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Bridging the biodiversity financing gap

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Angelina Hackmann

Bridging the biodiversity financing gap

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Bridging the biodiversity financing gap*

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Abstract

In recent decades, biodiversity has declined significantly, threatening ecosystem services that are vital to society and the economy. Despite the growing recognition of biodiversity risks, the private sector response remains limited, leaving a significant financing gap. The paper therefore describes market-based solutions to bridge the financing gap, which can follow a risk assessment approach and an impact-oriented perspective. Key obstacles to mobilising private capital for biodiversity conservation are related to pricing biodiversity due to its local dimension, the lack of standardized metrics for valuation and still insufficient data reporting by companies hindering informed investment decisions. Financing biodiversity projects poses another challenge, mainly due to a mismatch between investor needs and available projects, for example in terms of project timeframes and their additionality.

I. Introduction

In recent decades, biodiversity – the variety of all living things on our planet – has been declining at a concerning pace, mainly as a result of human activities such as land use change, pollution and the impact of climate change (EC, 2020). Indeed, according to data compiled by the World Wildlife Fund (WWF), between 1970 and 2018, monitored wildlife populations worldwide experienced a 69% reduction in relative abundance (WWF, 2022).

The severity was further confirmed by a team of scientists who quantified the processes that regulate the stability and resilience of the Earth system (Richardson et al., 2023). As shown in Figure 1, six of the nine planetary boundaries have been transgressed suggesting that the Earth is now well outside of the safe operating space for humanity and increasing the risk of large-scale abrupt or irreversible environmental change (Richardson et al., 2023).

The collapse of global biodiversity poses a significant threat to the provision of ecosystem services, such as food production, water purification or climate regulation, which contribute to the well-being of both society and the economy. US\$ 44 trillion of economic value generation, representing more

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than 50% of the world’s GDP, is significantly reliant on nature and its services, rendering it vulnerable to the impacts of biodiversity loss (WEF, 2020).

Figure 1: Planetary boundaries

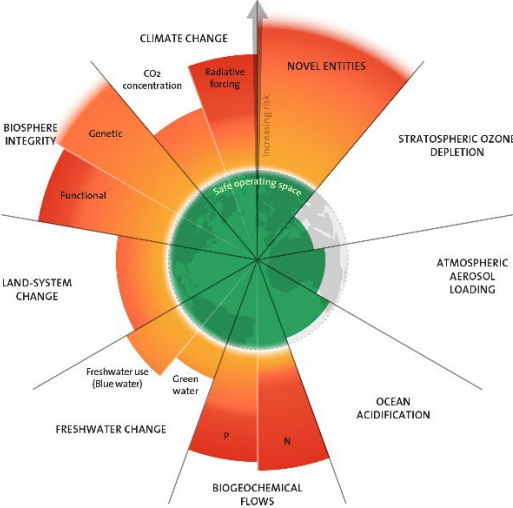


Figure 1: The green zone is the safe operating space. Yellow to red represent zones of increasing to high risk and show that these planetary boundaries are transgressed. Crossing these boundaries reflects unprecedented human disruption of Earth system and an increased risk of generating large-scale abrupt or irreversible environmental changes. Source: Azote for Stockholm Resilience Centre, based on analysis in Richardson et al. (2023).

Despite the growing recognition of biodiversity risks (Giglio et al., 2023), the recent World Economic Forum (WEF) Global Risks Report 2024 suggests that biodiversity loss and ecosystem collapse are not viewed as urgent concerns, especially by the private sector. While respondents from civil society or government ranked it as one of the top concerns in the short term, the private sector rated the risks related to biodiversity loss and ecosystem collapse as more relevant in the long term (10-year time horizon) (WEF, 2024).

Historically, conservation efforts have relied heavily on public funding and private philanthropy. The scale of the challenge at hand, however, necessitates greater involvement from the private sector. In particular, a recent report by the United Nations Environment Programme (UNEP) states that annual financial flows to Nature-based Solutions (Nbs) – with the size of US\$ 200 billion in 2022 – will need to more than double by 2025 and nearly triple by 2030 in order to reach Rio Convention targets, namely limiting global warming to below 1.5°C, halting biodiversity loss by ensuring that 30% of land and sea is protected by 2030, and achieving land degradation neutrality by 2030 (UNEP, 2023). Private investments in particular will be needed to fill this large financing gap.

This paper describes the interconnectedness between biodiversity and the economy as well as the need for investments in biodiversity conservation and restoration in section II. Given the scale of the

problem, section III explains market-based solutions for bridging the biodiversity financing gap, distinguishing between a risk assessment approach and an impact-oriented perspective. Section IV provides an overview of the current EU regulatory framework aiming to strengthen biodiversity financing. Finally, section V describes key obstacles to mobilising capital for biodiversity conservation and section VI provides an outlook.

II. The financial value of biodiversity

Natural capital can be defined as the world's stock of natural assets, including geology, soil, air, water and all living things. These natural assets in turn provide ecosystem services, such as food, water, climate regulation, natural flood defences or recreational opportunities, which yield a flow of benefits to society and the economy. Biodiversity, representing the variability of "living" natural assets, helps raise the productivity and resilience of these ecosystem services (TNFD, 2023).

The economy and society are highly dependent on ecosystem services: In principle, all businesses depend on natural capital assets and ecosystem services, either directly or indirectly through their supply chains (WEF, 2020). In particular, the WEF estimates that US\$ 44 trillion of annual economic value creation, representing more than 50% of global GDP, is moderately or highly dependent on nature and its services (WEF, 2020). This dependence can take the form of direct extraction of resources from forests and oceans, or the use of ecosystem services, such as healthy soils, clean water, pollination or a stable climate (WEF, 2020). For example, 60% of coffee species are in danger of extinction due to climate change, disease and habitat loss caused by land use change and deforestation (Davis et al., 2019). This, in turn, could affect global coffee markets and consequently a large number of smallholder farmers.

While society and the economy are highly dependent on ecosystem services and thus have an incentive to conserve biodiversity, achieving this goal poses a major challenge. As public goods, many of these ecosystem services are susceptible to the free-rider problem, whereby individuals benefit from actions without paying the full social cost. Markets cannot efficiently manage the provision of these goods because individuals who do not pay for the good cannot be excluded from receiving it. This can lead to an under-provision of the good (Heal, 2020). In addition, biodiversity conservation can lead to external benefits. For example, conserving tropical forests benefits everyone in the world, not only the individuals involved in the conservation (Heal, 2020). As a result, the provision of conservation actions does not pay off, and markets react by allocating their resources to more attractive investments. At first glance, therefore, conserving biodiversity might be best handled by the public sector. In fact, historically, biodiversity conservation and restoration have been financed primarily by public funding and private philanthropic giving (Flammer et al., 2023).

Figure 2: Investment needs for Nature-based Solutions (NbS)

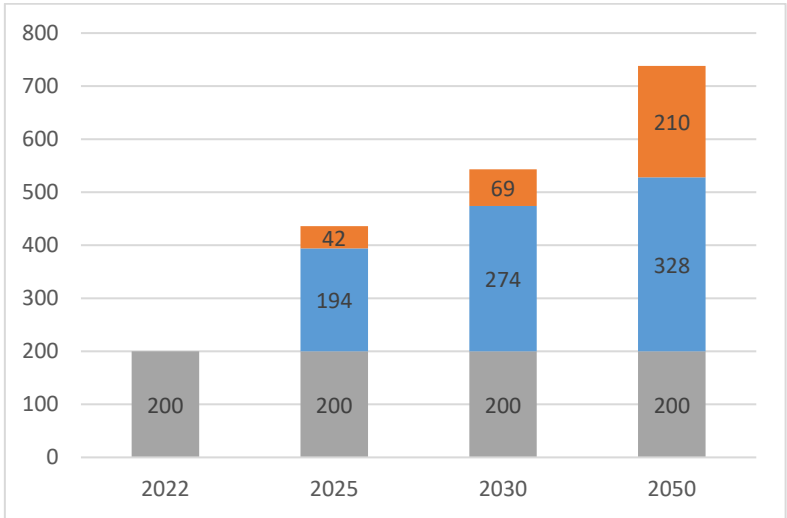


Figure 2: The grey bars represent the size of the public and private investments in NbS in 2022 (in 2023 billion US\$). The blue (orange) bars show the additional public (private) investments needed to reach Rio Convention targets, namely limiting global warming to below 1.5°C, halting biodiversity loss by ensuring that 30 per cent of land and sea is protected by 2030 and reaching land degradation neutrality by 2030. Source: UNEP (2023).

However, a closer look at the scale of the problem and the financial resources needed to solve the problem of biodiversity loss shows that these sources are not sufficient and that the private sector is needed. A recent report by the United Nations Environment Programme (UNEP) estimates the level of global investments in Nature-based Solutions (NbS) required to meet the goals of the Rio Convention, namely limiting global warming to below 1.5°C, halting biodiversity loss by ensuring that 30% of land and sea is protected by 2030, and achieving land degradation neutrality by 2030 (UNEP, 2023). The authors find that annual financial flows to NbS – with the size of US\$ 200 billion in 2022 – will need to more than double by 2025 and nearly triple by 2030 (see Figure 2). While public and private investments are likely to increase over time, private sources will provide a growing share of the financing gap. The authors expect private finance flows to increase by almost US\$ 70 billion per year by 2030, on top of the current annual flows of US\$ 35 billion. By 2050, private finance flows may reach almost US\$ 250 billion per year – roughly 33% of the total investment needs.

III. Market-based solutions to bridge the biodiversity financing gap

Investors can approach biodiversity issues from two distinct perspectives: (1) from an impact-oriented perspective aiming to mitigate or eliminate adverse effects on biodiversity and potentially striving for a net positive contribution to biodiversity conservation efforts; or alternatively, (2) via a risk assessment approach evaluating the direct and indirect impact of biodiversity loss on the financial performance of the companies in their portfolio.

1. Impact-oriented approach

The impact-oriented approach aims to increase financial flows to “projects that contribute—or intend to contribute—to the conservation, sustainable use, and restoration of biodiversity and ecosystems and their services to people” (World Bank, 2020). From an investor perspective, it is crucial to understand how to generate financial returns from conserving and restoring biodiversity. While a typical monetisation mechanism for natural capital would be to transform natural capital, in the case of biodiversity it needs to be protected rather than transformed. As suggested by Heal (2003), generating direct financial returns from protecting biodiversity is feasible by bundling the public good biodiversity with private goods whose value it enhances. Ecotourism is an example of such bundling: By protecting and restoring the native flora and fauna, these areas become more attractive, so that tourists are willing to pay more to visit these areas, which in turn increases the profit from ecotourism in these areas (Heal, 2003). In addition, the attractiveness of these protected areas will also increase the value of the real estate surrounding these protected areas. Protecting biodiversity can further enhance the productivity in agriculture and fishery, for example through soil fertility or by preventing overfishing, and increase consumer willingness to pay for products from these areas that can be labelled as biodiversity-friendly. As a result, revenues can be increased (Flammer et al., 2023). Furthermore, because of its importance for carbon reduction, the protection of biodiversity can generate carbon credits, which increases the attractiveness of the investment and generates indirect financial returns for the investor (Flammer et al., 2023). In addition to financial returns, investments in biodiversity conservation and restoration generate “biodiversity returns”, i.e. non-financial returns, which are generated by investing in natural capital. These returns are valued by so-called “impact investors” (Flammer et al., 2023).

In the following, we describe two categories of private financing products, namely bonds as debt-based instruments and funds as equity-based instruments. With regard to biodiversity bonds, a distinction can be made between conventional bonds and impact bonds. Proceeds from conventional biodiversity bonds are invested in projects that generate revenue while at the same time conserving or restoring biodiversity. An example is the sale of more sustainably produced commodities (Thompson, 2023). Impact bonds, on the other hand, are performance-based contracts in which investors get back their initial investment plus a return only if certain environmental targets are achieved. They are used for conservation impacts that are difficult to commoditise and have historically been funded by governments or donor agencies (Berndt and Wirth, 2018). However, to be attractive to investors, these projects need to generate financial returns in addition to achieving certain environmental impacts. For example, projects that aim to reduce deforestation may have the positive impact of maintaining or increasing the abundance of a species population. At the same time, such projects allow for sustainably

produced timber that can be sold at a price premium and the generation of carbon credits, both of which generate financial returns (Thompson, 2023).

While impact investments are becoming increasingly attractive to investors (Cooper and Trémolet, 2019), Thompson (2023) shows that these investments contain notable financial and impact risks at the project level. In terms of the environmental impact, risks can arise from the long timeframes for impacts to be realised, such as for trees to grow, as well as from the additionality of environmental impacts. Measurement risks arise from ambiguity on project site locations, and measuring of activities, output, outcomes, rather than impact. Finally, there is the financial risk of uncertainty, whether the projects will deliver profit, and thereby a return for investors (Thompson, 2023).

In terms of equity-based instruments, the group of biodiversity labelled or related funds is small compared to the total universe of sustainable funds, but has been growing, especially since 2022. The portfolios of these funds can vary in terms of style, sector exposure, objectives pursued, and consequently, their risk-return profile (Baselli, 2023). These funds can invest in “best in class” companies that are market leaders in terms of their own efforts and along their supply chains to minimise their impact on biodiversity or provide solutions to biodiversity loss. Impact funds are designed to have a measurable impact on the conservation and restoration of biodiversity, while also yielding a financial return. However, in order to mobilise private sector investment in biodiversity and ecosystem services at scale, granular data at the supply chain and project level would need to be available (World Bank, 2020).

As suggested by Flammer et al. (2023), private capital can be blended with public or philanthropic capital to de-risk private investments in biodiversity conservation and restoration. In particular, the authors find that projects with higher expected returns, smaller scale, and therefore smaller expected biodiversity impact, tend to be financed by pure private capital. In contrast, blended finance is more prevalent for larger scale projects with a more ambitious biodiversity impact, lower expected returns and lower risk. These results suggest that blending, and thereby de-risking private capital, improves the risk-return trade-off, which in turn increases the attractiveness to private investors. However, the authors find that certain conditions in terms of financial return and biodiversity impact need to be met for a project to be considered by investors, whether as a stand-alone or as blended finance opportunity. Therefore, alongside private solutions, public policies are still needed to tackle the biodiversity crisis (Flammer et al., 2023).

Biodiversity credits are emerging as an alternative economic instrument for financing biodiversity conservation and restoration. These credits, generated by companies engaged in biodiversity conservation, allow businesses to demonstrate their commitment to managing nature-related risks. While international standards for biodiversity credits are currently lacking, it is essential to establish

criteria such as environmental integrity, additionality, and respect for the rights of indigenous peoples and local communities to ensure equitable distribution of benefits and effective governance structures (Tamayo Tabares, 2023). Caution must be exercised with regard to biodiversity offsets, as failure to achieve expected outcomes can exacerbate biodiversity loss, as evidenced by cases such as the Victoria's Native Vegetation Framework (Zu Ermgassen et al., 2023, Apostolopoulou et al., 2019). In particular, due to its local and heterogeneous dimension and the irreversibility of biodiversity loss, once biodiversity is destroyed in one location, it cannot be adequately compensated by restoring it elsewhere.

2. Risk assessment approach

In terms of the risk assessment approach, financial market participants integrate climate and environmental considerations into financial risk management and, consequently, investment decisions. In order to understand, how nature loss is material to businesses, nature-related risks need to be regularly identified, assessed and disclosed by companies. These materiality assessments can not only help prevent mispricing and improve the estimation of accurate capital buffers, but also guide business activities in a nature-positive direction (WEF, 2020). In particular, nature risks become material for businesses, (1) when businesses depend directly on biodiversity and ecosystem services for their operations, through the supply chains, real estate assets, physical security and business continuity; (2) when (2) the impact of business activities on nature results in the loss of customers or entire markets, legal challenges or adverse regulatory changes; and (3) when the nature degradation affects the society or markets in which the businesses operate (WEF, 2020).

Nature-related risks for companies and the financial system can be divided into three categories. First, physical risks can be defined as the threat to economic activity associated with the loss of nature. It can be acute, as in the case of natural disasters such as oil spills or forest fires, or chronic, as in the case of dwindling ecosystems. Examples of the latter include the decline of pollinating insects or the degradation of agricultural land, resulting in lower crop yields that affect agricultural firms and the global food supply (Boldrini et al., 2023). The second category comprises transition risks, which occur due to adjustments in regulatory, policy and legal frameworks, as well as technological innovations and shifts in investor sentiment and consumer preferences. The need to adapt to these changes can impose costs on companies and affect their market value. Especially companies with a major impact on nature are highly exposed to transition risks (Boldrini et al., 2023). Third, nature-related systemic risks arise from the potential collapse of an entire system. For example, if certain tipping points are reached and regime shifts and/or an ecosystem collapse occur, the provision of ecosystem services will be disturbed, leading to physical and transition risks. The materialisation and accumulation of physical and transition risks can destabilize an entire financial system (TNFD, 2023).

Similar to the impacts of climate change, the tangible economic consequences of biodiversity-related physical and transition risks can include disrupted production processes, disruptions in global value chains and reduced productivity, diminishing corporate profitability, cash flows, and insurability. These impacts can reverberate throughout the financial system via impaired asset valuations, challenges in debt servicing, liquidity constraints, reputational damage, legal liabilities and broader macroeconomic instabilities such as exchange rate fluctuations, volatile commodity prices and threats to sovereign debt sustainability (CISL, 2021, Pinzón and Robins, 2020).

In recent years, these risks have become increasingly important for policymakers. With a view to the stability of the financial system, several central banks have started to assess nature-related risks to the financial sector. In this context, De Nederlandsche Bank and the Netherlands Environmental Assessment Agency found that 36% of the investments of Dutch banks, pension funds and insurers are highly or very highly dependent on at least one ecosystem service (van Toor et al., 2020). Furthermore, the Banque de France explored biodiversity-related financial risks and found that 42% of the value of securities held by French financial institutions is highly or very highly dependent on one or more ecosystem services (Svartzman et al., 2021). More recently, the European Central Bank examined the financial system's dependence on ecosystem services and found that approximately 75% of euro area banks' corporate loans to non-financial corporations are highly dependent on at least one ecosystem service. When considering only direct dependency rather than also taking into account supply chain exposure, the share of euro area corporate loans that are highly dependent on one or more ecosystem services falls to approximately 61% (Ceglar et al., 2023). Revealing the euro area firms' and financial institutions' exposure to transition risks, in a recent paper the European Central Bank found that the economy has had a significant impact on biodiversity loss – measured through its main drivers, land-use change and climate change. The overall impact is measured to be equivalent to the loss of 582 million hectares of “pristine” natural areas worldwide. Although the largest biodiversity impacts occur in Europe, companies' supply chains play a crucial role in determining their indirect biodiversity footprint globally. In terms of risks to the financial system, the study determined that the ten companies with the largest financing share of global impact on nature are responsible for financing 40% of the overall impact of euro area firms (Ceglar et al., 2023).

A recent study by Giglio et al. (2023) proposes a systematic framework to quantify physical and transition risks related to biodiversity loss and measure their impact on economic activity and asset values. In particular, the authors construct an index as a measure of biodiversity risk based on newspaper articles. Figure 3 shows the biodiversity news index and a climate news index, which represent the newspaper coverage of biodiversity- and climate-related issues, respectively. Giglio et al. (2023) propose these indices to measure attention and concern related to biodiversity and climate

risks over time, with a higher value associated with more negative news in that month. Since around 2015, concern and attention related to biodiversity have increased, while the concern related to climate risks remained more or less at the same level. The biodiversity index shows the largest peak, and therefore the greatest concern, in August 2019, when the Trump administration announced that it would adjust the Endangered Species Act, making it easier to remove a species from the endangered list and weakening protections for threatened species (Friedman, 2019). It also peaked in 2020 with the release of the fifth Global Biodiversity Outlook report (CBD, 2020).

Figure 3: Biodiversity and Climate Risk Indices

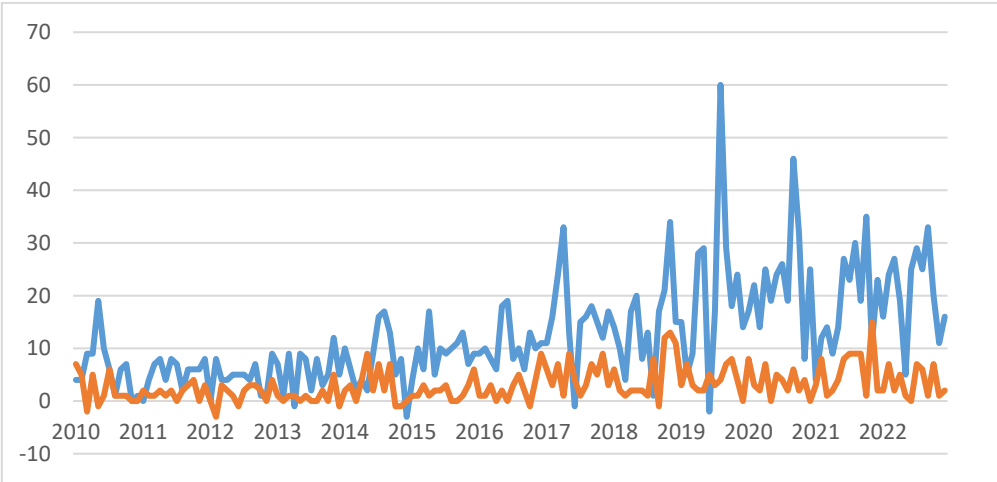


Figure 3: The blue line shows the biodiversity risk index and the orange line shows the climate index. Giglio et al. (2023) constructed these indices using newspaper articles in the New York Times related to biodiversity and climate, respectively. The indices are constructed on a daily basis by subtracting the number of positive biodiversity (or climate) articles from the number of negative articles. The daily indices are aggregated to monthly data by summing the daily data. A positive value reflects that negative articles outnumber positive ones, and therefore there is more concern about biodiversity (or climate).Source: Giglio et al. (2023).

Giglio et al. (2023) further construct three measures of biodiversity risk exposure based on firms’ 10-K statements (firm level), a survey of academics and professionals (industry level), and the holdings of four biodiversity-related funds. In contrast to the exposure to climate risk, the exposure to biodiversity risk varies considerably across industries, with energy, utilities and real estate being the most exposed. The authors find evidence that biodiversity risks are already incorporated into equity prices. However, about half of the respondents to a survey among market participants believe that biodiversity risks are not sufficiently priced into equity, commodity, sovereign debt, and real estate markets (Giglio et al., 2023).

In addition, Garel et al. (2023) introduce the concept of a corporate biodiversity footprint, examining its impact on stock returns across international firms. While, on average, the biodiversity footprint does not significantly influence stock returns, there’s evidence of a biodiversity footprint premium emerging post the two UN Biodiversity Conferences (COP15), indicating higher returns for firms with

larger footprints. This suggests that investors may be factoring in the risk associated with future biodiversity regulations, as evidenced by the value loss experienced by firms with large footprints following key COP15 events (Garel et al., 2023).

IV. The EU regulatory environment

1. EU Biodiversity Strategy for 2030

On 20 May 2020, the European Commission adopted the EU Biodiversity Strategy for 2030, which aims to protect nature and reverse the degradation of ecosystems caused by human activities. The EU Biodiversity Strategy is a cornerstone of the European Green Deal, which seeks to achieve a sustainable and carbon-neutral economy by 2050. The EU Biodiversity Strategy evolves around several pillars: First, it aims to protect and restore nature in the European Union, by improving and extending the network of protected areas and developing an EU Nature Restoration Plan for degraded habitats. In addition, the Commission is committed to set in motion a governance framework to steer the implementation of biodiversity commitments agreed at national, European or international level. In addition, it aims to mobilise at least €20 billion per year in private and public funding for nature (EC, 2020). Taken together, the EU and its Member States committed to implement more than 100 actions by 2030. To date, 49 actions have been completed, 47 are in progress and 8 are delayed (EC, 2022).

2. EU Taxonomy

In 2018, the European Commission adopted its first action plan on financing sustainable growth. It comprises three building blocks, namely, (1) the EU Taxonomy - a classification system for sustainable activities, (2) a disclosure framework for non-financial and financial companies, and (3) investment tools, including benchmarks, standards, and labels (EC, 2021).

Within the EU Taxonomy framework, activities must first be considered eligible before deciding whether the specific economic activities or investments are aligned. Ultimately, the degree of alignment determines whether assets or investments qualify as sustainable or green. To be defined as taxonomy-eligible, an activity must contribute to one of the six specified environmental objectives laid out in the EU Taxonomy Regulation¹: climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, transition to a circular economy, pollution prevention and control, and protection and restoration of biodiversity and ecosystems. An economic activity is defined as taxonomy-aligned if it makes a substantial contribution to at least one environmental objective, while not significantly harming any other environmental objective and

¹ Regulation (EU) No. 2020/852.

complying with minimum social safeguards (EC, 2021). The concepts of “substantial contribution” (SC) and “do not significant harm” (DNSH) are given, where possible, by quantitative thresholds and measures. Given the complex nature of some of the objectives, such as biodiversity, the screening criteria may be of qualitative nature, but may evolve over time (Fiestas, 2023). While the first set of technical screening criteria for the two climate objectives has applied since January 2022, the criteria for the four non-climate related environmental objectives were adopted in June 2023 and published in the EU Official Journal in November 2023. They entered into force on 1 January, 2024, meaning that reporting entities have to report on all six objectives for the financial year 2023 (EC, 2023a).

3. Reporting requirements

The Non-Financial Reporting Directive (NFRD)² requires companies to report the proportion of their taxonomy-aligned turnover, capital expenditure and operating expenses. In addition, the Directive requires companies to disclose on other sustainability-related issues, such as social, human, and governance factors. The companies covered by the Directive are large public-interest companies with more than 500 employees. The NFRD introduced the principle of double materiality, requiring firms to report on both how sustainability issues impact their performance and how their business in turn affects people and the environment.

Due to a lack of comparability and scope of the information disclosed, as well as too few companies being required to disclose, the NFRD was amended by the Corporate Sustainability Reporting Directive (CSRD)³, which came into force in January 2023. It introduced detailed sustainability reporting requirements to be met by all large and listed companies in the EU.

The disclosure requirements under the CSRD are based on harmonised European Sustainability Reporting Standards (ESRS)⁴ developed by the European Financial Reporting Advisory Group (EFRAG). In addition to disclosure requirements related to the company’s taxonomy-alignment, the first set of ESRS reporting standards, adopted in July 2023, contains two cross-cutting standards and 10 topical standards with a focus on environmental, social, and governance topics. The topical standards ESRS E4 specify the disclosures that should be made in relation to the undertaking’s actions to prevent, mitigate or restore actual or potential negative impacts on biodiversity and ecosystems, as well as measures to protect or restore biodiversity and ecosystems. Furthermore, companies must explain their material risks, dependencies and opportunities related to biodiversity and ecosystems, and how they manage them. These standards also require companies to disclose the potential financial effect of material risks and opportunities arising from biodiversity- and ecosystem-related impacts and dependencies.

² Directive (EU) 2014/95.

³ Directive (EU) 2022/2464.

⁴ Regulation (EU) 2023/2772.

Companies may voluntarily disclose a transition plan for biodiversity and ecosystems (EFRAG, 2023). The standards will be enforced between 2024 and 2028, starting with companies that were previously subject to the NFRD, which will have to apply the standards in the 2024 financial year for reports published in 2025 (EC, 2023b).⁵

In the absence of mandatory reporting requirements, few companies in the EU reported reliable information on biodiversity. By means of a textual analysis, von Zedlitz (2023) investigates voluntary biodiversity reporting of 359 European blue-chip companies in 2021 and finds that disclosures largely lack standardisation, quantification, details and clear targets. In addition, companies in sectors or regions more exposed to nature-related risks as well as larger companies appear to report more (von Zedlitz, 2023).

Also financial market participants are required to disclose taxonomy-based metrics. In particular, the Sustainable Finance Disclosure Regulation (SFDR) requires financial market participants and financial advisors to provide pre-contractual and ongoing disclosure on the integration of sustainability risks and the consideration of adverse sustainability impacts. With regard to the level of sustainability, the SFDR distinguishes between three product categories: (i) Article 6 (grey) products, which do not have a sustainability scope, (ii) Article 8 (light green) products, which promote social and/or environmental characteristics, and may invest in sustainable investments, but do not have sustainable investment as their core objective, and (iii) Article 9 (dark green) products, which have sustainable investment as their objective. As of January 2023, the SFDR requires Article 8 funds with a commitment to sustainable investments (Article 8.5 funds) and Article 9 funds to report their asset allocation to sustainable investments, broken down into social, environmental and taxonomy-aligned investments. To determine these figures, financial companies rely on information from the CSRD reports of the companies in which they invest. Thus, compliance with SFDR reporting requirements is intertwined with information obtained from CSRD reports, highlighting the relevance of CSRD in fulfilling SFDR obligations. As shown by Badenhoop et al. (2023), the regulatory changes to the SFDR that took effect in January 2023 led to a downgrading of Article 9 funds to Article 8 funds along with a higher proportion of sustainable investments in the group of Article 9 funds. The authors therefore conclude that the additions to and clarifications of the SFDR have indeed sharpened the profile of the SFDR classifications and increased their accuracy. The share of disclosed taxonomy-aligned investments was still very low

⁵ In its 2024 Commission Work Programme, the EC announced to reduce burdens associated with reporting requirements by 25%. In particular, it includes a proposal to postpone the adoption of sector-specific ESRS and the standard for certain third-country undertakings to June 2026 (EC, 2023c). It also includes a delegated directive to adjust the thresholds for the size criteria for micro, small, medium-sized and larger undertakings or groups by 25%, impacting the entities that fall into the scope of the CSRD (Directive (EU) 2023/2775).

in early 2023, most likely due to the very specific scope of the taxonomy, namely the implementation of only two out of six environmental objectives at that time (Badenhoop et al., 2023).

V. Key obstacles to mobilising capital for biodiversity conservation

Despite growing awareness of the urgent need for biodiversity conservation, mobilising private investment at scale remains a formidable challenge. Several key barriers hinder efforts to channel private capital into biodiversity projects, ranging from the lack of clear policy goals and data to the complexities of impact investing.

A key challenge is the lack of a unified policy goal for biodiversity conservation akin to the 1.5°C target set by the Paris Agreement for climate change. Without a clear target, it is difficult to create a framework that incentivises investment in biodiversity conservation. The 30x30 target of the Kunming-Montreal Global Biodiversity Framework (GBF), aiming to protect 30% of the Earth's land and sea by 2030, could potentially fill this gap. However, as noted by Gurney et al. (2023), achieving this target depends on action across all 23 targets of the GBF, especially those addressing climate change and environmentally harmful subsidies, and the implementation of a more robust monitoring and review process. The multidimensional nature of biodiversity loss, encompassing genetic diversity, species loss and ecosystem degradation, further complicates the issue.

Pricing biodiversity poses another formidable challenge due to several factors (Giglio et al. 2023, Karolyi and Tobin-de la Puente, 2023). First, unlike climate risk, which can be quantified to some extent on a global scale, biodiversity risk is highly dependent on local factors, making it challenging to measure consistently. Moreover, the inability to establish a carbon price equivalent or compensation scheme further impedes efforts to assign a monetary value to biodiversity. Traditional offsetting mechanisms, commonly used in carbon markets, are not applicable to biodiversity conservation due to the irreversibility of biodiversity loss. Once biodiversity is destroyed in one location, it cannot be adequately compensated by restoring it elsewhere. The difficulty in measurement due to the local and heterogenous nature of biodiversity extends to the pricing of biodiversity, as there is no standardised metric or valuation method (World Bank, 2020). In particular, the lack of comprehensive data, including along the supply chain, and the existence of multiple metrics make it difficult to accurately quantify the value of biodiversity (Karolyi and Tobin-de la Puente, 2023, Kedward et al., 2023, Chenet et al., 2022).

As a result of these challenges, the corporate reporting on biodiversity-related issues is currently very low (von Zedlitz, 2023). The EU Taxonomy used to define economic activities as green or sustainable is not yet comprehensive and still excludes, for example, the agricultural sector. Reporting standards for companies are currently in the process of considering the disclosure of environmental issues. The ESRS

already contain topical standards on biodiversity-related issues, although the standards will not be enforced for the first group of companies until the 2024 financial year. At a global level, the ISSB standards do not yet include biodiversity. However, standardising the disclosure of environmental data is a necessary step for investors to make informed decisions in line with their sustainability preferences (Krahn, 2023). The lack of reliable data has implications for the pricing of biodiversity risks in asset markets. While Giglio et al. (2023) find evidence that biodiversity risks are already incorporated into equity prices to some extent, the authors also conducted a survey suggesting that about half of the market participants believe that biodiversity risks are not sufficiently priced into equity, commodity, sovereign debt, and real estate markets. This heterogeneity in perception and lack of clarity may hinder price setting mechanisms in asset markets and thus the mobilisation of private capital for biodiversity conservation.

Financing biodiversity projects poses another challenge, mainly due a mismatch between investor needs and available projects. First, the long timeframes required for conservation projects to deliver tangible results may not be compatible with the shorter-term investment horizons of many investors. Conservation projects often take years, if not decades, to generate revenues and realise impacts, making them less attractive from a financial perspective. Moreover, the concept of additionality, which refers to the additional environmental benefits beyond those that would have occurred anyway, is questionable for many conservation projects (Thompson, 2023). Unlike many other investment opportunities, biodiversity conservation is often viewed as a public good, making it challenging to assign a financial value (Heal, 2003).

VI. Outlook

Biodiversity loss and climate change are two of the most pressing challenges of our time, yet research on biodiversity finance lags behind that on climate finance (Karolyi and Tobin-de la Puente, 2023). A separate examination of the role of finance in biodiversity conservation and restoration is therefore essential. Market-based solutions for bridging the biodiversity financing gap can be approached from two perspectives: risk assessment or impact-oriented strategies.

In terms of the risk assessment approach, enhancing transparency on how biodiversity loss impacts companies, and how companies in turn impact biodiversity loss, is essential to account for associated externalities. Standardising the disclosure of companies' biodiversity risks and impacts will enable asset markets to accurately price companies' footprints and risks, allowing investors to align their actions with their sustainability preferences. At the EU level, the EU Taxonomy, with possible extensions to include additional sectors such as agriculture, and the ESRS, which will be mandatory from 2024, play a key role in this endeavour. At the global level, the ISSB standards would need to be

extended to the topic biodiversity. While mandatory reporting requirements are still low, attitudes are already evolving, as evidenced by the emergence of a biodiversity footprint premium following international agreements such as COP15 (Garel et al., 2023) and the incipient incorporation of biodiversity risks into equity prices (Giglio et al., 2023), indicating a growing concern for biodiversity impacts among investors. As awareness of biodiversity risks and impacts grows, integrating incentives for conservation into existing business models, such as greening supply chains, has significant potential to drive impactful change.

In terms of financing biodiversity projects, the impact-oriented strategy, bridging the gap between investor needs and biodiversity conservation projects is essential. For projects that take a long time to realise impacts, one solution could be for bond issuers to start projects before the bond issuance (Thompson, 2023). Additionally, for larger-scale projects with ambitious biodiversity impacts, blended finance is becoming increasingly prevalent. While these projects may offer lower expected returns, they also carry lower risks, making them more attractive to private investors. However, it is crucial to ensure that biodiversity projects meet certain thresholds in terms of both financial returns and biodiversity impact in order to effectively attract private capital (Flammer et al., 2023).

References

- Apostolopoulou, E., Greco, E., & Adams, W. M. (2019). Biodiversity Offsetting and the Production of 'Equivalent Natures': A Marxist Critique. *ACME: An International E-Journal for Critical Geographies*.
- Badenhoop, N., Hackmann, A., Mücke, C., & Pelizzon, L. (2023). Quo vadis sustainable funds? Sustainability and taxonomy-aligned disclosure in Germany under the SFDR. SAFE White Paper No. 94. Available at: [Link](#) (Accessed: 19.04.2024).
- Baselli, V. (2023). Biodiversity – Can you save the planet and make money?. Morningstar Special Report. Available at: [Link](#) (Accessed: 19.04.2024).
- Berndt, C., & Wirth, M. (2018). Market, metrics, morals: The Social Impact Bond as an emerging social policy instrument. *Geoforum*, 90, pp. 27-35.
- Boldrini, S., Ceglar, A., Lelli, C., Parisi, L., & Heemskerk, I. (2023). Living in a world of disappearing nature: physical risk and the implications for financial stability. ECB Occasional Paper No. 333. Available at: [Link](#) (Accessed: 19.04.2024).
- Ceglar, A., Boldrini, S., Lelli, C., Parisi, L., & Heemskerk, I. (2023). The impact of the euro area economy and banks on biodiversity. ECB Occasional Paper No. 335. Available at: [Link](#) (Accessed: 19.04.2024).
- Chenet, H., Kedward, K., Ryan-Collins, J., & van Lerven, F. (2022). Developing a precautionary approach to financial policy: from climate to biodiversity. The Inspire Sustainable Central Banking Toolbox, Policy Briefing Paper No. 2. Available at: [Link](#) (Accessed: 19.04.2024).
- CISL (2021). Handbook for nature-related financial risks: key concepts and a framework for identification. Available at: [Link](#) (Accessed: 19.04.2024).
- CBD (2020). Global Biodiversity Outlook 5. Available at: [Link](#) (Accessed: 19.04.2024).

- Cooper, G., & Trémolet, S. (2019). Investing in nature: private finance for nature-based resilience. The Nature Conservancy and Environmental Finance. London, United Kingdom. Available at: [Link](#) (Accessed: 19.04.2024).
- Davis, A. P., Chadburn, H., Moat, J., O'Sullivan, R., Hargreaves, S., & Nic Lughadha, E. (2019). High extinction risk for wild coffee species and implications for coffee sector sustainability. *Science advances*, 5(1), pp. eaav3473.
- EC (2020). EU Biodiversity Strategy for 2030. Bringing nature back into our lives. Available at: [Link](#) (Accessed: 19.04.2024).
- EC (2021). Strategy for Financing the Transition to a Sustainable Economy. Available at: [Link](#) (Accessed: 19.04.2024).
- EC (2022). EU Biodiversity Strategy Actions Tracker. Available at: [Link](#) (Accessed: 19.04.2024).
- EC (2023a). Questions and Answers on the Sustainable Finance package. 13 June 2023. Available at: [Link](#) (Accessed: 19.04.2024)
- EC (2023b). Questions and Answers on the Adoption of European Sustainability Reporting Standards. 31 July 2023. Available at: [Link](#) (Accessed: 19.04.2024).
- EC (2023c). Proposal for a decision of the European parliament and of the council amending Directive 2013/34/EU as regards the time limits for the adoption of sustainability reporting standards for certain sectors and for certain third-country undertakings. Available at: [Link](#) (Accessed: 19.04.2024).
- EFRAG (2023): ESRS E4 – Biodiversity and ecosystems. Available at: [Link](#) (Accessed: 19.04.2024).
- Fiestas, H. V. (2023). The EU Taxonomy: Financing the Transition through Sustainable Investing. *ICE, Revista de Economía*, 932.
- Flammer, C., Giroux, T., & Heal, G. (2023). Biodiversity finance. NBER Working Paper No. w31022. Available at: [Link](#) (Accessed: 19.04.2024).
- Friedman, L. (2019). U.S. Significantly Weakens Endangered Species Act. In: The New York Times, 12.08.2019. Available at: [Link](#) (Accessed: 19.04.2024).
- Garel, A., Romec, A., Sautner, Z., & Wagner, A. F. (2023). Do investors care about biodiversity? *Review of Finance, forthcoming*.
- Giglio, S., Kuchler, T., Stroebel, J., & Zeng, X. (2023). Biodiversity risk. NBER Working Paper No. w31137. Available at: [Link](#) (Accessed: 19.04.2024).
- Gurney, G. G., Adams, V. M., Álvarez-Romero, J. G., & Claudet, J. (2023). Area-based conservation: Taking stock and looking ahead. *One Earth*, 6(2), pp. 98-104.
- Heal, G. (2003). Bundling Biodiversity. *Journal of the European Economic Association*, 1(2-3), pp. 553-560.
- Heal, G. (2020). The economic case for protecting biodiversity. NBER Working Paper No. w27963. Available at: [Link](#) (Accessed: 19.04.2024).
- Karolyi, G. A., & Tobin-de la Puente, J. (2023). Biodiversity finance: A call for research into financing nature. *Financial Management*, 52(2), pp. 231-251.

- Kedward, K., Ryan-Collins, J., & Chenet, H. (2023). Biodiversity loss and climate change interactions: financial stability implications for central banks and financial supervisors. *Climate Policy*, 23(6), pp. 763-781.
- Krahen, J. P. (2023). Welche Rolle spielt die Finanzwirtschaft im Angesicht des Klimawandels?. Available at: [Link](#) (Accessed: 19.04.2024).
- Pinzón, A, Robins, N. (2020). The sovereign transition to sustainability: Understanding the dependence of sovereign debt on nature. Available at: [Link](#) (Accessed: 19.04.2024).
- Richardson, K., Steffen, W., Lucht, W., Bendtsen, J., Cornell, S.E., Donges, J.F., Drüke, M., Fetzer, I., Bala, G., von Bloh, W. and Feulner, G. (2023). Earth beyond six of nine planetary boundaries. *Science Advances*, 9(37), pp. eadh2458.
- Svartzman, R., Espagne, E., Julien, G., Paul, H. L., Mathilde, S., Allen, T., & Vallier, A. (2021). A 'Silent Spring' for the Financial System? Exploring Biodiversity-Related Financial Risks in France. Banque de France Working Paper No. 826. Available at: [Link](#) (Accessed: 19.04.2024).
- Tamayo Tabares, E. (2023). Paths to Biodiversity Finance: A stocktaking analysis. Frankfurt School of Finance and Management. Frankfurt am Main, Germany. Available at: [Link](#) (Accessed: 19.04.2024).
- Thompson, B. S. (2023). Impact investing in biodiversity conservation with bonds: An analysis of financial and environmental risk. *Business Strategy and the Environment*, 32(1), pp. 353-368.
- TNFD (2023). Recommendations of the Taskforce on Nature-related Financial Disclosures. Available at: [Link](#) (Accessed: 19.04.2024).
- UNEP (2023). State of Finance for Nature. The Big Nature Turnaround Repurposing \$7 trillion to combat nature loss. Available at: [Link](#) (Accessed: 19.04.2024).
- Van Toor, J., Piljic, D., Schellekens, G., Van Oorschot, M., & Kok, M. (2020). Indebted to nature: Exploring biodiversity risks for the Dutch financial sector. De Nederlandsche Bank. Available at: [Link](#) (Accessed: 19.04.2024).
- von Zedlitz, G. (2023). Mind the Gap?! The Current State of Biodiversity Reporting. SAFE White Paper No. 95. Available at: [Link](#) (Accessed: 19.04.2024).
- WEF (2020). Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy. Available at: [Link](#) (Accessed: 19.04.2024).
- WEF (2024). The Global Risks Report 2024. 19th Edition. Available at: [Link](#) (Accessed: 19.04.2024).
- World Bank (2020). Mobilizing private finance for nature. Available at: [Link](#) (Accessed: 19.04.2024).
- WWF (2022). Living Planet Report 2022 – Building a nature-positive society. Available at: [Link](#) (Accessed: 19.04.2024).
- Zu Ermgassen, S. O., Devenish, K., Simmons, B. A., Gordon, A., Jones, J. P., Maron, M., ... & Bull, J. W. (2023). Evaluating the impact of biodiversity offsetting on native vegetation. *Global Change Biology*, 29(15), pp. 4397-4411.

Regulations

Commission Delegated Directive (EU) 2023/2775 of 17 October 2023 amending Directive 2013/34/EU of the European Parliament and of the Council as regards the adjustments of the size criteria for

micro, small, medium-sized and large undertakings or groups. Available at: [Link](#) (Accessed 19.04.2024).

Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023 supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards. Available at: [Link](#) (Accessed 19.04.2024).

Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU as regards disclosure of non-financial and diversity information by certain large undertakings and groups. Available at: [Link](#) (Accessed 19.04.2024).

Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting. Available at: [Link](#) (Accessed 19.04.2024).

Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088. Available at: [Link](#) (Accessed 19.04.2024).