



Biodiversity: the next frontier for financial institutions

An approach for Brunel Pension Partnership's integration of the Dasgupta Review into passive equity investment decisions

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EXECUTIVE SUMMARY

The Dasgupta Review is an independent, global review on the Economics of Biodiversity, led by Professor Sir Partha Dasgupta (Frank Ramsey Professor Emeritus, University of Cambridge). It was commissioned by the UK treasury in 2019 and sets out how nature should be accounted for in economics and decision-making. This report presents routes available to Brunel Pension Partnership (herein referred to as Brunel) for the integration of the Review's findings into investment decisions for passive equities. The information in the report is intended to provide Brunel with the foundation needed to mobilise asset managers so that they can take the first steps towards equipping themselves for the effective incorporation of biodiversity considerations into ESG integration, screening and engagement decisions.

Overview of action areas identified

Encourage asset managers to initiate the assessment of portfolio exposure to nature-related risks

The Dasgupta Review calls for investors to assess their existing and potential exposure to nature loss, by mapping dependencies and impacts on biodiversity within their portfolios, with an initial focus on a select few high-priority sectors. High priority sectors in Brunel's case are the consumer staples, consumer discretionary, energy and materials sectors, due to their interaction with agriculture, forestry, oil and gas production, mining and tourism (these being the sub-sectors which have the highest impacts and dependencies on biodiversity).

Monitor and participate in investor initiatives that will improve asset manager ability to assess exposure to biodiversity risk

The assessment of dependencies and impacts is currently hindered by a lack of adequate biodiversity data, measurement tools and metrics. Brunel and its asset managers could stand to benefit from monitoring and participating in collaborative investor initiatives that are already underway to address this key barrier.

Encourage asset manager use of interim impact and dependency measurement solutions, until standardised approaches are developed

For as long as standardised solutions remain work-in-progress, the best possible use by asset managers of existing measurement tools is to be encouraged. *The Corporate Biodiversity Footprint* tool, and the *Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE)* tool are identified as the most robust existing groundwork for this.

Monitor emerging initiatives that can inform biodiversity-related targets for benchmarking, screening, and engagement

Brunel can monitor the development of the *Post-2020 Global Biodiversity Framework* of the *Convention of Biological Diversity*, which is scheduled to be formulated in October 2021, as well as the development of the *science-based targets for nature* (created by *The Science Based Targets Network*).

Emphasise biodiversity as a priority for engagement

The Biodiversity Assessment Framework devised by AXA IM provides direction for engagement with high-priority sectors on biodiversity. There may also be potential to collaborate in the construction of the *Nature Action 100+*, a framework for coordinating investor engagement on biodiversity issues.

(Note for readers: terms that are underlined in this report can be found in the report's glossary).

INTRODUCTION

The Dasgupta Review on the Economics of Biodiversity is a landmark review that calls for action by government and financial actors to protect and enhance nature. Chapters 17 and 20 of the Review highlight the importance of financial actors embedding nature into risk management and financial decision-making and redirecting the flow of capital away from nature-negative activities.

Key findings of the Dasgupta Review

Our economy is inextricably linked with and dependent on nature and biodiversity.

More than half of the world's GDP is dependent on natural capital, which is the stock of renewable and non-renewable resources that deliver ecosystem services on which people and businesses depend [1]. Ecosystem

services include air and water purification, crop pollination and the breaking down of waste. **Biodiversity** is a key characteristic of healthy natural capital assets, that underpins the delivery of these important services. The World Economic Forum’s 2020 Global Risks Report ranks biodiversity loss as one of the top five threats humanity will face in the next ten years, in terms of both likelihood and impact [2].

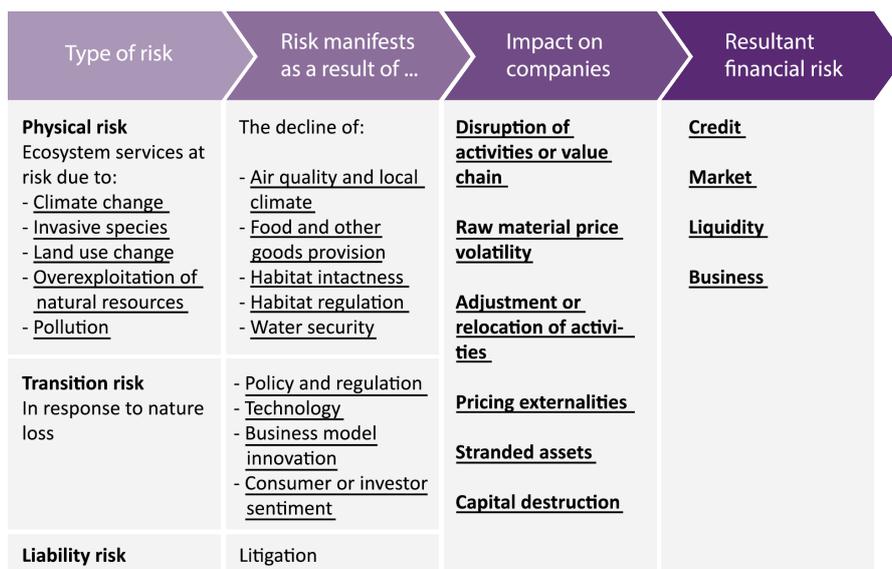
It has been estimated that a business-as-usual scenario will see biodiversity decline resulting in financial losses of USD 10 trillion between 2011 and 2050 [3]. Alarming, however, financial actors are not focusing closely on the risks associated with biodiversity loss; up until now, their understanding of financial risks and natural capital has centred almost exclusively on climate change, which is just one, albeit major, subset of biodiversity risk.

Financial institutions have an indirect relationship with biodiversity, through their financing of companies that depend on, and impact, biodiversity

Dependency on ecosystem services and biodiversity exposes companies to physical risks in the long-term, whereby the disruption or collapse of ecosystem services caused by nature loss can culminate in a wide spectrum of detrimental business outcomes (see Figure 1). These impacts on companies can lead to financial risks for asset managers and asset owners such as Brunel, across credit, market, liquidity and business.

In addition, adverse impacts on biodiversity exposes companies to transition and litigation risks, which can cascade to asset owners in the form of financial risks. Transition risks result from the process of adjusting towards an economy that engages more sustainably with nature, while litigation risks arise from legislation and fines against companies that are not in compliance with legal frameworks on the preservation of biodiversity.

Figure 1: Transmission of nature-related risks to financial institutions [3]



As a first step, financial actors should assess their existing and potential exposure to nature loss, in the form of dependencies and impacts

The Dasgupta Review emphasises the concept of “double materiality”, whereby asset managers have a better chance of fulfilling their fiduciary duty if their financial materiality perspective is broadened to include impact of investments on biodiversity, as well as dependence on biodiversity. This enlargement of perspective is particularly vital to passive investors and universal owners, for whom systemic risks to the market in the long run are more important than risks to a specific company. The impacts that certain companies or sectors within a portfolio have on biodiversity may negatively affect other sectors and companies within the portfolio. For example, the adverse impacts generated by agriculture and primary food production, such as water scarcity, habitat destruction, and the emergence of zoonotic disease, can become systemic risks with far-reaching, cross-sector business consequences, posing an amplified financial risk.

Aims of the report

As yet, few investors have moved beyond a very early stage of assessing nature-related financial risks. 72% of institutional investors have not assessed their investments’ impact on biodiversity, and 27% are not addressing biodiversity themes to any extent [4]. The lack of available data and metrics, and asset owner

demand, are some of the key barriers identified as responsible for holding asset managers back [4]. This report presents:

- Action paths that Brunel Pension Partnership can promote among its external asset managers, to jumpstart the assessment of exposure to biodiversity-related financial risk (in the form of dependencies and impacts), as recommended by the Dasgupta Review and its surrounding literature. The understanding gained through such assessment, can serve as a springboard for incorporating biodiversity considerations into ESG integration, screening, and engagement strategies.
- The collaborative initiatives Brunel can join to play an active role in bridging the data and metrics barrier, and in facilitating the setting of biodiversity-related targets for passive investment strategies.
- The biodiversity-related issues that Brunel can already be encouraging asset managers to engage with companies on, with an initial focus on high-priority sectors.

Assumptions and Limitations

The report assumes a minimal baseline of knowledge among Brunel's asset managers about biodiversity-related financial risks. The study is limited in that it does not outline how benchmarks and indices for integration should be constructed, nor present a roadmap for how Brunel and its asset managers can invest in conservation opportunities that generate positive biodiversity outcomes. The latter is due to the opportunity set for investing in biodiversity conservation and restoration still being small [4]. However, it is an avenue that merits future consideration.

METHODS

The directional findings outlined in the report are based on desk research conducted in June 2021. The Dasgupta Review, and particularly chapters 17 and 20, has formed the basis of research, as well as key reports and websites signposted by Brunel's Stewardship Manager, Helen Price, authored by the *UN Principles of Responsible Investment* [5], the *Taskforce on Nature-related Financial Disclosures* [6], and the *University of Cambridge Institute for Sustainability Leadership* [3]. Further reports exploring the relationship between biodiversity and financial actors have been located through the NEXIS research database, and through the *Taskforce on Nature-related Financial Disclosures' Knowledge Bank*, the *Green Finance Platform's Knowledge Bank*, and the *Finance and Biodiversity Pledge's 'Overview of initiatives for financial institutions'*. The understanding gained through these reports, has been complemented by research into the ESG strategies that are most relevant to passive holdings, outlined by the *UN Principles for Responsible Investment* [7].

FINDINGS: ACTION POINTS AND RATIONALE

Encourage focus on four high-priority sectors

The *Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE)* web-based tool is a key resource to promote among external asset managers, that will enable them to gain a general understanding of which sub-sectors and economic activities within their portfolio have the most adverse impact on, and are most dependent on, biodiversity [8]. This will provide a directional understanding of which sectors within Brunel's portfolios should be prioritised when it comes to measuring exposure to biodiversity-related financial risk.

The 'Beyond Business as Usual' report published by the *UN environment programme, Natural Capital Alliance and Global Canopy*, provides the most in-depth understanding of which sub-sectors pose the most risk to financial institutions [8]. Their ranking is based on the *ENCORE* tool, and takes into consideration impacts and dependencies, as well as the size of financial flows into these sub-sectors. The sub-sectors with the most material impacts are agricultural products, oil and gas exploration and production, and mining and metals, and the sub-sectors that are most dependent on biodiversity are agricultural products, brewers and apparel, accessories and luxury goods [8]. Other reports also advise prioritisation of the tourism, fisheries and forestry sub-sectors, because of their dependency on biodiversity [9, 10].

These sub-sectors are distributed across four major economic sectors: consumer staples, consumer discretionary, energy and materials, all of which are present in Brunel's portfolios. These four sectors are particularly exposed to biodiversity-related financial risk, in the form of physical, transition and litigation risks. They also represent the key sources of potential systemic risk across the span of sectors that Brunel invests in.

Monitor and participate in the creation of standardised biodiversity metrics and reporting frameworks, that will facilitate corporate disclosure and enable investor measurement of portfolio impacts

Companies are used to assessing and reporting on carbon emissions, and the extent to which their activities

align with *science-based targets* (SBTs) on climate action and the *Paris Agreement*. From this, asset managers have been able to integrate an understanding of carbon emission impacts into the construction of Low Carbon Indices, and climate change targets and policies [11].

However, only a small proportion of companies currently pay close attention to biodiversity, and corporate reporting on impacts on biodiversity is therefore lacking. This makes it problematic for asset managers to assess their portfolio's impact on biodiversity. One reason for the lack of corporate reporting is the greater relative difficulty of deriving a metric for nature loss compared to carbon emissions [12]. Investors are currently working to resolve this obstacle, through collaboration on the development of standardised biodiversity metrics and reporting frameworks. Brunel would benefit from monitoring these initiatives closely, and ensuring asset managers do the same, so that they are primed and ready to leverage new frameworks once they emerge, for incorporation into impact assessments:

- *The Taskforce on Nature Related Financial Disclosures (TNFD)* is currently in the research and development phase of creating a framework for companies and financial institutions to identify and report on impacts. The framework should be disseminated in late 2023 [6].
- *The Carbon Disclosure Project (CDP) and BNP Paribas* are developing a common biodiversity corporate reporting metric by 2022-23, to accelerate corporate environmental disclosures and enable biodiversity conscious investment decision-making based on reliable data [13].

Similarly, ESG providers do not collect biodiversity-related data in a consistent way due to the diverging nature of their methodologies and scoring mechanisms, and varying depth of analysis [12]. AXA IM, BNPP, Mirova, and Sycomore AM, have launched a *Call for Expressions of Interest (CEI)* for an ESG data provider to develop a standardised methodology for measuring the impact of a company's activity on biodiversity [14], and Brunel and its asset managers would benefit from monitoring CEI's development. To establish its reputation as an industry leader, Brunel may also wish to play an active collaborative role in addressing ESG scoring inconsistencies, by becoming a signatory of *The Finance for Biodiversity Pledge*. In 2021, signatories will engage with data providers on the standardisation of biodiversity measurement approaches and metrics [15].

Encourage asset managers to use existing tools to assess portfolio impacts, by sector

Many of the studied reports recommend that, while initiatives such as the *TNFD* are still in the research and development phase, investors use existing measurement tools and frameworks to assess the impact of their portfolios. This is because the uptake of the *TNFD* and other initiatives may be slow to begin with [3]. There are multiple existing biodiversity footprinting approaches, which have been initiated by proactive companies and financial institutions, and which are still under development. Our evaluation indicates that the most suitable tool for understanding sectoral impacts currently is *The Carbon Biodiversity Footprint (CBF)*. The comparative advantage of the CBF lies in its assessment of listed equities, and applicability at a portfolio, sector and index level. Furthermore, it already makes data available for high priority sub-sectors across Food, Energy, Oil and Gas, Metals and Mining [15].

The *CBF* tool assesses corporate impact on: Land occupation and land transformation, Climate change with greenhouse gas emissions, Ecosystem disturbance due to eutrophication and acidification through air pollutions, Freshwater biodiversity disturbance by the emission of toxic compounds. With the understanding of impacts that the CBF provides, asset managers are better equipped to understand their exposure to risk and: Collaborate with data and index providers in the creation of bespoke benchmarks and indices, Make informed screening decisions, Set targets and refine focus for engagement with investee companies by sector.

Monitor and join initiatives that will help investors set targets for biodiversity integration, screening and engagement in line with global goals, following impact assessment

Between 2021 and 2022, signatories of *The Partnership for Biodiversity Accounting* and *The Principles of Responsible Investment* will be sharing practical experiences and guidance regarding the use of impact assessments in target-setting, and Brunel and its asset managers may wish to consider becoming signatories of these [16].

Setting biodiversity targets will also be facilitated by:

- The declaration of the *Post-2020 Global Biodiversity Framework* at the *Convention on Biological Diversity (CBD)* in October 2021. This framework will provide guidance on the biodiversity goals that companies and financial institutions should be setting [16].
- The new *ENCORE Biodiversity Module*, which will advise investors on how they can align their portfolios with the targets outlined in the *Post-2020 Global Biodiversity Framework* [16].

- The new SBTs for nature, scheduled to become available at the end of 2022, which will provide guidance for the setting of integrated targets for freshwater, land, oceans and biodiversity [17].

Encourage asset managers to use existing tools to assess portfolio dependencies, by sector

Asset managers are used to evaluating climate-change-related financial risks arising from dependencies, and to measuring the degree of portfolio alignment with given climate scenarios (1.5°C, 2°C, 3°C), through tools such as the Climate Progress Dashboard and the Transition Pathway Initiative. These can inform and model asset allocations which are sufficiently diversified and balance the investment principles of safety and profitability [18]. By comparison, there is no sufficiently mature tool for asset managers to account for biodiversity-related financial risks arising from dependency on biodiversity, or to conduct stress testing with specific biodiversity loss scenarios. The *TNFD* is currently working to bridge this gap, by developing a framework for identifying and reporting risk of nature-related dependencies and assessing how these risks affect portfolios [5].

In the meantime, asset managers' best resource is the *ENCORE* tool, which provides a generic understanding of how production processes within sectors potentially depend on or impact natural capital, and of which economic activities within sectors constitute the most risk for investors [8]. The recently launched *ENCORE Biodiversity Module* also enables financial institutions to understand future potential dependencies, although this is currently limited to the agriculture and mining sectors [16]. An understanding gained from the *ENCORE* tool can facilitate integration and screening decisions, and help investors understand which issues they should be engaging with investee companies on.

Encourage asset managers to assess exposure to fragile ecosystems

A report from WWF France and AXA recommends that sector impact and dependency assessments be complemented by a geographic approach [12]. Asset managers can be encouraged to ensure adequate screening against corporate activities in areas with fragile ecosystems. The main tools currently available for this are:

- The *ENCORE hotspot map* – an interactive mapping tool for understanding areas of depletion of natural capital, and the risks arising from operating in those areas.
- The *Integrated Biodiversity Assessment Tool (IBAT)* - an interactive mapping tool that allows investors to identify geographies that are Key Biodiversity Areas, Protected Areas, or areas covered by the IUCN Red List of Threatened Species.

Following the use of these tools, Brunel and asset managers can weight indices away from high-risk areas and identify companies that must be prioritised for engagement. Our research suggests that this will be of growing importance for Brunel's Passive Emerging Markets portfolio, given a concentration of fragile ecosystems in these markets [19]

Encourage engagement with investees in high-priority sectors and regions

Currently, no biodiversity-related framework for coordinating investor engagement is as targeted as *Climate Action 100+*. Proposals for an equivalent for biodiversity, *Nature Action 100+*, have been put forward by the World Bank, and several investor groups are contributing to its development [20]. In the coming months, there may be potential for Brunel to also participate. Furthermore, defining engagement priorities will be facilitated by the *Post-2020 Global Biodiversity framework* and the new nature-related *SBTs*, which will give guidance to investors on the actions and standards that should be demanded of investee companies. In the short term, however, there would still be merit in Brunel ensuring that its asset managers are actively engaging with high-priority sectors. Guidance for the topics that should be covered under engagement can be drawn from the *AXA IM Biodiversity Assessment Framework* [21], which outlines cross-industry best practice to aim for (see Figure 2).

Figure 2: The AXA IM Biodiversity Assessment Framework [21]

<p>Biodiversity Management and Oversight</p> <ul style="list-style-type: none"> • Board and senior management expertise and oversight? • Company-wide assessment of biodiversity impacts and dependencies? 	<p>Biodiversity Operational Impact Management</p> <ul style="list-style-type: none"> • Policy specifically covering biodiversity issues? • Direct operations biodiversity impact management programmes? • Supply chain biodiversity impact management programmes? • External audits and certifications?
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Biodiversity Transparency

- Reporting on backward looking key performance indicators?
- Establishing forward looking, ambitious targets?

Company's Response to Engagement Dialogue

- Companies willing to discuss biodiversity?
- Response to and progress of engagement over time? company participation in external stakeholder
- Initiatives?

Sub-sectors that have the highest impact on biodiversity are the priority for engagement. Outlined below are key sub-sectors, and the issues which should be central to an engagement approach with investees.

Agricultural Products

Primary food production is the most significant driver of terrestrial biodiversity loss, with the expansion of the beef, soybean, palm oil industries having particularly rapid and significant impact on tropical rainforest erosion [1]. This deforestation has caused a reduction of carbon sinks which mitigate climate change, posing a risk to all businesses within all sectors, and therefore increasing Brunel's wider exposure to financial risk. Land use should be the focus of engagement with agricultural companies, as well as consumer staples and consumer discretionary companies that depend on agriculture in their supply chains. It can also be ensured that investee companies reliant on agriculture are members of industry bodies and stakeholder initiatives that have a focus on biodiversity protection. The most relevant ones are the Roundtable on Sustainable Palm Oil (RSPO), the Roundtable on Sustainable Soy, the Marine Stewardship Council (MSC), and The Sustainable Agriculture Initiative (SAI) [9].

Mining and Metals

The highly material issues for the mining operations include the damage caused to vegetation, and topsoil removal. Extraction tends to occur in sensitive ecosystems, and therefore mining is one of the sectors with the most biodiversity-related controversies [22] This leaves mining companies particularly exposed to litigation risks, which can lead to financial risks for Brunel. The industry bodies that are most relevant for companies to join, are the International Council on Mining and Metals (the ICMM) and the Global Mining Initiative (GMI).

Oil and Gas Exploration

The highly material issues for the oil and gas sector include the over-extraction and pollution of water and habitat fragmentation. Companies are increasingly vulnerable to policy and regulation, leading to transition risks. For example, they are likely to be affected by the EU Biodiversity Strategy for 2030's mandate for the protection of 30% of EU land and sea area [23]. Investors can encourage companies to report on their impact on water, through the CDP water disclosure framework for example, and through better reporting on operations management in areas of high environmental sensitivity. External stakeholder initiatives and industry bodies that are most relevant for this sector are the International Petroleum Industry Environmental Conservation Association (IPIECA) and the International Association of Oil and Gas Producers (OGP).

CONCLUSIONS

As an asset owner, Brunel has a key role to play in catalysing its external asset managers' assessment of portfolio exposure to biodiversity-related financial risk. This role can be fulfilled by encouraging asset managers to focus on high-priority sectors, that most depend on and impact biodiversity, and to make use of existing measurement tools to assess exposure to risk. Once armed with this knowledge, asset managers will be better placed to make informed decisions regarding strategies for ESG integration, screening and engagement.

Until further guidance emerges from upcoming frameworks such as the *Post-2020 Global Biodiversity Framework*, Brunel can encourage asset managers to use the *AXA IM Biodiversity Assessment Framework* as a blueprint for engagement across sectors. Key sub-sectors, which are most dependent and have the most impact on biodiversity, should be the key locus for engagement, with this report having outlined several of the most salient biodiversity issues that should form the basis of engagement and provide traction in each sub-sector.

As a final area of focus, Brunel's role can also involve the monitoring of emerging initiatives that will make assessment of exposure to risk more straightforward in future, and that will inform effective biodiversity-related target setting for benchmarking, screening and engagement. There is also the option for Brunel to collaborate with other investors to overcome the key barrier today, which is a lack of data availability, standardised metrics and frameworks.

GLOSSARY

These glossary terms were taken and adapted from the Handbook for nature-related financial risk from the University of Cambridge [3].

Adjustment or relocation of activities: A form of disruption with long term consequence for business operations, which involves capital expenditures to adapt

Air quality and local climate: A category of ecosystem service. Climate stability and good air quality provide the same predictable operational environment from which all companies can benefit

Biodiversity: The variety of life on earth. Biodiversity is a characteristic of healthy natural capital assets. It underpins nature's capacity to generate flows of ecosystem services, such as how birds and animals pollinate our crops, worms are essential to soil fertility and intact forests prevent the spread of diseases. The resilience of nature is directly related to the health and status of biodiversity

Business model innovation: New ways to organise and run a company can improve the profitability or balance sheet of that company. If business model innovation displaces old systems and disrupts some parts of the existing economic system, then winners and losers emerge, with greater financial risks attached to the latter

Business risk: Those risks that a financial institution's operations, plans or business model face as a result of a change in circumstances. This can include the reputational risk to revenues of being connected, as a financier or investor, with biodiversity loss

Capital destruction: Occurs when a physical risk manifests and damages assets, e.g. if a landslide damages a railway

Climate change: Change in climate attributed directly or indirectly to human activity. When climate conditions are destabilized, ecosystem services are disrupted, and biodiversity is lost. For example, 50 per cent of the corals in the Great Barrier Reef have died since the 1990s

Consumer or investment sentiment:

Changing consumer sentiment toward certain products or investor sentiment toward certain assets can impact demand for both:

- Investors are sensitive to environmental disasters. For example, of a sample of 64 explosions in chemical plants and refineries between 1990-2005 petrochemical firms lost 1.3 per cent of their market value in the two days following an explosion; furthermore, the greater the extent of chemical pollution from the event, the greater the size of the loss
- Consumer demand for sustainability labels has led to unlabelled products losing market share to ethical products. Between 2013 and 2018, 90 per cent of the fastest growing consumer goods products in the US, by sales, were marketed as sustainable

Credit risk: comprises issuer and counterparty risk. Issuer risk is the possibility that an issuer/borrower is not able to fulfil its obligations due to its default. Counterparty risk comprises the risk that a counterparty defaults and is not able to fulfil its obligations

Disruption of activities or the value chain: The company would add costs to doing business in the short-term e.g. transport route diverted temporarily awaiting a landslide road clearance, potentially drawing on working capital and access to debt. Without access to either, the solvency of the business may be threatened, increasing the probability of default. The increased demand for liquidity may also increase refinancing risk

Ecosystem services: Benefits that people obtain from natural capital, such as air and water purification services, crop pollination and the breaking down of waste. Biodiversity underpins the flow of benefits. Ecosystem services are also known as 'nature's contributions to people'

Food and other goods provision: The provision of food and other goods, including materials and energy. This ecosystem service grows or otherwise creates soft and hard commodities, from which tangible economic goods are derived

Habitat intactness: Habitat intactness refers to the maintenance of conditions necessary for habitat dependent species and ecosystem health. One way a habitat ceases to be intact is if connectivity is removed and species are marooned in small pockets. For example, having a decent-sized block of connected forest to maintain the forest ecosystem

Hazard regulation: Regulation of the impact of floods, fires, landslides, droughts, wind, storms, hurricanes, seawater intrusion, tidal waves, heat waves, tsunamis, high noise levels and organisms detrimental to humans. Much of the value of hazard regulation is only fully realized when it is lost. Reduced hazard regulation can create a need for costly expenditures such as sea defences and tidal barriers, as well as emergency government action such as mandatory evacuations and travel bans

Invasive species: Species whose introduction by humans threatens biodiversity. The species will not be native and is described as invasive if it expands into and modifies the ecosystem. For example, European starlings are estimated to cause USD 1 billion of damage per year to US agriculture

Land use change: Change in the use or management of land by humans. This may lead to a change in the quality or extent of natural habitat, which has knock-on effects for ecosystem services. For example, the conversion of natural forests to agriculture threatens local water supply: in the Amazon area, one-third of the rainfall is created by natural processes in the forest itself – rainfall that would be lost if the forest became degraded

Liability risks: The risk associated with emerging legal cases related to nature loss, which could arise if parties that suffer loss or damage from the effects of environmental change seek compensation from those they hold responsible. Fines for oil spills are a prominent example

Liquidity risk: The risk that an institution will not be able to meet efficiently both expected and unexpected current and future cash flow and collateral needs without affecting either daily operations or the financial condition of the firm

Market risk: The risk of losses in on- and off-balance-sheet positions arising from movements in [financial] market prices

Natural capital: The stock of renewable and non-renewable resources (e.g. plants, animals, soils, minerals, ecosystems) that combine to yield a flow of benefits to people, referred to as ecosystem services

Nature Loss: Decline of natural capital, ecosystem services and biodiversity

Overexploitation of natural resources: Using natural resources or harvesting species from the wild at rates faster than they can recover. One example of overexploitation is overfishing; between the 1950s and 1990s the number of fish caught in the wild quadrupled, putting major pressure on marine ecosystems

Physical risks: The risks that arise when natural systems, such as stability of climate and generation of raw materials, are compromised. For example, deforestation could reduce local rainfall, raising operating costs for numerous sectors

Pollution: Introduction of materials into the environment that harm nature. Pollution can be of air, water and/or land. One example is how air pollution impacts cognitive performance and human health, significantly reducing both the supply and productivity of labour

Policy and regulation: Policy refers to government legislation passed, whereas regulation can come from a semi-autonomous regulatory body, including financial regulation

Pricing externalities: Pricing externalities means accounting for the economic, social and/or environmental impacts arising from the activities of an entity

Raw materiality price volatility: Refers to fluctuating commodity prices caused by disruptions at the beginning of supply chains, or systemic changes in the supply chain

Stranded assets: Assets that suffer from unanticipated or premature write-offs, downward revaluations or are converted to liabilities [as a result of] a range of environment-related risks

Technology: Technological improvements or innovations that support the transition to a nature-positive economy can have a significant impact on certain companies. For example, the development of leather and protein alternatives as a substitute to deforestation-associated agricultural goods. To the extent that new technology displaces old systems and disrupts some parts of the existing economic system, winners and losers emerge. There are financial risks of being exposed to the latter. The timing of technology development and deployment, however, is a key uncertainty in assessing technology risk

Water security: The availability and quality of freshwater. From beverage manufacturers to utilities and consumer goods companies, the availability of clean water is the lifeblood of the business

REFERENCES

1. Dasgupta P. The Dasgupta Review [Internet]. The Economics of Biodiversity; 2021. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/962785/The_Economics_of_Biodiversity_The_Dasgupta_Review_Full_Report.pdf
2. World Economic Forum. The Global Risks Report 2020. Geneva: World Economic Forum; 2020.
3. University of Cambridge. Handbook for nature-related financial risk. Cambridge: University of Cambridge; 2021.
4. Responsible Investor Research, Credit Suisse. Unearthing investor action on biodiversity. USA: Responsible Global Media; January 2021.
5. UN Principles for Responsible Investment. Investor Action On Biodiversity: Discussion Paper [Internet]. London; 2021. Available from: <https://www.unpri.org/download?ac=11357>
6. Warner J. [Internet]. Taskforce on Nature-related Financial Disclosures. 2021 [cited 5 July 2021]. Available from: <https://tnfd.info/>
7. Principles for Responsible Investment. How can a passive investor be a responsible investor? Principles for Responsible Investment; 2019. Available from: <https://www.unpri.org/download?ac=6729>
8. UN Environment Programme, UNEP Finance Initiative and Global Canopy 2020. Beyond Business As Usual [Internet]. Cambridge; 2020. Available from: <https://naturalcapital.finance/wp-content/uploads/2020/06/Beyond-Business-As-Usual-Full-Report.pdf>
9. IUCN The World Conservation Union. Biodiversity, the next challenge for financial institutions? [Internet]. Gland; 2007. Available from: https://www.iucn.org/sites/dev/files/import/downloads/ivo_bb_report.pdf
10. Allianz Global Corporate & Specialty. Measuring And Managing Environmental Exposure [Internet]. 2018. Available from: <https://www.agcs.allianz.com/content/dam/onemarketing/agcs/agcs/reports/AGCS-Natural-Capital-Risk-Report.pdf>
11. Ashman H, Avery H, Hussle J, Leach K. How can UK institutional investors back government policy to mitigate the cost of biodiversity loss and damage to ecosystems?. Lecture presented at; 2021; London.
12. WWF France, AXA Insurance. Into the Wild: integrating nature into investment strategies. G7 Environment meeting; 5-6 May 2019; Metz: World Wildlife Fund; 2019. Available from: https://wwfint.awsassets.panda.org/downloads/report_wwf_france_axa_into_the_wild_may_2019_dv_1.pdf
13. AM B, CDP. BNP Paribas Asset Management and CDP partner to accelerate the development of biodiversity reporting metrics. May 19 2021. Available from: <https://www.cdp.net/en/articles/media/bnp-paribas-asset-management-and-cdp-partner-to-accelerate-the-development-of-biodiversity-reporting-metrics>

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14. IM A. AXA IM, BNP Paribas AM, Sycomore AM and Mirova launch joint initiative to develop pioneering tool for measuring investment impact on biodiversity. 2020. Available from: https://realassets.axa-im.com/content/-/asset_publisher/x7LvZDsY05WX/content/axa-im-bnp-paribas-am-sycomore-am-and-mirova-launch-joint-initiative-to-develop-pioneering-tool-for-measuring-investment-impact-on-biodiversity/23818.
15. Finance for Biodiversity Pledge. Finance for Biodiversity: Guide on biodiversity measurement approaches. 2021. Available from: <https://www.financeforbiodiversity.org/wp-content/uploads/Finance-for-Biodiversity-Guide-on-biodiversity-measurement-approaches.pdf>
16. Finance for Biodiversity Pledge. Finance and Biodiversity [Internet]. Zurich; 2021. Available from: https://www.financeforbiodiversity.org/wp-content/uploads/Finance_and_Biodiversity_Overview_of_Initiatives_April2021.pdf
17. Science Based Targets Network. Science Based Targets for Nature [Internet]. Singapore: Global Commons Alliance; 2020. Available from: <https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/09/SBTN-initial-guidance-for-business.pdf>
18. WWF. Nature Is Too Big To Fail [Internet]. PWC; 2020. Available from: https://wwfint.awsassets.panda.org/downloads/nature_is_too_big_to_fail_en_web.pdf
19. A fifth of countries worldwide at risk from ecosystem collapse as biodiversity declines, reveals pioneering Swiss Re index | Swiss Re [Internet]. Swissre.com. 2020 [cited 5 July 2021]. Available from: <https://www.swissre.com/media/news-releases/nr-20200923-biodiversity-and-ecosystems-services.html>
20. Stewart F. A proposal for targeted investor engagement on biodiversity [Internet]. Nature Action 100. 2021 [cited 5 July 2021]. Available from: <https://blogs.worldbank.org/psd/nature-action-100-proposal-targeted-investor-engagement-biodiversity>
21. Investment Managers. Biodiversity crisis: The role of investors in resolving species extinction [Internet]. London; 2019. Available from: <https://realassets.axa-im.com/documents/23818/221263/Biodiversity+Crisis+-+The+role+of+investors+in+resolving+species+extinction.pdf/c1681b3d-86be-8349-c67b-a04cab51c387>
22. Moody's. Controversy risk assessment: a focus on biodiversity [Internet]. Moody's; 2021. Available from: [https://assets.website-files.com/5df9172583d7eec04960799a/60af61a9367371598fa6b807_BX6580_MESG_Biodiversity%20Controversies_27.05%20\(FINAL\).pdf](https://assets.website-files.com/5df9172583d7eec04960799a/60af61a9367371598fa6b807_BX6580_MESG_Biodiversity%20Controversies_27.05%20(FINAL).pdf)
23. IPIECA. Biodiversity and Ecosystem Services Horizon Scanning Report 2021 [Internet]. London; 2021. Available from: <https://www.ipieca.org/resources/awareness-briefing/biodiversity-and-ecosystem-services-horizon-scanning-report-2021/>