact of corporates, financial institutions and sovereign entities on global and local biodiversity.”	Can be used to improve investment decision-making and take biodiversity into account when allocating capital. The CBF metric, which can be stated in both absolute and relative terms, can be used for a variety of purposes: extra-financial reporting, fund reporting/label reporting, portfolio management, best-in-class/best-in-universe, exclusions, engagement/stewardship, investment strategies and index.
Biodiversity Footprint Financial Institutions (BFFI)	ASN Bank, PRé Sustainability and CREM.	Provides a biodiversity footprint of the economic activities in which a financial institution invests. The methodology allows calculation of the environmental pressures and the biodiversity impact of investments within an investment portfolio, at the level of a portfolio, an asset class, a company, or a project.	The methodology is suitable for the following applications: calculating the biodiversity footprint of a portfolio, an asset class, a company or a project, development of an engagement policy and investment criteria based on insights in the main drivers behind the impact, identifying biodiversity impact hotspots on a portfolio level, allowing financial firms to focus on a certain loan or investment and using the footprint to establish and track a "no net loss or net gain" policy.
Species Threat Abatement and Restoration (STAR)	The IUCN Species Survival Commission’s Post-2020 Taskforce	Helps national governments, corporates, civil society and the finance industry and investors identify the potential contribution they can make to global targets such as the SDGs. It can help these actors identify which management responses are most likely to reduce species extinction risk, through management designed to reduce threats to species.	The STAR metric assesses how investments can help to reduce the risk of extinction of species by abating threats and by restoring habitat. It can assist the financial sector and investors in focusing their investments on conservation outcomes and measuring their contributions to global goals such as the Sustainable Development Goals. Because biodiversity is distributed unevenly over the globe, STAR evaluates the possibility for specific activities at specific locations to contribute to conservation goals.
Global Biodiversity Score for Financial Institutions (GBSFI)	CDC Biodiversité	Biodiversity assessment for companies (GBS) and for financial institutions (GBSFI). The methodological grounds are identical for both, but the operational frameworks differ considering the differences in terms of coverage (one company versus multiple financial assets) and data availability (comprehensive company data versus scarce publicly available data).	The GBSFI is suitable for calculating the footprint of a financial asset portfolio. Its ability to produce results for investment decisions is conditioned by the underlying data availability which varies depending on the asset type. For listed assets (equity and corporate bonds) an integrated solution, BIA, is under development. In that case, limited data from users will be necessary. For other asset types, at first GBSFI will remain a tailor-made approach that can only be used if a minimum data is provided by the financial institution (it can either be its own data, data purchased from third-party data providers or a mix of both).
Biodiversity Impact Analytics (BIA)	Carbon4Finance and CDC Biodiversité	BIA provides an overall and synthetic vision of the biodiversity footprint of portfolios or indices considering the full value chain of underlying companies. As BIA relies on the GBSFI methodology, it comes with the same concepts and limitations. It is not intended to replace local indicators which are best suited to local or on-site biodiversity assessments. The impacts of pressures caused by specific economic activities on ecosystems are quantified, relying on the GLOBIO model which is based on pressure-impact relationships.	BIA is suitable for calculating the footprint of a financial asset portfolio and indices composed of listed equity and/or corporate and sovereign bonds. The list of assets covered will then be expanded (e.g., corporate loans, sovereign bonds, etc.).
ENCORE - Exploring Natural Capital Opportunities, Risks and Exposure	Natural Capital Finance Alliance (Global Canopy and UNEP FI)	Linking environmental change with its consequences for the economy. Encore assists global banks, investors, and insurance companies in assessing the risks that environmental degradation, such as ocean pollution or forest destruction, causes for financial institutions. It guides in understanding how businesses in all sectors may be dependent on and impacted by nature, and how these potential reliances and impacts may pose a business risk.	According to UNPRI (2020), ENCORE is valuable to assess overall risk exposure to natural capital externalities. It is a good start for understanding biodiversity risk exposures and dependencies but it does not have tailored risk reports or asset-level data
The PBAF Standard	The Partnership for Biodiversity Accounting Financials (PBAF) is an independent foundation supported by the Dutch government	The main goal of PBAF is to create the 'PBAF Standard.' The PBAF Standard enables financial institutions to assess and disclose the impact and dependence of loans and investments on biodiversity.	Provides practical guidance to financial institutions on biodiversity impact and dependency assessment, as well as defining what is required for these assessments (whether undertaken by data providers or not) to convey the relevant information to financial institutions. With this information, financial institutions may efficiently manage and report on biodiversity-related risks and opportunities, thereby contributing to biodiversity conservation and sustainable usage.

## **Appendix 2**

### **Consents and questions**

#### **Investor interview consent**

Below you will find interview questions for a 60 minute interview.

During the interview, I will map out how your organization is approaching biodiversity loss, how you assess your own investments in relation to biodiversity, and what kind of targets you have in terms of biodiversity loss. During the interview, you may also refuse to answer a question if you prefer to do so.

This thesis is limited to Nordic institutional investors and listed equity investments.

With your permission, I'm going to record our interview and take notes on it. After the interview, the data will be transcribed and destroyed after the master's thesis is complete. Your identity will remain anonymous during the research project and in the final Master's thesis.

The questions are divided into three categories. Additional questions are possible depending on your answers.

#### **Background question**

1. Describe the importance of biodiversity for your organization at the moment?

#### **Current state**

2. What are the drivers for your organization to consider biodiversity?

3. In which sectors and/or themes do you see biodiversity loss as most relevant? Why?

4. Can you describe in more detail the key risks that biodiversity loss may cause?

5. Can you describe in more detail the key opportunities that nature positive initiatives/investments may offer?

#### **Assessment**

6. How do you assess the biodiversity impacts of your investments?

7. How well/credibly do existing assessment frameworks and datasets provide the required information/analysis of the companies' biodiversity impacts?

8. Do you see that investors have proper means to influence biodiversity loss?

9. What are the key challenges for you in assessing companies' biodiversity impacts?

#### **Targets**

10. What are your overall objectives and targets related to biodiversity considerations?

11. What would you need to be able to better analyze your investments and to allocate them?

12. How do you foresee biodiversity issues to be part of your investment strategies in the near future?

## **ESG specialist interview consent**

Below you will find interview questions for a 60 minute interview.

During the interview, I will map out your views on the consideration of biodiversity loss when investing in listed equity in the institutional investor context, how biodiversity is currently measured, and what targets can be set for taking biodiversity into account in investment decisions.

This thesis is limited to Nordic institutional investors and listed equity investments.

With your permission, I'm going to record our interview and take notes on it. After the interview, the data will be transcribed and destroyed after the master's thesis is complete. Your identity will remain anonymous during the research project and in the final Master's thesis.

The questions are divided into three categories. Additional questions are possible depending on your answers.

### **Background question**

1. Describe the importance of biodiversity for an institutional investor at the moment?

### **Current state**

2. What do you see as the role of institutional investors in addressing biodiversity loss?

3. In which sectors and/or themes do you see biodiversity loss as most relevant? Why?

4. Can you describe in more detail the key risks that biodiversity loss may cause?

5. Can you describe in more detail the key opportunities that nature positive initiatives/investments may offer?

### **Assessment**

6. Do you see that investors have proper means to influence biodiversity loss?

7. How well/credibly do existing assessment framework and datasets provide the required information/analysis of the companies' biodiversity impacts?

8. What kind of data or knowledge investors could or should use to assess their biodiversity impacts? Do you know any data sources?

9. What is lacking from the biodiversity assessment that institutional investors do or is there something they fall short in?

### **Targets**

10. What should be the targets/objectives for an investor when it comes to biodiversity investing, which also supports the value development of the investment object?

11. What are the next steps for an investor to better be able to have an impact in biodiversity conservation?

12. How should an investor develop their competences related to biodiversity?

### Interview questions for investors

Research question	Themes	Interview questions for investors	Sub questions
1	Background question	Describe the importance of biodiversity for your organization at the moment?	
2	Current state	What are the drivers for your organization to consider biodiversity?	i) is it a threat and mainly a risk management issue, ii) it is an investment opportunity, do you see growth opportunities here iii) is it a strategic consideration and high level commitment for you or something else?
3	Current state	In which sectors and/or themes do you see biodiversity loss as most relevant? Why?	
4	Current state	Can you describe in more detail the key risks that biodiversity loss may cause?	
5	Current state	Can you describe in more detail the key opportunities that nature positive initiatives/investments may offer?	
6	Assessment	How do you assess the biodiversity impacts of your investments?	i) Any particular frameworks? ii) What kind of data is it built upon? iii) Is the data publicly available, do you produce the analysis yourself or make use of external providers?
7	Assessment	What are the key challenges for you in assessing companies biodiversity impacts?	
8	Assessment	Do you see that investors have proper means to influence biodiversity loss?	
9	Assessment	How well/credibly do existing assessment framework and datasets provide the required information/analysis of the companies biodiversity impacts?	
10	Targets	What are your overall objectives and targets related to biodiversity considerations?	

11	Targets	What would you need to be able to better analyze your investments and to allocate them?	
12	Targets	How do you foresee biodiversity issues to be part of your investment strategies in the near future?	On what timeframe are you likely to report your biodiversity impacts?

### Interview questions for ESG specialists

Research question	Themes	Interview questions for ESG specialists	Sub questions
1	Background question	Describe the importance of biodiversity for an institutional investor at the moment?	
2	Current state	What do you see as the role of institutional investors in addressing biodiversity loss?	How would you assess the current state of institutional investors in relation to biodiversity?
3	Current state	In which sectors and/or themes do you see biodiversity loss as most relevant? Why?	Do you see that institutional investor should have a particular role in specific biodiversity loss questions? What kind of role should institutional investors take in biodiversity conservation?
4	Current state	Can you describe in more detail the key risks that biodiversity loss may cause?	
5	Current state	Can you describe in more detail the key opportunities that nature positive initiatives/investments may offer?	
6	Assessment	Do you see that investors have proper means to influence biodiversity loss?	
7	Assessment	How well/credibly do existing assessment framework and datasets provide the required information/analysis of the companies' biodiversity impacts?	i) Where do you see the most important development opportunities? Ii) Where to start?
8	Assessment	What kind of data or knowledge investors could or should use to	

		<p>assess their biodiversity impacts? Do you know any data sources?</p>	
<b>9</b>	Assessment	<p>What is lacking from the biodiversity assessment that institutional investors do or is there something they fall short in?</p>	<p>i) Do you consider that sufficient scientific data on biodiversity loss is available for institutional investors? ii) Is existing data being used effectively? iii) Are there enough resources to analyze existing data?</p>
<b>10</b>	Targets	<p>What should be the targets/objectives for an investor when it comes to biodiversity investing, which also supports the value development of the investment object?</p>	<p>What should be the role of institutional investors in this theme?</p>
<b>11</b>	Targets	<p>What are the next steps for an investor to better be able to have an impact in biodiversity conservation?</p>	
<b>12</b>	Targets	<p>How should an investor develop their competences related to biodiversity?</p>	

## Appendix 3

### A priori template

Interview question theme	Categories	Themes
Current state	Drivers to take biodiversity into account	<ul style="list-style-type: none"> <li>• Risk management</li> <li>• Reputation</li> <li>• Regulation</li> <li>• Market opportunities</li> <li>• Consumer demands</li> </ul>
	Relevant sectors	<ul style="list-style-type: none"> <li>• Mining</li> <li>• Food &amp; beverage</li> <li>• Forestry</li> <li>• Fishery</li> <li>• Chemicals</li> </ul>
	Risks and opportunities	<ul style="list-style-type: none"> <li>• Latent risks</li> <li>• Latent opportunities</li> <li>• Physical risks</li> <li>• Transition risks</li> <li>• Systemic risks</li> </ul>
Assessment	Current tools available for investors	<ul style="list-style-type: none"> <li>• Company and industry case studies</li> <li>• Financial relevance missing</li> <li>• Biodiversity metrics is available</li> <li>• Not tangible enough for an investor</li> </ul>
	Required data and knowledge	<ul style="list-style-type: none"> <li>• Data transparency and comparability</li> <li>• Valuation and financial materiality</li> <li>• Modeling and methodology</li> <li>• Geospatial data</li> <li>• Availability</li> </ul>
	Challenges in assessing	<ul style="list-style-type: none"> <li>• Data availability &amp; reliability</li> <li>• Valuation and financial materiality</li> <li>• Data transparency and comparability</li> <li>• Lack of standardization and information</li> </ul>
	Future requirements	<ul style="list-style-type: none"> <li>• Monitoring regulatory changes</li> <li>• Transparent and comparable data</li> <li>• Creating biodiversity policies</li> <li>• Financially relevant data</li> <li>• Resources</li> </ul>
Targets	Objectives & targets	<ul style="list-style-type: none"> <li>• Some related targets defined</li> <li>• Understanding the context</li> <li>• Targets not yet defined</li> </ul>
	Future strategies	<ul style="list-style-type: none"> <li>• Unknown</li> <li>• Engagement with companies</li> <li>• Shareholder activism</li> <li>• Investment screening</li> </ul>