



Land – A key Life Pillar

Why biodiversity is essential to our investment decisions

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1

Why change is needed



The Triple Planetary Crisis

Climate change, pollution, and biodiversity loss are the three components of the Triple Planetary Crisis. Each of these challenges has its own origins and effects and each issue needs to be tackled if we are to have a viable future on our planet.

A



The Triple Planetary Crisis



Climate Change

About **90%** of all anthropogenic carbon dioxide emissions come from fossil fuels. Energy, industry, transport, buildings, and agriculture release greenhouse gases into the environment. Climate change already causes droughts, water scarcity, wildfires, rising sea levels, flooding, and melting polar ice.



Pollution

Air pollution causes more than **seven million** premature deaths per year, making it the leading global cause of disease and morbidity. A shocking nine out of ten of Earth's inhabitants breathe air that exceeds WHO pollution guidelines.



Biodiversity loss

The deterioration of nature reduces ecosystem services and endangers natural capital. IUCN reports around 12,000 endangered species. Many biologists believe there are even more species at risk of extinction as the number of species is estimated at 1.75 million to **14 million**.

Source: [UNFCCC](#), IPCC 6th Assessment Report, Deutsche Bank AG. Data as of January 2023.

The three Life Pillars

B

The Triple Planetary Crisis is a result of failing to [include the value of natural capital](#) in our economic decision-making. A structural approach that includes the value of nature requires a granular view. Therefore, we look at natural capital as being comprised of three [Life Pillars: Land, Ocean and Atmosphere](#).

Each Life Pillar represents an [essential ingredient for life](#).



The three Life Pillars



Land

Land includes soils, climate, vegetation, terrain, and other natural resources, as the foundation for agriculture and other rural land uses. Technically, the term "land" refers to a defined region of the earth's surface that includes all characteristics of the biosphere that are immediately above or below it, such as the near-surface climate, the soil and terrain types, the surface hydrology (including shallow lakes, rivers, marshes, and swamps), the near-surface sedimentary layers and associated groundwater reserve, the plant and animal populations, the pattern of human settlement, and the physical outcomes of past and present human activity.



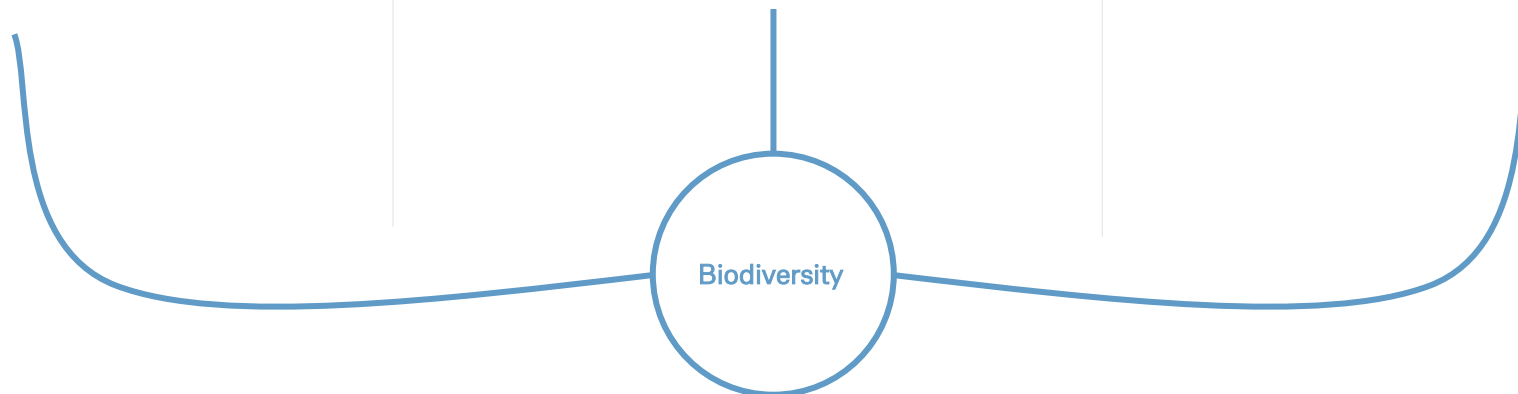
Ocean

Ocean refers to all living and non-living components of the natural environment in the water, including the water itself. We look at both marine and coastal ecosystems and the use of marine resources such as seafood. Ocean here is therefore a collective term for everything related to the water resources of our planet. This includes naturally-occurring water-borne objects, such as animals, and non-natural water-borne objects, such as plastic. Human activity is estimated to have severely altered two-thirds of the Ocean.



Atmosphere

Atmosphere refers to the multiple atmospheric layers that envelop the planet. The atmosphere shields life on earth from harmful ultraviolet (UV) radiation, insulates the planet to maintain a comfortable temperature, and prevents temperature extremes between day and night. As with Land and Ocean, human activity (mostly industrial activity) has had a significant impact on the atmosphere. In 2021, the total amount of anthropogenic (i.e. human-caused) fossil CO₂ emissions worldwide was 38.0 billion tons, with about 80% of these emissions from G20 countries.



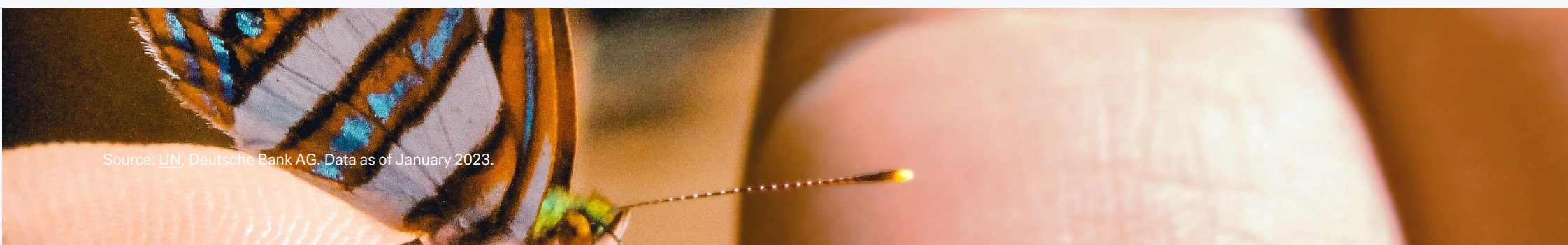
Source: [FAO](#), [UN](#), [Earth.org](#), [WRI](#), [UNCTAD](#), [Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T. R., Perryman, M., Andrady, A., Narayan, R., & Law, K. L. \(2015\). Plastic waste inputs from land into the ocean. In Science \(Vol. 347, Issue 6223, pp. 768–771\). American Association for the Advancement of Science \(AAAS\), National Geographic, DESTATIS, UNEP, Deutsche Bank AG. Data as of January 2023.](#)

What is biodiversity and why is it important?

C

Biodiversity, or biological diversity, is the **variability among living organisms** from all sources including, inter alia, **terrestrial, marine** and other **aquatic ecosystems** and the **ecological complexes** of which they are part; this includes diversity **within** species, **between** species and diversity **of ecosystems**.

Biodiversity loss is one of the world's **most serious environmental issues**. **A species that is lost is lost forever**.



Biodiversity is tangible



Genetic diversity

Genetic diversity describes the total variation across all members of a species in their DNA.



Species diversity

The number of various species and their relative abundance in a given area is known as species diversity. Examples for these are: habitats, biomes or even entire biospheres.



Ecosystem diversity

Ecosystem diversity refers to the various types of ecosystems that can be found within a larger landscape. These ecosystems can range in size from biomes, which are the largest ecological units, to microhabitats, which are the smallest.



Spiders can be found in a variety of settings and there are more than 45,000 species that have been identified.



Around 8.7 million species of plants and animals are thought to exist. So far, only about 1.2 million species have been identified and catalogued.



The natural world is responsible for half of global GDP. One dollar spent on environmental conservation can provide up to thirty dollars' worth of economic benefits.

Source: [Behavioral Diversity \(Ethodiversity\): A Neglected Level in the Study of Biodiversity \(February 2017\)](#), [National Geographic](#), [Species diversity or biodiversity](#), [National Geographic](#), [EEA](#), [UNEP](#), Deutsche Bank AG. Data as of January 2023.

Biodiverse ecosystems provide goods and services

Food



Contribution to food production

Pollination from different species contributes directly to between **5% and 8% of the world's crop production**. The yearly market value of these crops is between **USD 235 billion and USD 577 billion**. If all animal pollinators disappeared, crop consumers would experience an estimated yearly net loss in welfare of between **USD 160 billion and USD 191 billion**, while producers and consumers in other markets would experience an additional loss of between **USD 207 billion and USD 497 billion**.

Water Security



Increasing water demand, stress and pollution

Around **30% of the world's population** lacks access to **appropriately managed drinking water supplies**, while an estimated **40%** of the population is already **impacted by water scarcity**. Water scarcity has its roots in ecological deterioration and poor resource management.

Human Health



Biomedical resources and insights

Various medicines are based on ingredients from plants, lizards, cone snails and fungi. Between 1981 and 2014, over **80% of small molecule anticancer medicines were natural, based on natural, or mimicked natural products**.

Economy



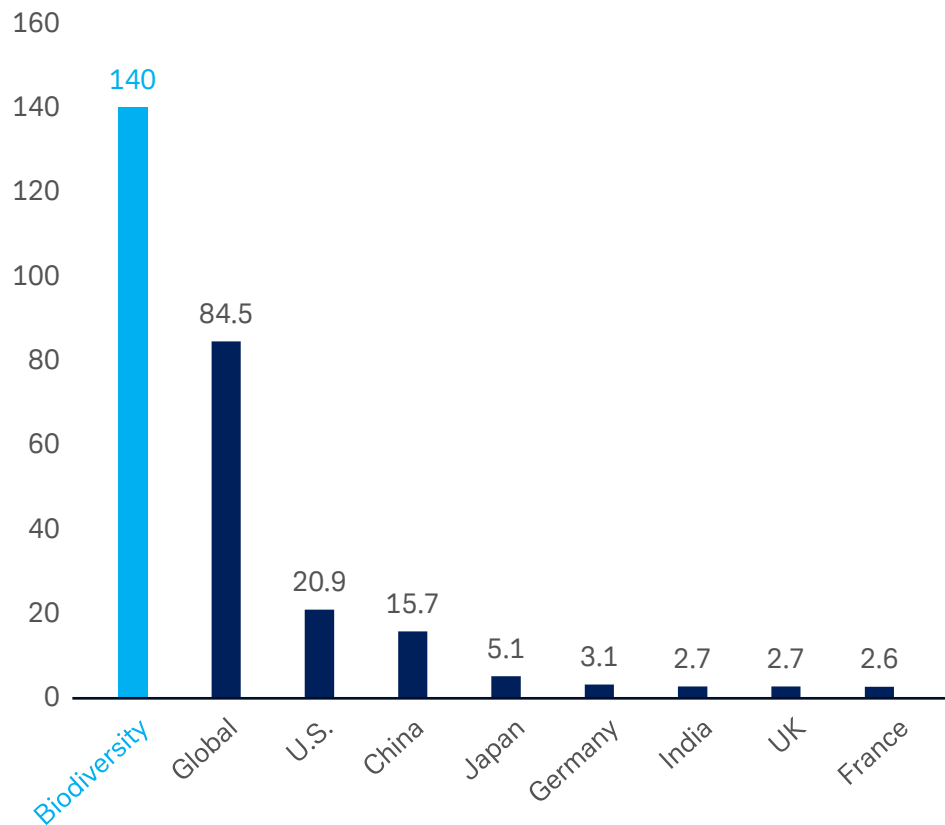
Significant decline in global GDP

According to the World Bank, the loss of certain **ecosystem services** provided by nature, such as **wild pollination**, the provision of **food** from marine fisheries, and the provision of **timber** from native forests could result in a decrease in annual global gross domestic product of **USD 2.7 trillion by the year 2030**.

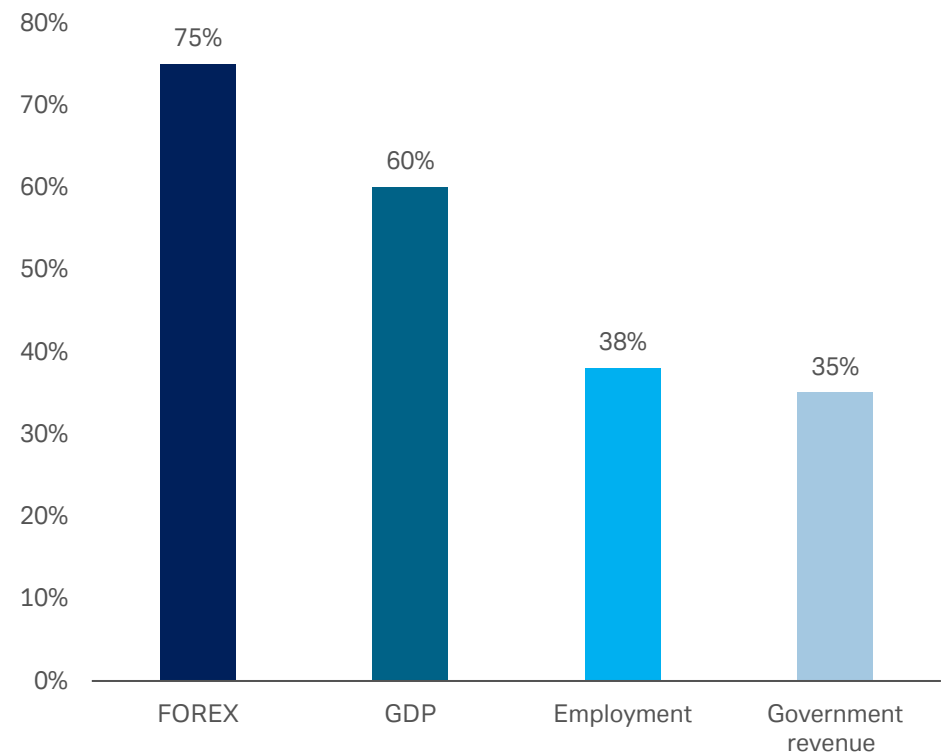
Source: Biodiversity: [Finance and the Economic and Business Case for Action OECD](#), [World Bank](#), Deutsche Bank AG. Data as of January 2023.

Biodiversity is crucial – both globally and locally

Value of Biodiversity in comparison to GDP* (USD trillion)



Biodiversity's contribution to the Seychelles economy



*Numerous valuation studies with estimates of the benefits provided by biodiversity and ecosystem services are available at the local, regional, and international levels (e.g. pollination, climate regulation and water purification). The most thorough estimate available indicates that ecosystem services generate benefits worth USD 125–140 trillion per year, or more than 1.5 times the amount of global GDP. Source: [Seychelles Clearing House Mechanism](#), Bloomberg L.P., [OECD](#), Deutsche Bank AG. Data as of January 2023.

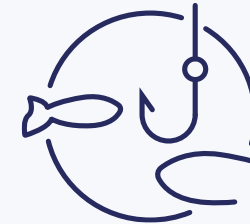
Double Materiality – Food Sector

D

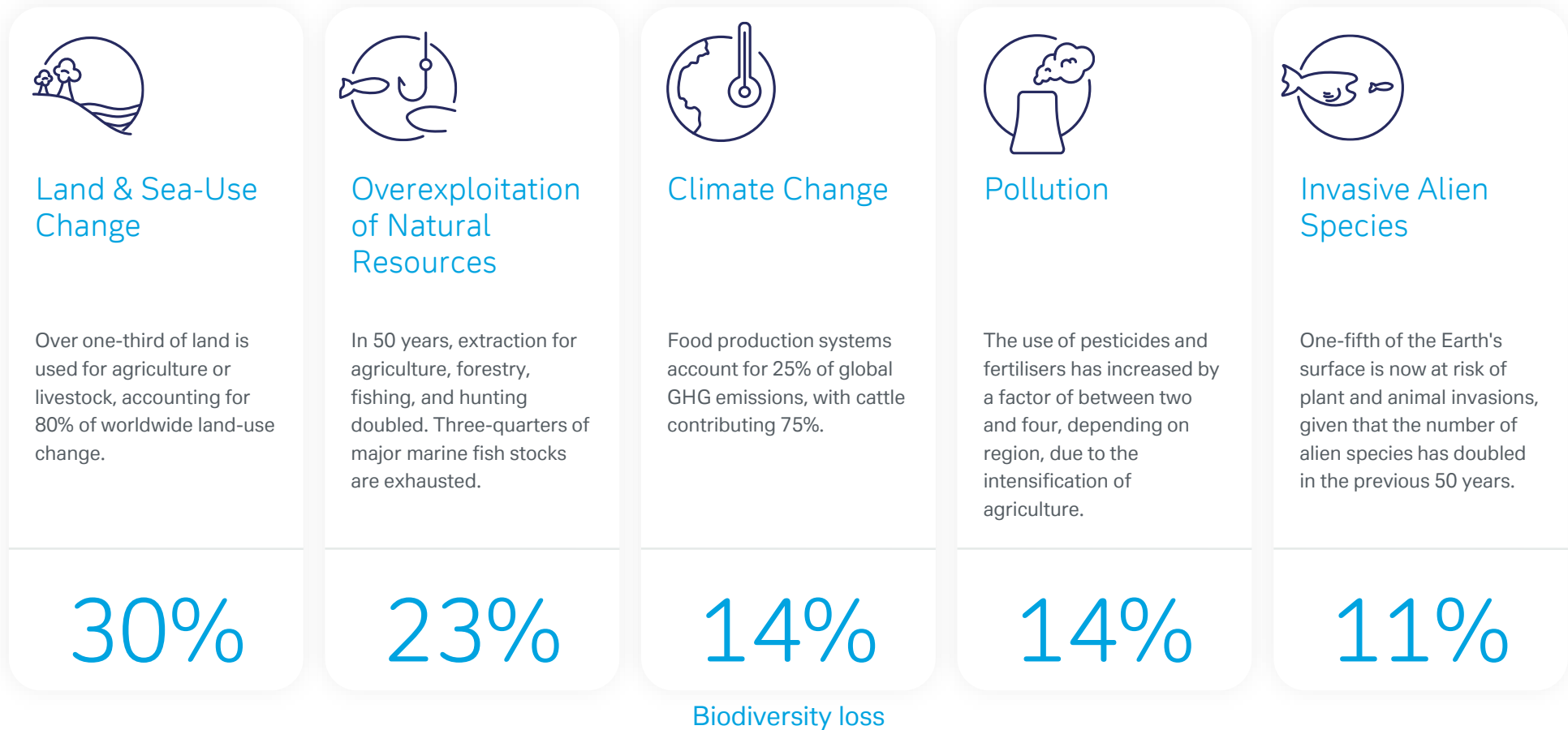
The concept of double materiality describes, on one hand, the **influence** that companies exert on nature through their **business activities**. On the other hand, the concept also includes the **impact of nature on the company**, i.e. the **company's dependence on nature**.

The **food sector** is the **most important driver of biodiversity loss**. The current rate of species extinction across the globe is far higher than the pace that has been observed on average over the past 10 million years.

Agriculture alone is the main threat to **24,000 of the 28,000 species that are in danger of extinction**.



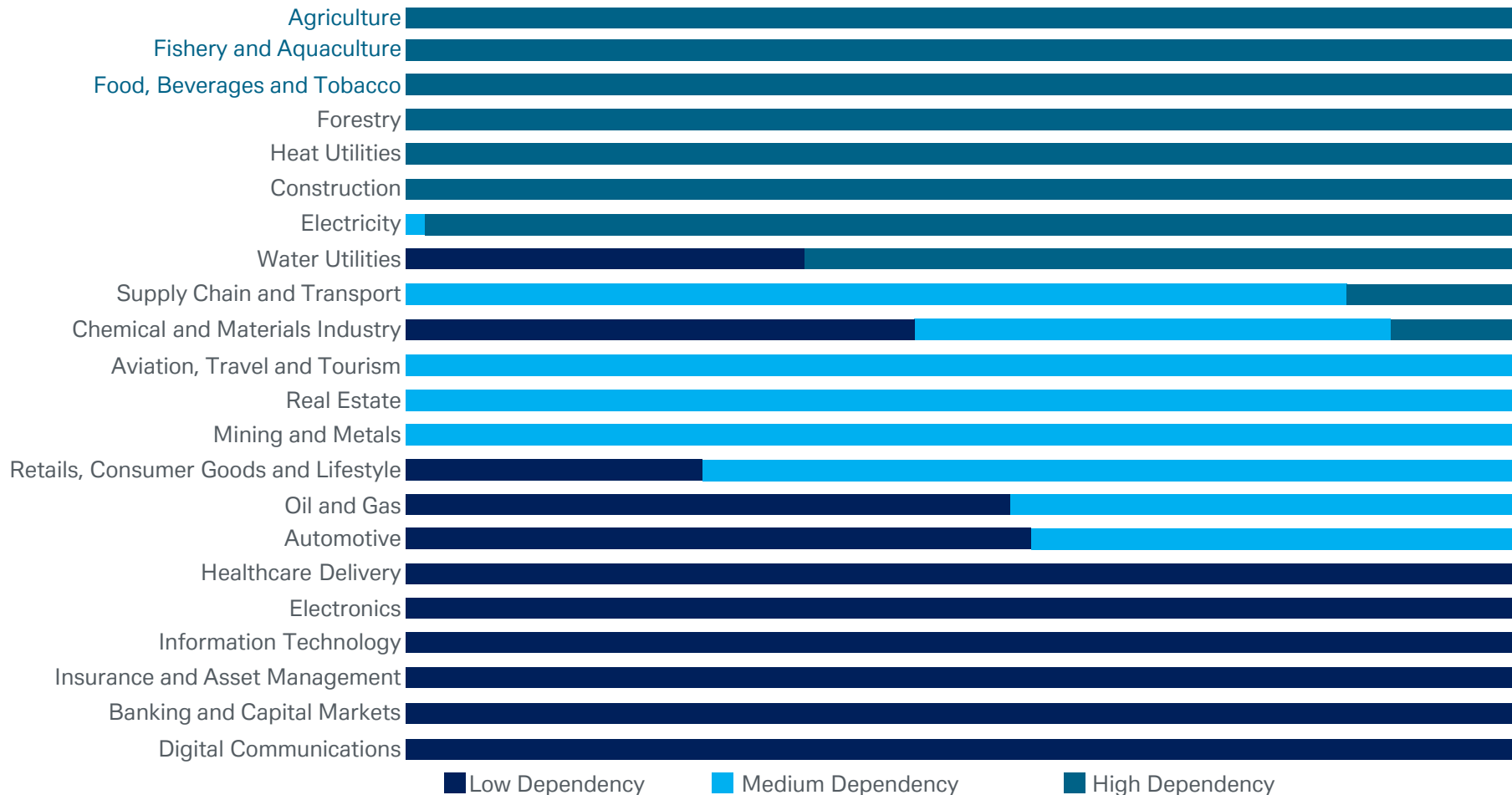
The food sector is the primary cause of biodiversity loss



Source: Campbell et al. 2017. "Agriculture production as a major driver of the Earth system exceeding planetary boundaries", Ecology and Society; IDH. 2020. "The urgency of action to tackle tropical deforestation."; Stockholm Environment Institute (SEI). 2021. "Stepping up: The continuing impact of EU consumption on nature."; FAO. 2016a; Foley et al. 2005. "Food system impacts on biodiversity loss"; Chatham House; IPBES. 2020. "Global Assessment Report."; IPBES-IPCC co-sponsored workshop report on biodiversity and climate change. 2021; Earth Journalism Network. 2019. "Global biodiversity is collapsing, warn scientists."; Páez-Osuna et al. 2017. "Shallow Returns, ESG risks and opportunities in aquaculture"; FAIRR. 2019, Deutsche Bank AG. Data as of January 2023.

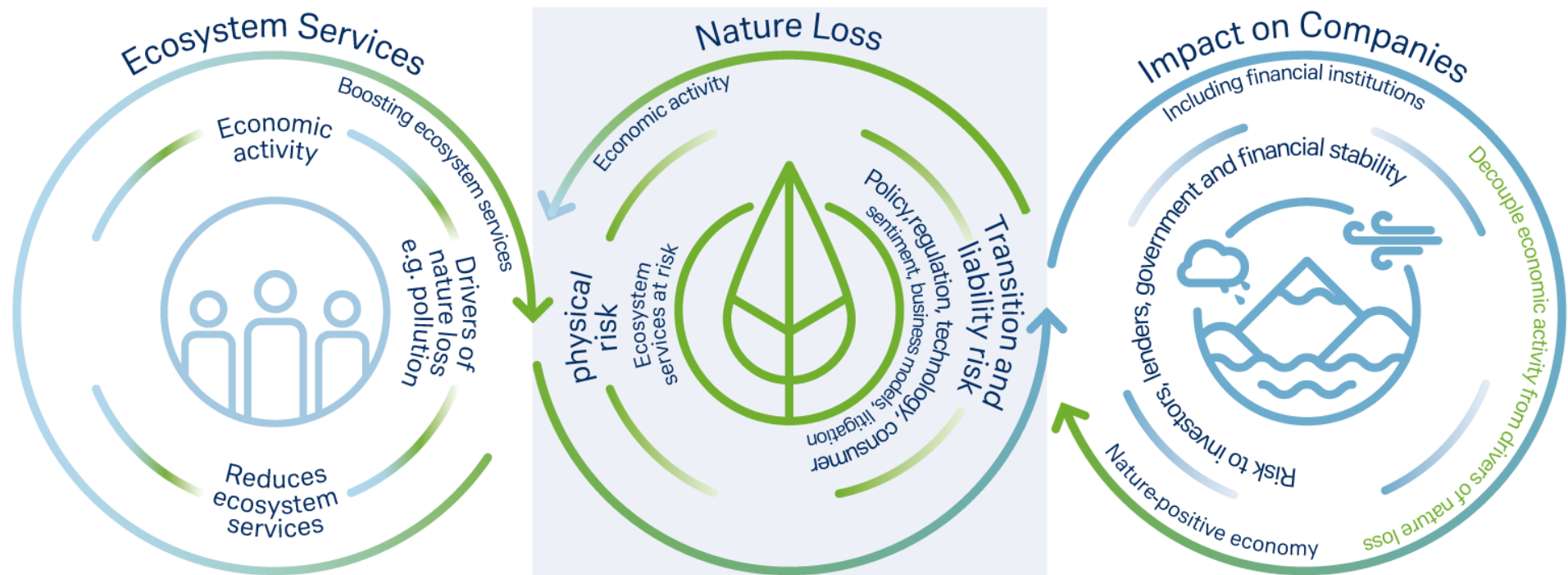
But the food sector is also the most vulnerable

Percentage of industry-specific direct and supply chain gross-value added (GVA) with high, medium, and low nature dependency



Sources: MSCI ESG Research, World Economic Forum and PwC. „[Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy.](#)“, Deutsche Bank AG. Data as of January 2023.

Nature loss entails different types of risk



Source: [University of Cambridge Institute for Sustainability Leadership: Handbook for Nature-related Financial Risks](#), Deutsche Bank AG. Data as of January 2023.

Physical risks to the food sector



Pollinator extinction

Pollination affects over **30% of food crops**, worth **USD 235 billion to USD 577 billion**. However, **40%** of pollinator species, including bees, are **endangered**. An extinction of pollinators could have severe consequence for the most reliant food crops, with a **yield decrease exceeding 90%** for some of them.



Water scarcity

Crop yield failures may increase **25-fold by 2050**. Food production, which uses **70% of world freshwater**, depends on ground and surface water quality and quantity. **By 2040, 40% of irrigated crops will be severely water-stressed**.



Overfishing

By **2050, virtually all seafood could be extinct** due to **overfishing** and **pollution** (90% depletion rate).



Soil erosion

Due to diminished nutrients and space, soil erosion might cut **agricultural yields by 50%**. In 40 years, erosion and pollution destroyed **33% of arable land worldwide**. In a **business-as-usual scenario, 90%** of Earth's soils **might be degraded by 2050**.



Water pollution

Even the most conservative human use and climate change scenarios forecast higher biochemical **oxygen demand (BOD)**, **nitrogen (N)**, and **phosphorus (P) burdens by 2050**.



Natural hazards

Storms and floods could become **more frequent** and **severe** along with other natural disasters as a result of **climate change** and the **destruction of ecosystems** that can act as **natural barriers** against such occurrences.

Source: MSCI Biodiversity & Food: The Double Burden (January 2022), [European Commission I](#), [European Commission II](#) Deutsche Bank AG. Data as of January 2023.

Regulatory risks to the food sector

Regulatory risk

A growing number of [international treaties](#), [national commitments](#), and [legislations pertaining](#) to biodiversity have recently gone into effect or are anticipated to do so in the near future. Many of them focus on the [food sector](#). For food producers, this [policy risk](#) (which is one of the many risks associated with the transition to a nature-positive world) could result in considerable [increases in production costs](#), a [reduction in fiscal subsidies](#), and, in some extreme situations, [stranded assets](#).

Examples of biodiversity-focused regulation

Jurisdictions	Requirements	Costs linked to non-compliance
EU Anti-Deforestation Law	Companies must gather geographical coordinates and monitor forest degradation via satellite photos of their source goods to verify they are free from deforestation, dating from Dec 31, 2020	Penalties equal to 4% of a company's annual revenue. Import bans.
EU Post-2020 Common Agricultural Policy (CAP) Tool to meet the Farm to Fork strategy and EU 2030 biodiversity strategy	Conditionality for CAP funds (EUR 50bn until 2027); crop diversification to crop rotation obligation; proper wetland and peatland conservation; conformity with the water framework and the sustainable use of pesticides regulation; every farm must dedicate at least 4% of arable land to biodiversity and non-productive elements; Member States must allocate at least 25% of their income support budget to eco-schemes.	Payments may be reduced if recipients do not fulfil their commitments regarding biodiversity. Increased financial assistance for agricultural practices that incorporate biodiversity.

Source: MSCI Biodiversity & Food: The Double Burden (January 2022), [European Commission I](#), [European Commission II](#) Deutsche Bank AG. Data as of January 2023.



2

Securing a diverse biosystem

Definition of Net Positive Biodiversity

E

Having established an understanding of what nature is and what threatens it, we now change perspective in order to understand **how we can improve matters**. Therefore, we need to define the term **Net Positive Biodiversity (NPB)**.

NPB refers to an objective in which the measures taken to **prevent** and **mitigate** the impacts on biodiversity (i.e. the variety of ecosystems and living things) are greater than the actions taken to **rehabilitate** impacted species and landscapes and **balance** any **residual consequences**.



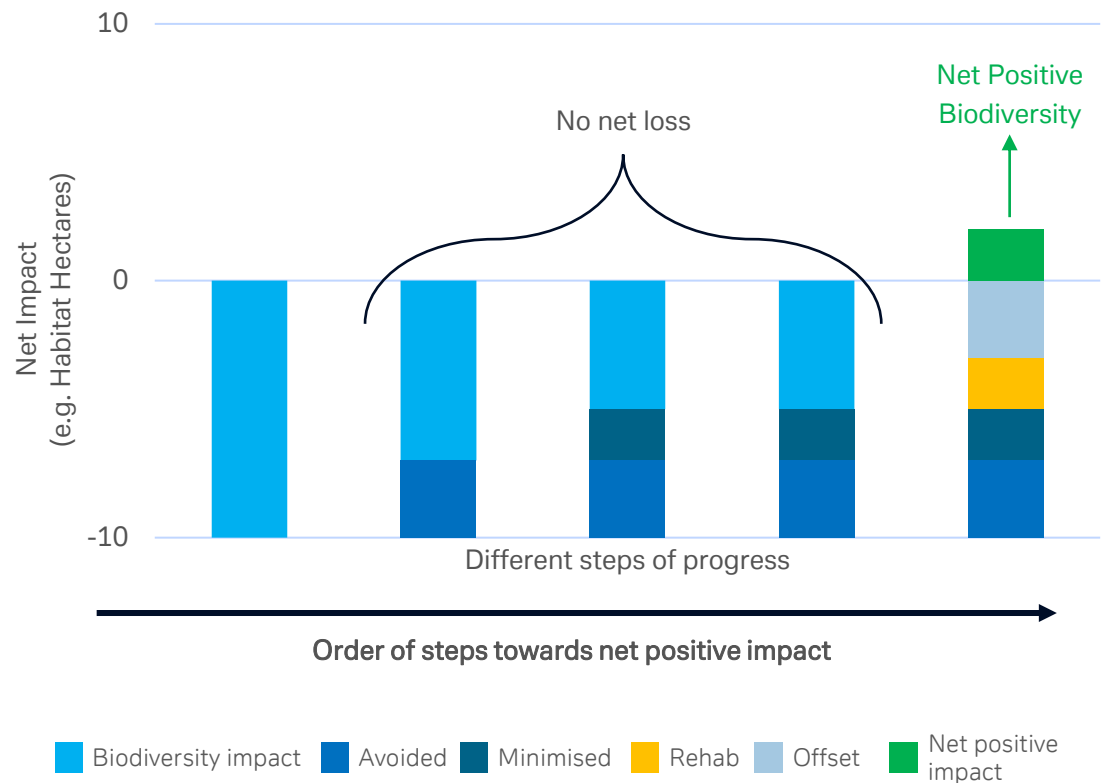
Net Positive Biodiversity – Mitigation Hierarchy

The **effectiveness** of NPB implementation and the presence of supportive contexts for NPB applications, such as **cooperative connections** between **corporations**, **governments**, and **conservation organisations**, will determine the extent to which the potential benefits are realized in practice.

New projects must consider the risks and flaws identified in earlier mitigation and offset initiatives.

The Mitigation Hierarchy illustrates that impact avoidance is the most preferred option, followed by impact mitigation and rehabilitation, and finally, once these options have been exhausted, we can rely on biodiversity offsetting to cover any residual damage that cannot be otherwise addressed.

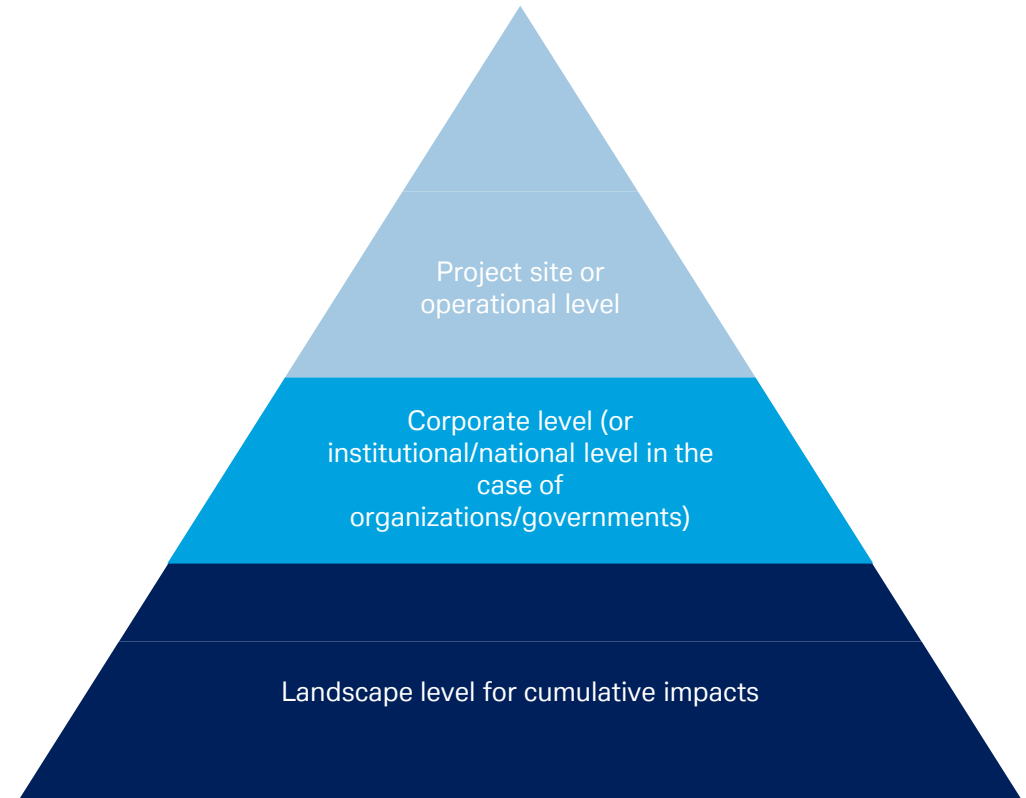
The Mitigation Hierarchy



Source: [IUCN](#), Deutsche Bank AG. Data as of January 2023.

No Net Loss is not enough

<h2>Net Positive Biodiversity Investment (NPBI)</h2> <p>In essence, a NPBI commitment is similar to a NNL commitment, but with a larger margin of error included to make sure that at the very least NNL is attained.</p> <p>This is especially crucial in situations when conservation gains are unknown (as in rapidly developing countries) or if biodiversity consequences are more severe (e.g. in critical habitats).</p>
VS
<h2>No Net Loss (NNL)</h2> <p>NNL has served as the standard for many business pledges to address biodiversity issues because it is a more well-established strategy.</p> <p>NNL refers to the objective of a development project, programme, plan, or activity in which the impact on biodiversity is completely offset or outweighed by steps taken to prevent and minimise the effects, to restore impacted regions, and then to offset the remaining impacts, leaving no loss.</p>



In each case, implementing an NPBI approach usually involves [planning project level responses to biodiversity impacts](#).

Whether applied at a project, corporate, or landscape level, an NPBI approach is based on a [well-established framework](#) for the [systematic planning of actions](#) to reduce biodiversity impacts.

Source: [Forest Trends Organization](#), [IUCN](#), Deutsche Bank AG. Data as of January 2023.

Literacy

F

According to the UN, **literacy** is “the ability to **identify, understand, interpret, create, communicate and compute...**”.

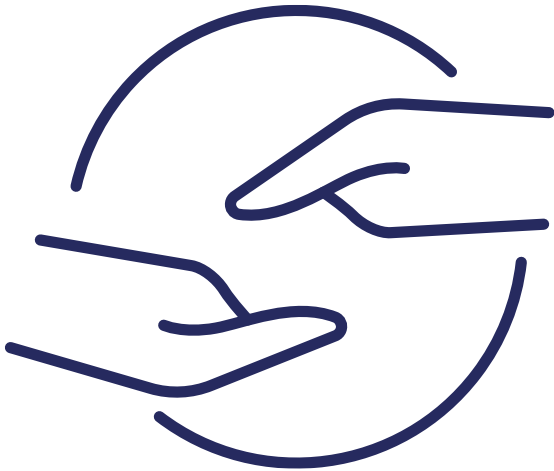
However, when we talk about literacy, we start by emphasising the importance of recognising not only the challenges facing our planet but also the origins of these challenges – namely the current structure of our **economic activities**.

Literacy also refers to devising the ways and means to **tackle** these challenges.



The natural capital value chain

Linear economy



Take



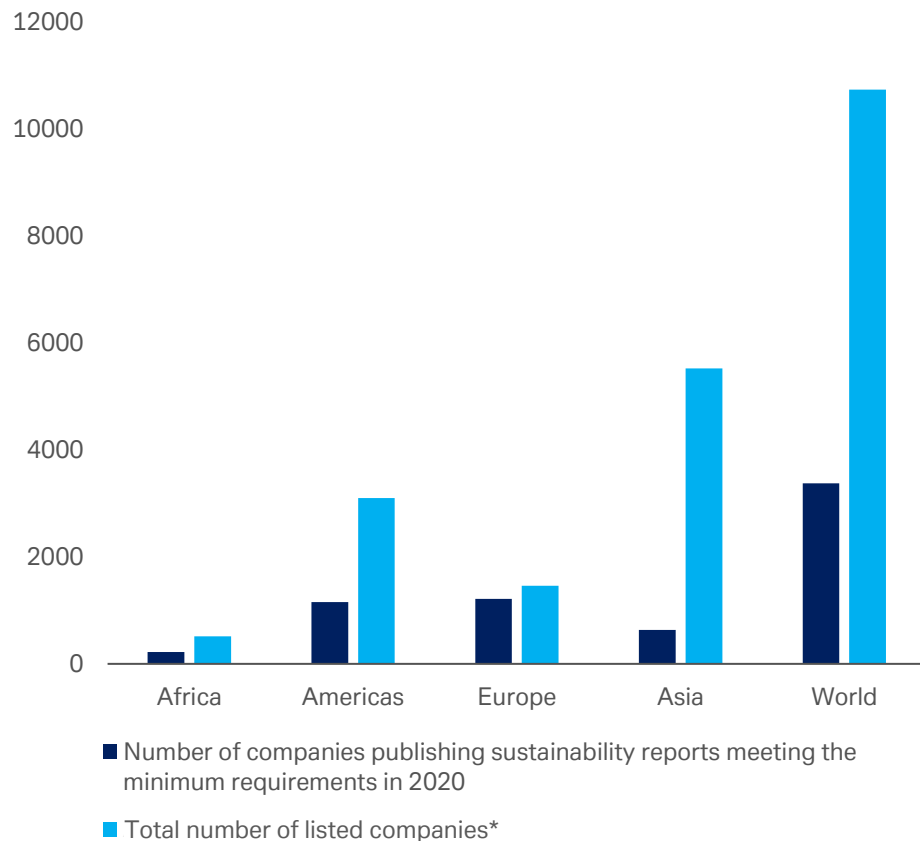
Make



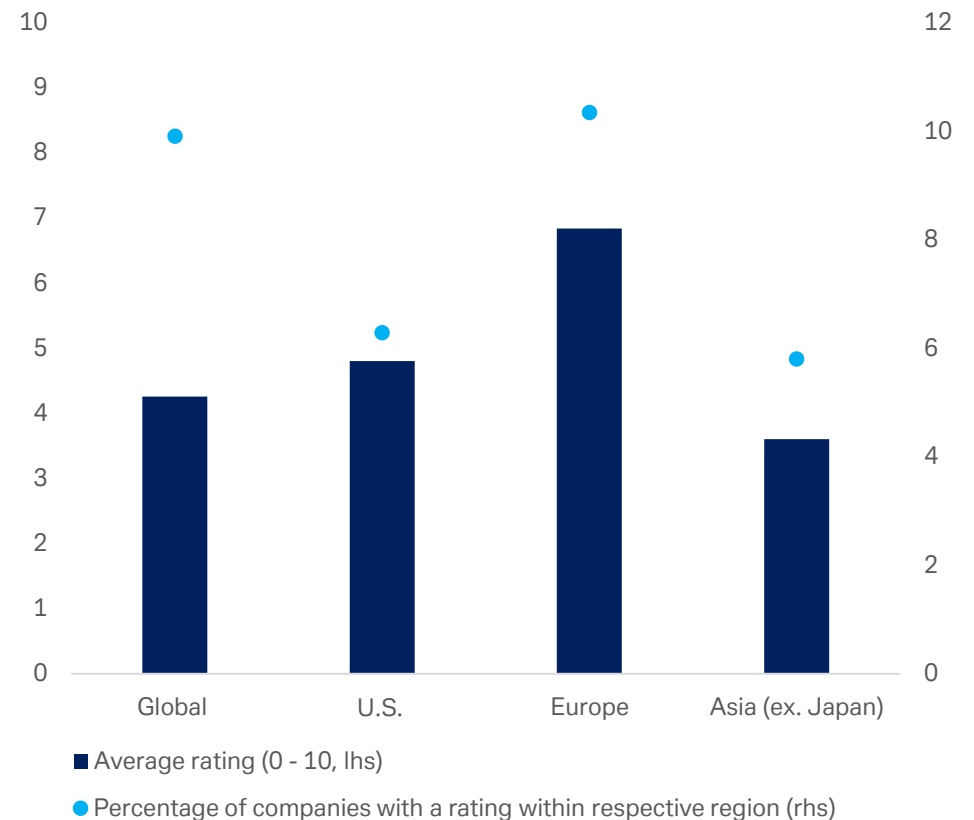
Waste

Impact still ignored in most accounting

Number of companies that publish sustainability reports

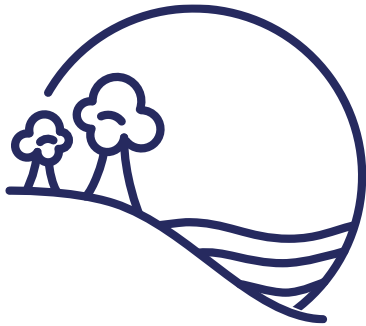


Biodiversity score and companies with scores available (%)**



*Based on Bloomberg World Large, Mid and Small Cap PR Index (similar to MSCI World ACWI IMI; WLS Index); Source: <https://unstats.un.org/sdgs/metadata/files/Metadata-12-06-01.pdf>, Bloomberg L.P., Data as of November 28, 2022., MSCI, Deutsche Bank AG., Data as of August 2022.**Companies that have policies and programmes designed to protect biodiversity and address community concerns on land use, score well on this benchmark. Companies with operations that disturb large and/or fragile, bio-diverse areas and lack strategies to minimise and mitigate biodiversity losses, score poorly. Regions represented by MSCI indices. (Global = MSCI ACWI, USA = MSCI USA, Europe = MSCI Europe, Asia ex. Japan = MSCI Asia ex. Japan IMI)

Market failure is a consequence



Natural resources are used...



... for production processes



Enterprise values are based on future earnings expectations

Value of nature not fully taken into account

Costs of economic activity not assessed correctly

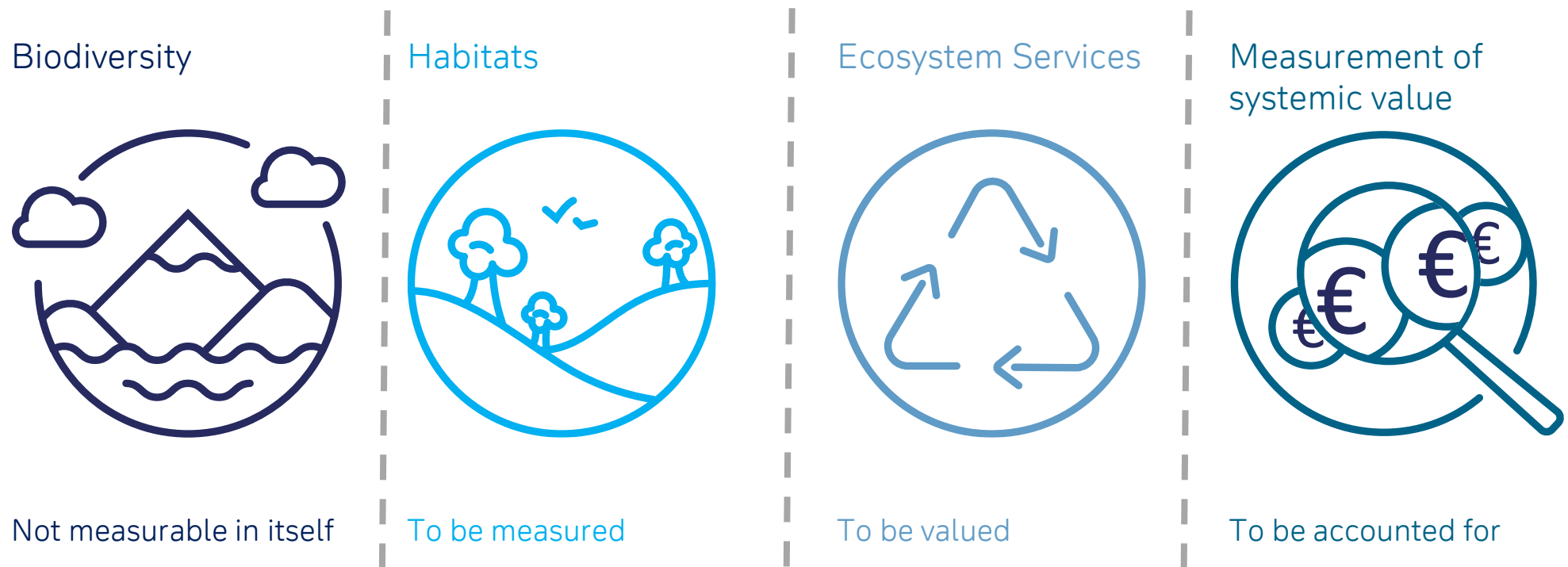
Incorrect calculation of enterprise value

Market failure

Source: [Cozero](#)., Deutsche Bank AG. Data as of January 2023.

The natural capital value chain

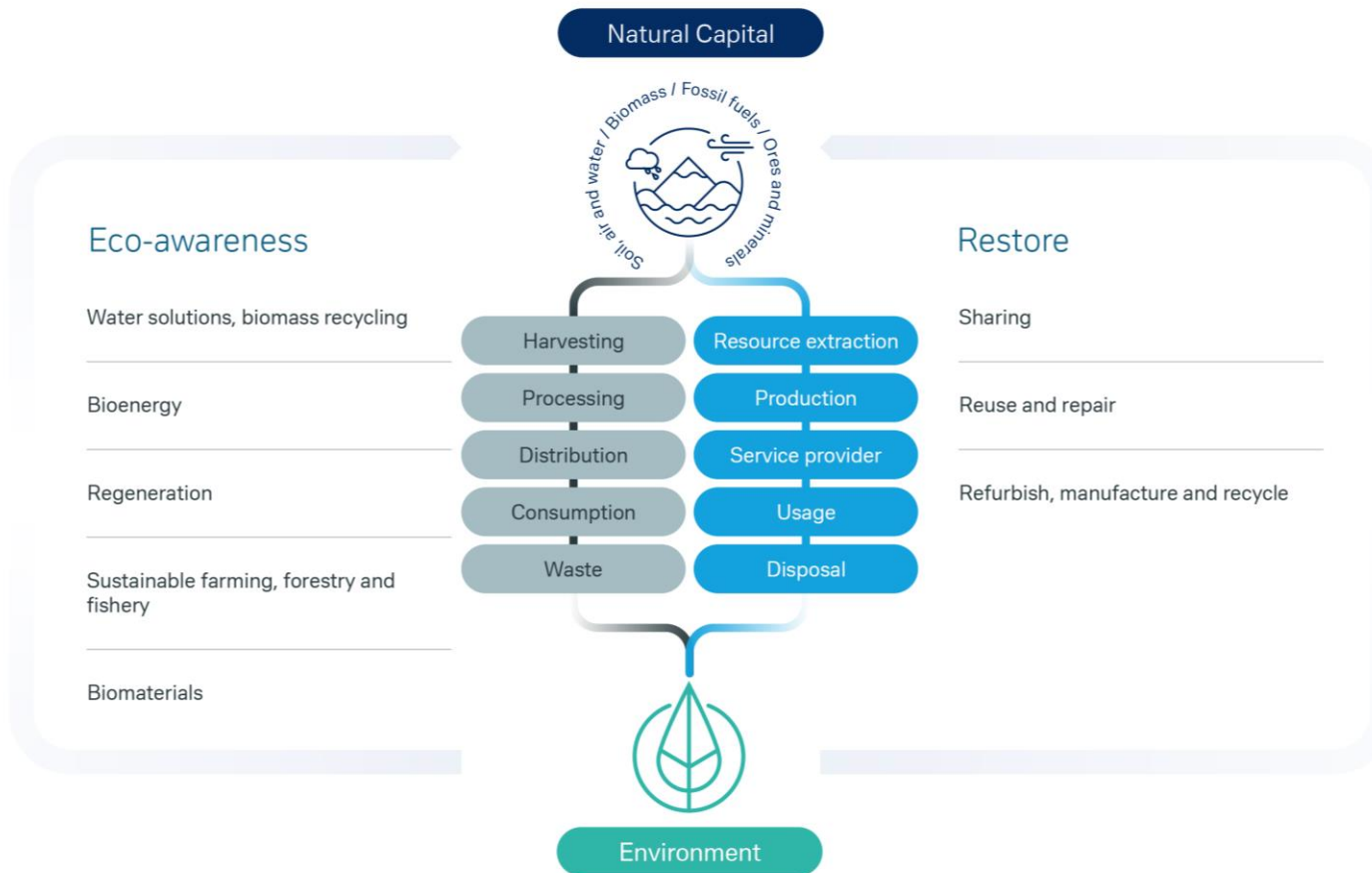
Accounting is paramount



Source: [Cozero](#)., Deutsche Bank AG. Data as of January 2023.

The natural capital value chain

Circularity is a key ingredient



New economic model based on circularity and inter-dependence.

Investments that:

- Enhance energy efficiency
- Reduce carbon emissions and pollution
- Harness the power of natural capital and the benefits of these ecosystems provide
- Halt the loss of biodiversity

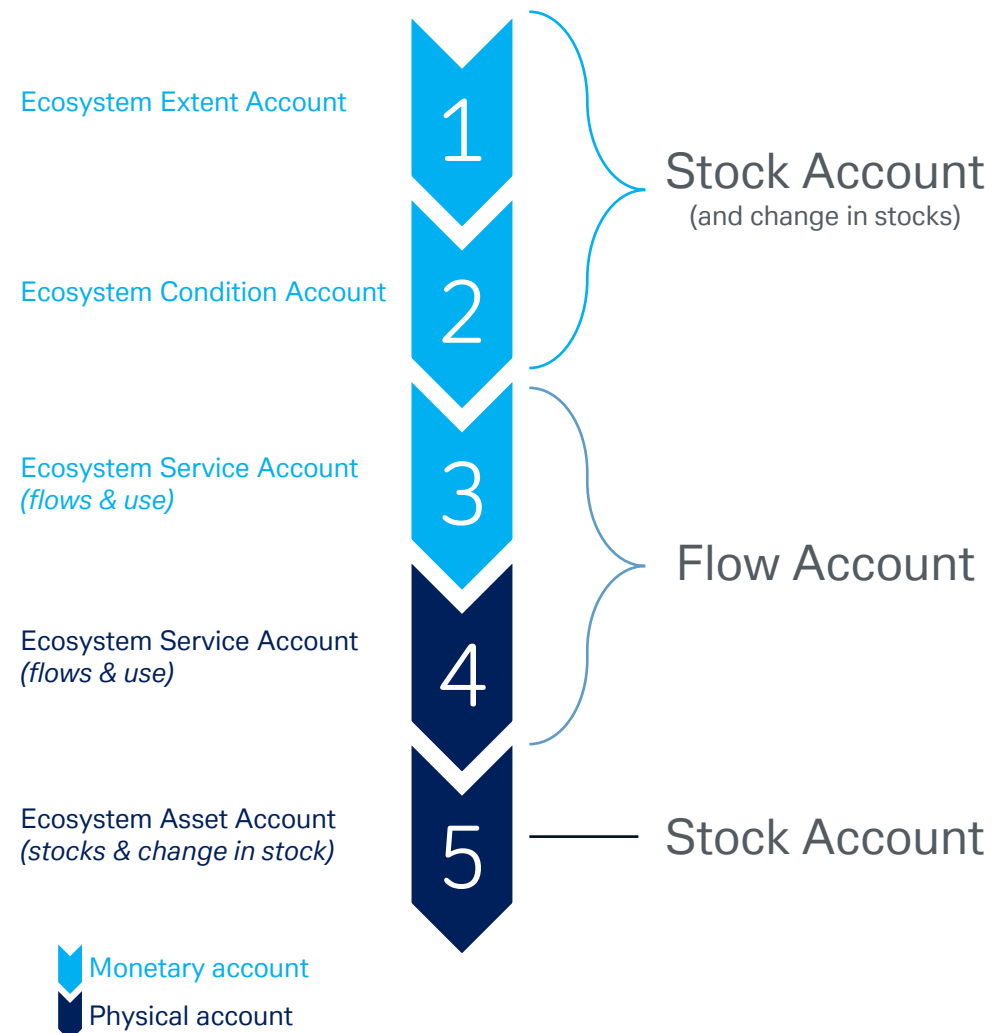
Evaluating nature – how could it work?

- 1 **Ecosystem Extent Accounts** classify ecosystems by category and track their total area (ecosystem accounting area). Ecosystem extent accounts track variations in ecosystem type extension across time in ecosystem accounting areas.

- 2 **Ecosystem Condition Accounts** document ecosystem asset attributes at certain times. They track ecosystem health by recording their state over time.

- 3 & 4 **Ecological Service Flow Accounts** (physical and monetary) track how ecosystem assets supply ecosystem services and how economic units, including households, utilise those benefits.

- 5 **Ecosystem Asset Accounts** record information on ecosystem asset stocks and changes in stocks (additions and decreases) are recorded in Monetary Ecosystem Asset Accounts. This involves taking into account the improvement and degradation of ecosystems.

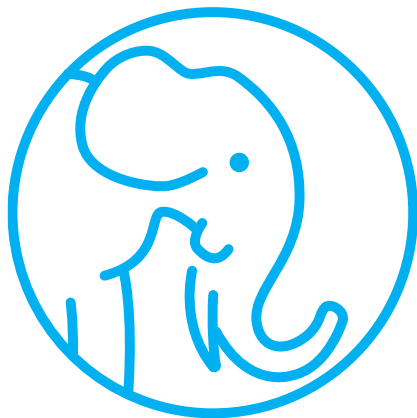


Source: [SEEA](#), Deutsche Bank AG. Data as of January 2023.

From valuation to real value

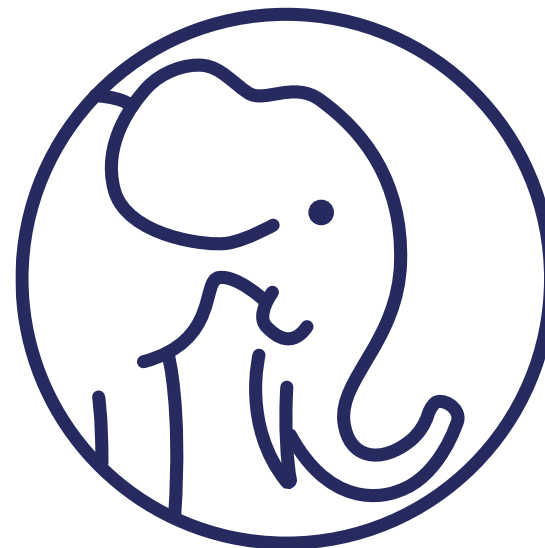
USD 40,000

Is the **current market value** of a poached elephant due to the **demand for ivory**.



USD 1,750,000

Is the **real value** of a forest elephant taking into account the **carbon-capture services** provided by this species.



Source: [Valuation of carbon services produced by wild animals finances conservation. Ralph Chami.](#), Deutsche Bank AG. Data as of January 2023.

Valuing nature-based solutions

Gabon

88%

88% of Gabon's land area is covered by [rainforests](#)

CO₂

Rainforests serve as nature-based solutions also due to their [ability to sequester carbon](#)

90m

Gabon plans to issue [90 million carbon credits](#) on the voluntary carbon markets

USD 1.35-3.15bn

Revenue from the issuance

Agreement

Although there is already a broad international consensus regarding the problem of **biodiversity loss** that faces mankind and our planet, we still have to reach **agreement** on **the path** we must take **to reverse it**.

G



Agreement across international organisations

Sustainable Development Goals	COP 15 and the Post-2020 Biodiversity Framework	Agreement at COP 27- Biodiversity Day	International organisations dedicated to biodiversity
	<p>Evaluate</p> <p>Evaluation of the goals, indicators, and lessons learnt from the Aichi Targets. In total, the world hasn't met a single target.</p>	<p>ENACT</p> <p>ENACT will coordinate global efforts to address climate change, land and ecosystem degradation, and biodiversity loss through nature-based solutions.</p>	
	<p>Strengthen</p> <p>Consider ways to strengthen the current framework and measurability of potential new biodiversity (goals and) targets within the post-2020 global biodiversity framework, both globally and nationally.</p>	<p>High-Quality Blue Carbon Principles and Guidance</p> <p>Details how to build high-quality blue carbon projects and credits for market accountability, sustainability, and transparency.</p>	
	<p>Identify</p> <p>In order to create smarter targets for the post-2020 framework, it is important to identify significant gaps in the indicator suite, determine if it is feasible to close these gaps, and assess the implications of doing so.</p>	<p>Champions Group for Deltas and Coastal Zones</p> <p>Seeks to harmonise action between countries and Small Island States to realise sustainable management of deltas and coastal zones.</p>	

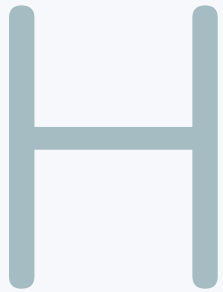
Source: [SEEA](#), Deutsche Bank AG. Data as of January 2023.



3

Investment

Funding



Funding involves two key aspects: **Financing** and **Investing**.

Financing has a **direct impact** on business activities as the financing costs of certain activities also **dictate their economic profitability**. Financial institutions can **steer capital flows** by incorporating **nature into their policies**.

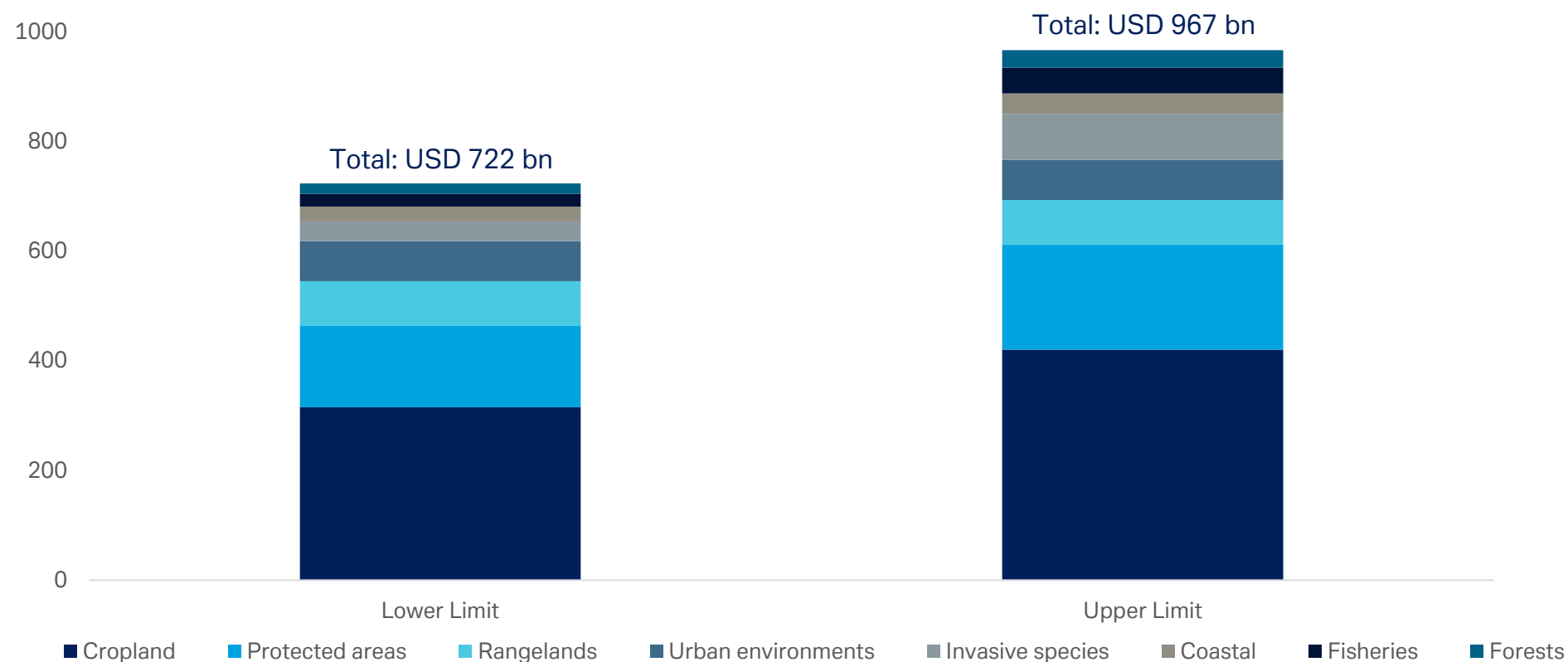
Investing has a **more indirect** – but significant – affect on business activities as markets **send signals** to business leaders **indicating which economic activities** it expects to be **profitable in the future** – and **which not**. Thereby also **steering capital flows into nature**.



Funding is lacking

Biodiversity financing gap per year

Studies imply that investments of between USD 722 billion and USD 967 billion per year are needed to restore biodiversity loss by 2030. The biodiversity financing gap averages **USD 711 billion** each year.



Source: [Paulson Institute](#), Deutsche Bank AG. Data as of January 2023.

Closing the funding gap – Relevant actors



Source: [World Bank](#), Deutsche Bank AG. Data as of January 2023.

Driving private investments towards biodiversity – the key factors

Harmful Subsidies Reform

Some **government subsidies** provided to the agriculture, fisheries and forestry sectors **increase biodiversity loss**. Subsidy reform can avert further **damage**.

Investment Risk Management

Mainstreaming the **biodiversity-related risk management practices** in **conventional financial markets** offers a huge opportunity to protect biodiversity.

Biodiversity Offsets

Biodiversity offsets are imposed by **governments** to compensate for unavoidable biodiversity harm caused by a development project when the cause is difficult or impossible to eliminate. Biodiversity offsets should always be the last option in the mitigation hierarchy.

Domestic Budgets and Tax Policy

Government taxation, budgeting and spending control. **55 – 61% of biodiversity conservation funding comes from government budgets**.

Natural Infrastructure

Natural infrastructure protection serves a **dual purpose**. It **sustains** healthy ecosystems and **provides** ecosystem services to humans, sustaining livelihoods and communities.

Green Financial Products

Green financial products, mostly **debt** and **equity**, **enable investment in biodiversity-friendly enterprises and initiatives**. The interest of individuals and institutions in investing sustainably has **dramatically increased in recent years**.

Nature-based solutions and Carbon Markets

With nature-based solutions, countries are **protecting** and **restoring** forests and other biodiversity-rich ecosystems to meet their **Nationally Determined Contributions (NDC)**. Several countries are also implementing **carbon pricing systems as part of their climate initiatives**.

Sustainable Supply Chains

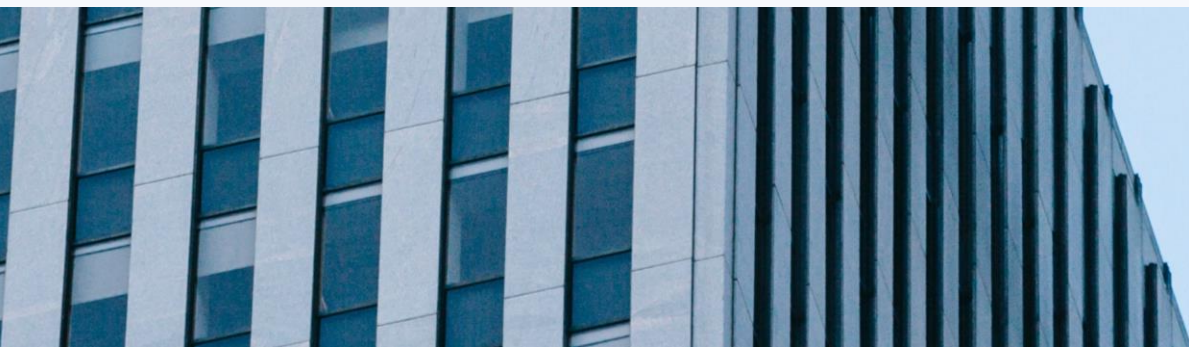
Supply chain sustainability involves **environmental, social, and governance management** of **commodities and services** from **producers to consumers**. Land use change and unsustainable agricultural, forest, fishery, and other commodity practices have negatively impacted biodiversity in global supply chains.

Source: [Paulson Institute](#), Deutsche Bank AG. Data as of January 2023.

Portfolio alignment

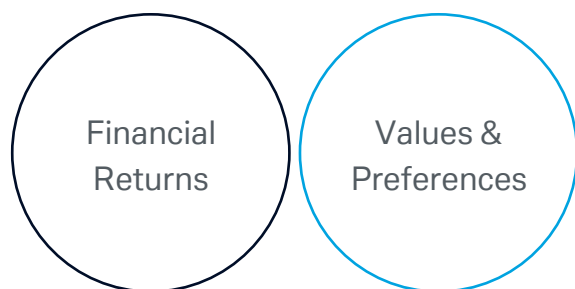
So far, we have looked at biodiversity from a conceptual perspective. Having dealt with the importance of biodiversity for our economy, the impact of our economic activities and the funding gap, the question now is [how to consider biodiversity in a portfolio context](#).

In the following chapter, we illustrate [different approaches to portfolio alignment taking biodiversity into account](#).



Different approaches to portfolio alignment

Values Alignment



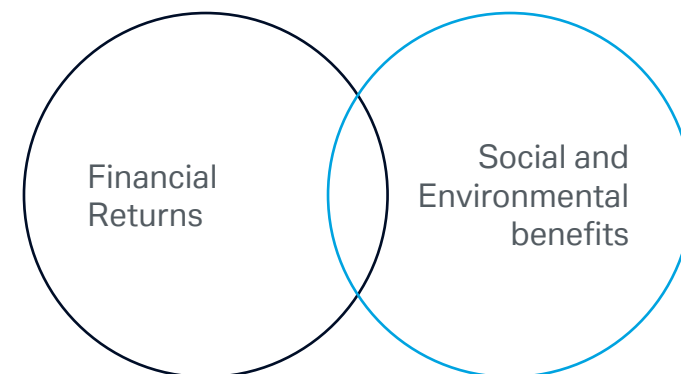
Align a portfolio with a set of ethical or political values

ESG Integration



Incorporate selected ESG factors with potential financial impact

Impact Investing



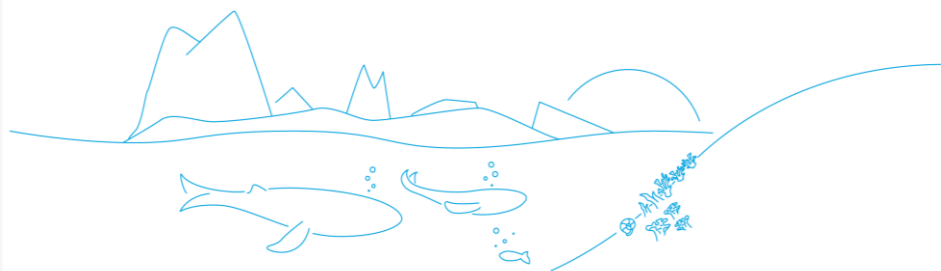
Generate measurable social or environmental benefits along with financial returns

Source: EFFAS 2021., Deutsche Bank AG. Data as of January 2023.

Values Alignment approach

A Values Alignment approach

This approach can be divided into a [values-based approach](#) and a [norms-based approach](#). A values-based approach means excluding companies that derive a significant share of their revenue or profit from [activities seen as negative for society or environment](#). Norms-based screening means excluding companies that [violate internationally \(or nationally\) recognized norms or conventions](#).



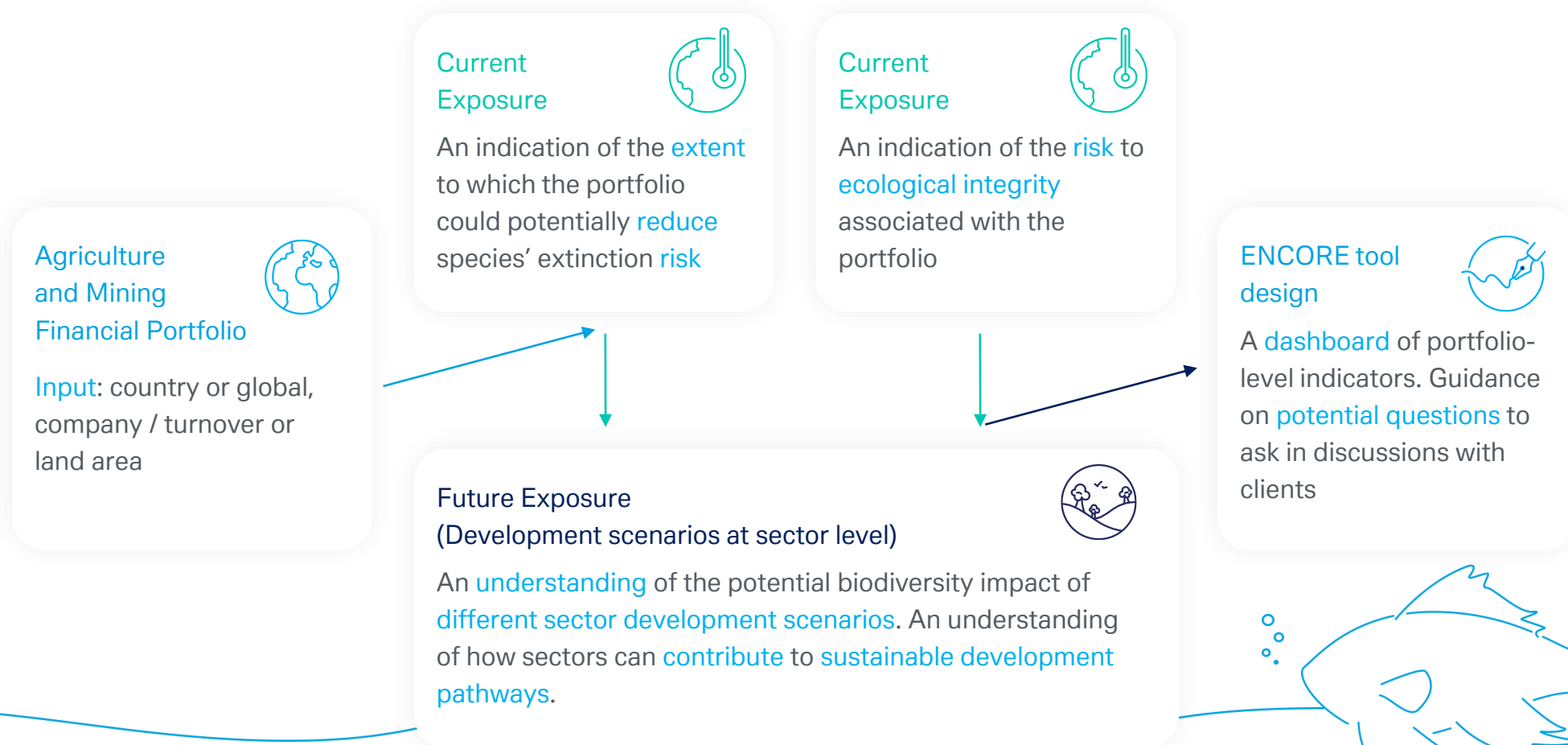
What is the ENCORE biodiversity module?

ENCORE can be seen as an example of a Values Alignment approach. While the ENCORE platform [helps the finance industry to comprehend and visualize the connections between the economy and nature](#), the ENCORE biodiversity module allows users to [investigate how financial activity in specific sectors can be aligned with a future that is more supportive of nature](#). [Mining](#) and [agriculture](#) have been chosen as the module's first two priority sectors due to their [significant material impacts](#) and [reliance](#) on the [environment](#). As the module is improved, other industries will be added. The module aims to help financial institutions to respond to the following inquiries regarding biodiversity implications on their portfolios:

- How can my portfolio reduce species' extinction risk and ecological integrity risk?
- Which are the potential pathways for my agriculture or mining portfolio to achieve a positive impact?
- What types of actions can I take to align my portfolio with global biodiversity goals?

Source: [ENCORE](#), Deutsche Bank AG. Data as of January 2023.

How can a Values Alignment approach be implemented



Source: [Encore: Aligning Financial Portfolios with Biodiversity Goals. Scoping report and full method for the ENCORE biodiversity module](#), Deutsche Bank AG. Data as of January 2023.

ESG Integration approach

ESG Integration refers to a traditional financial management approach that considers environmental, social and corporate governance factors at every stage of the investment decision-making process. The primary motivation for this approach tends to be financial return. A crucial component is risk exposure and management.

Biodiversity & Land Use

Risk Exposure Score	Risk Management Score
<ul style="list-style-type: none"> Percentage of operations with high/moderate/low impact on biodiversity Percentage of operations in areas with high/moderate/low biodiversity sensitivity 	<ul style="list-style-type: none"> Biodiversity policies Programs to protect natural ecosystems Biodiversity impact assessment Track record of minimizing disturbances from operations Biodiversity controversies

This Key Issues section evaluates how potentially vulnerable enterprises are to having an impact on local biodiversity and how they handle such impacts.

Raw Materials Sourcing

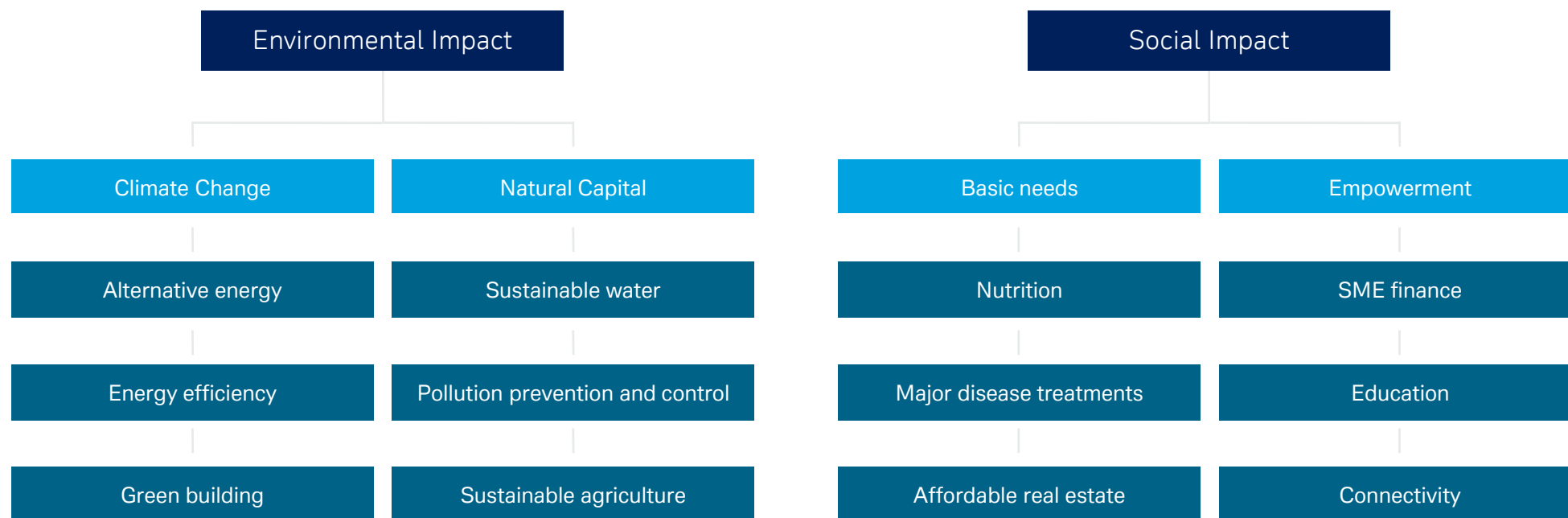
Risk Exposure Score	Risk Management Score
<ul style="list-style-type: none"> Percentage of operations with high/moderate/low impact in biodiversity Percentage of operations in areas with high/moderate/low biodiversity sensitivity 	<ul style="list-style-type: none"> Policies, programs for each commodity Policy to address controversial raw materials Collaboration with suppliers to address impacts of raw materials Future targets: raw materials sourcing External certification Controversies

This Key Issues section assesses the supply chain transparency and certification programs of firms as well as the environmental impacts of the raw materials used to make their products.

Source: EFFAS 2021., MSCI: Data and Metrics Overview: Assessing Biodiversity Impacts and Risks, Deutsche Bank AG. Data as of February 2022.

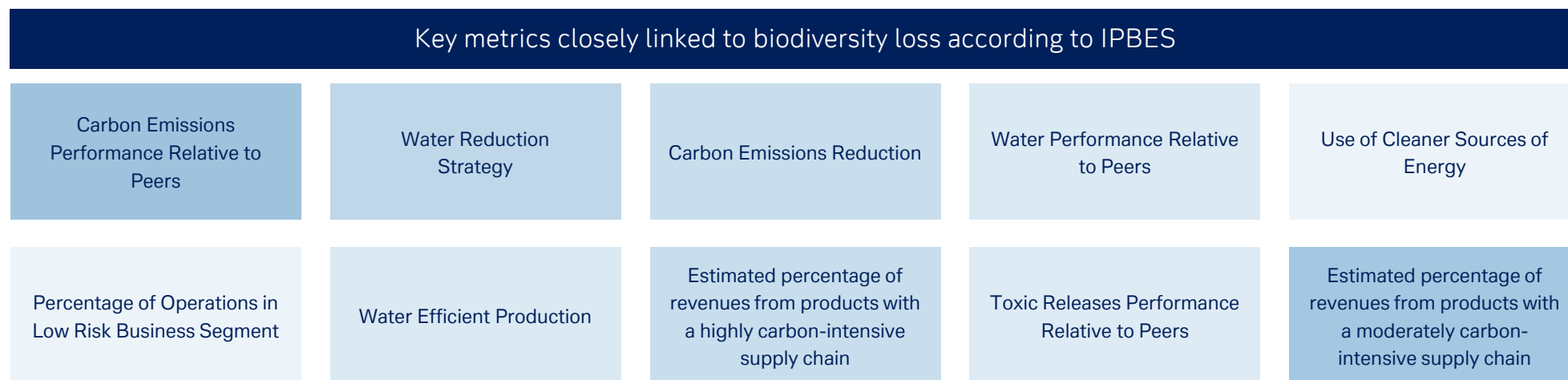
Impact Investing Approach

Investments made in businesses, organizations, and funds with the aim of producing social and environmental impact in addition to a financial return are known as impact investments. Many times, investments are project-specific. The investor keeps possession of the asset and anticipates a profit. Since impact is directed towards the extern, impact investing focuses on environmental impact as well as social impact.

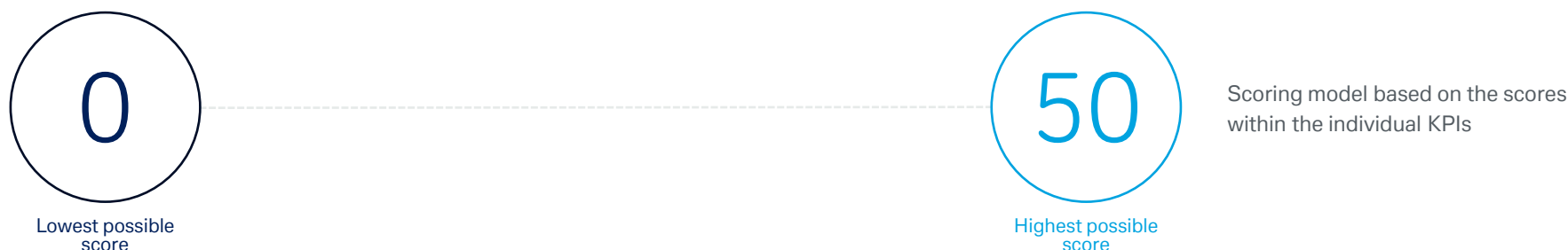


Source: EFFAS 2021., MSCI: Data and Metrics Overview: Assessing Biodiversity Impacts and Risks, February 2022.

Exemplary market analysis – Definition of key metrics and a scoring model



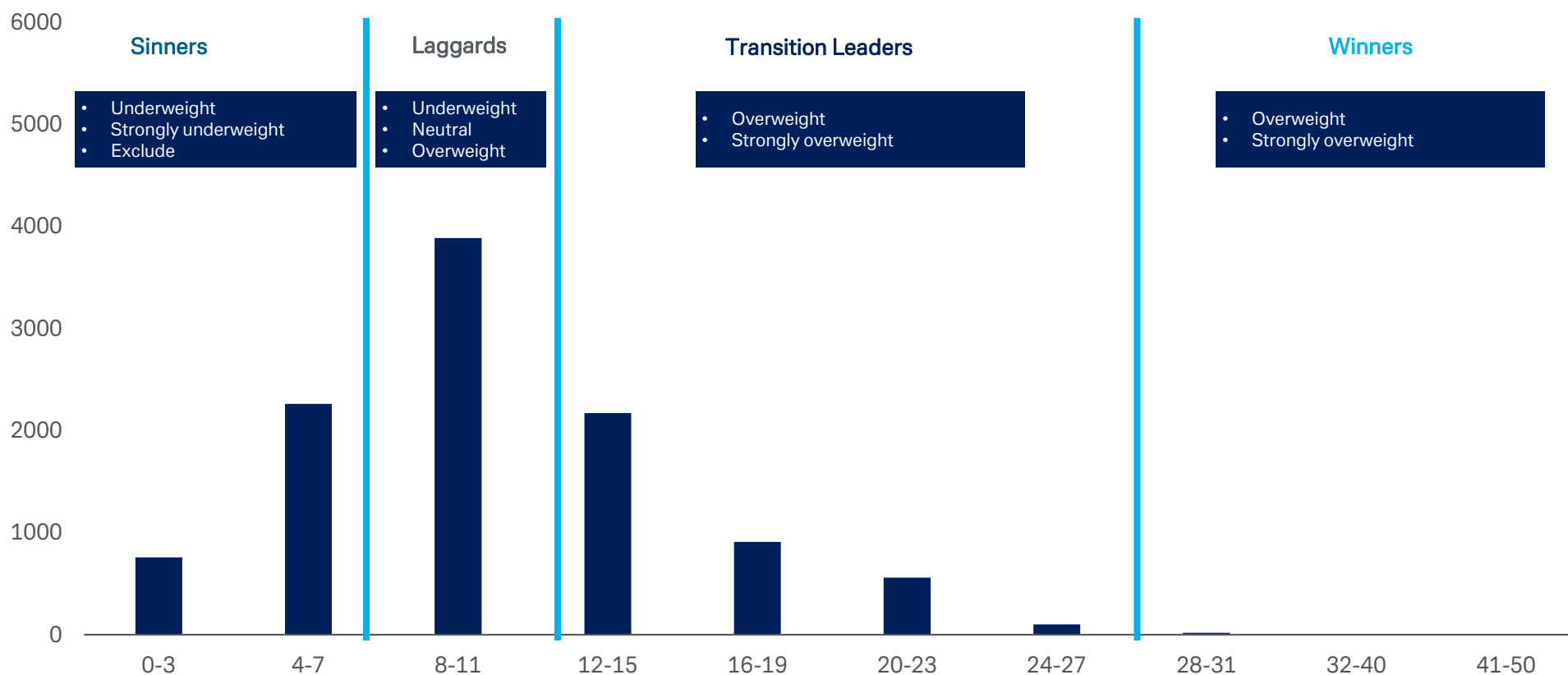
Having identified the threats to biodiversity, we have chosen different **key metrics that are closely linked to biodiversity loss**. Based on their performance on each **key metric**, companies may score from **0 to 5** points on each of them. As **5 is the highest possible score**, it indicates the **best possible performance** within the key metric. A **score of 0** indicates the **worst possible performance**.* A company can therefore receive a final score that can range from 0 to 50 points.



*Please find a detailed explanation of the key metrics in the appendix.
 Source: MSCI: Data and Metrics Overview: Assessing Biodiversity Impacts and Risks, February 2022, Deutsche Bank AG. January 2023

Applying the scoring model to the global stock market

Distribution of the scores with a granular approach (y-axis: number of companies, x-axis: total score based on defined metrics)*

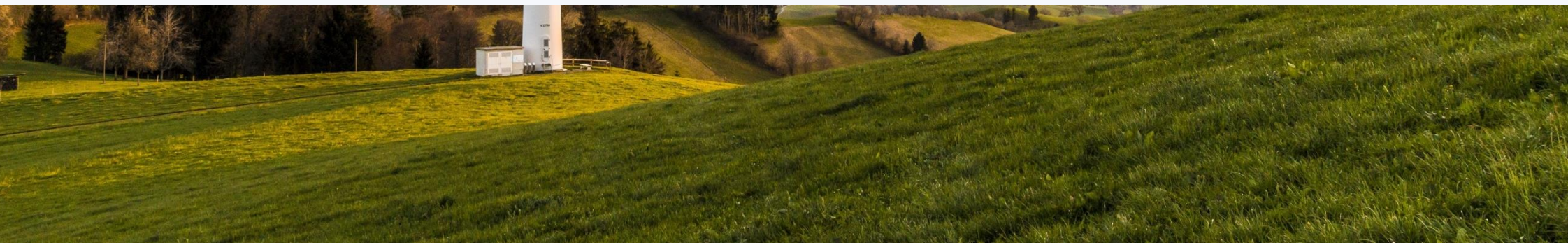
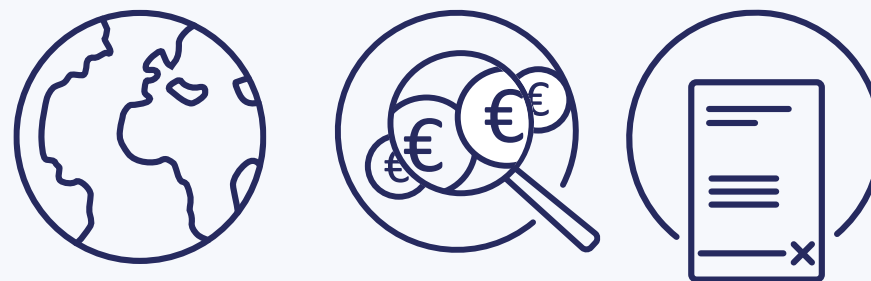


*Based on Bloomberg World Large, Mid & Small Cap Prive Return Index (WLS Index Bloomberg Ticker)
 Source: MSCI: Data and Metrics Overview: Assessing Biodiversity Impacts and Risks, February 2022. Bloomberg L.P., Deutsche Bank AG. Data as of December 2022

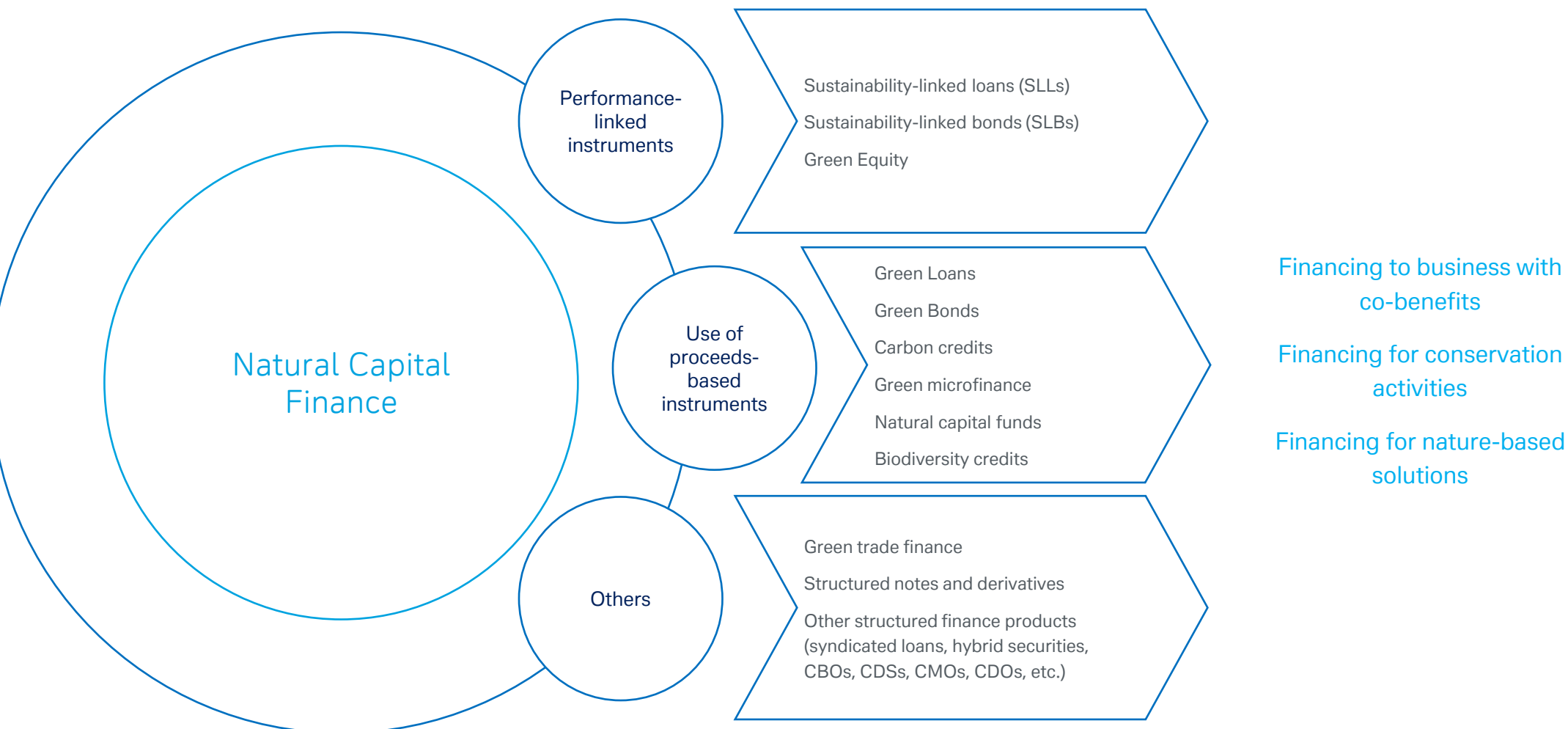
Markets

When talking about markets, we refer to **available products** and **solutions** that can already be bought on the markets.

Green credit cards, energy-efficient mortgages, alternative energy venture capital, green savings deposits, and green car loans are just a few of the cutting-edge green financial products that are currently available worldwide.



The universe of natural capital finance instruments



Source: Data and Metrics Overview: Assessing Biodiversity Impacts and Risks, February 2022.

Sustainability-linked debt

Definition

- SLD refers to a type of loan or bond that **incentivizes** the borrower's or issuers achievement of predetermined **sustainability objectives**
- Measured through KPIs and assessed against **Sustainability Performance Targets (SPTs)**

Applicability to nature

- Biodiversity-related **KPIs** have been identified by the **Sustainability Linked Loan Principles (SLLP)** (e.g. conservation, sustainable farming, etc.)
- Generally appliance to influence corporate strategy

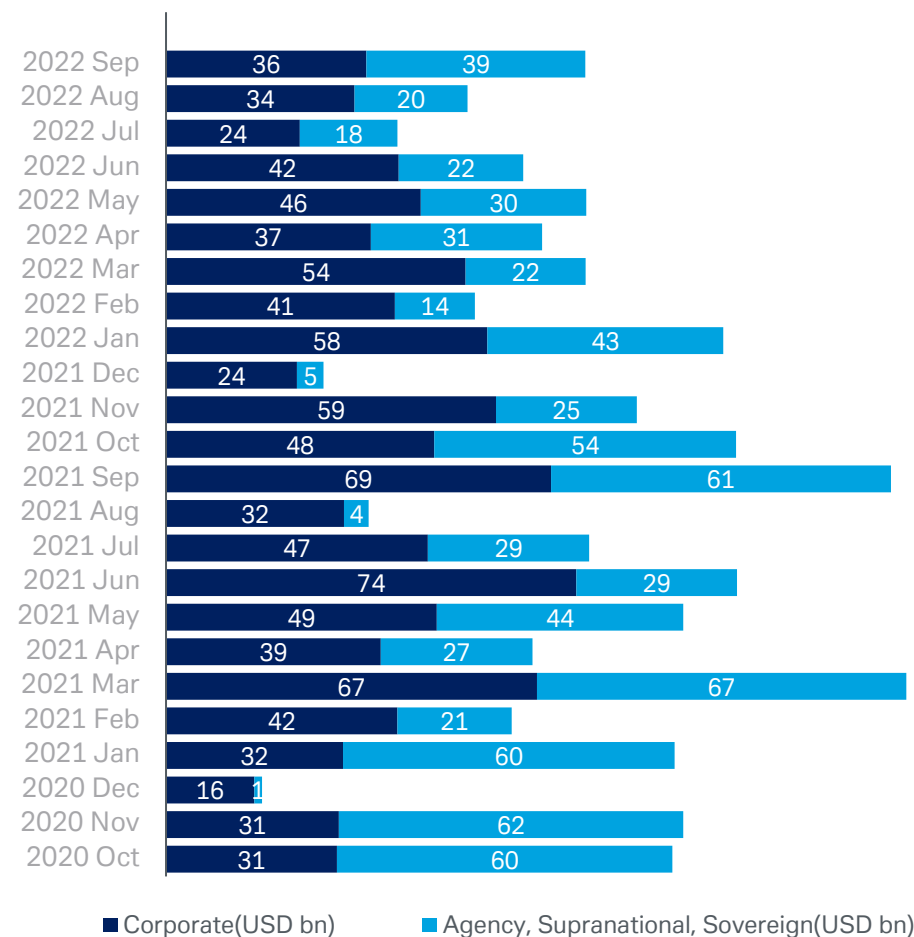
Benefits

- SLDs **enable** financing for **transition activity, enhance sustainable production and consumption**
- Accentuate the benefits of **ESG rating improvement**
- Flexibility due to no project linkage

Drawbacks

- **More complex** than traditional debt
- Timeframe can be too short to support biodiversity outcomes
- Additionality principle → relation of KPIs and outcome, reducing biodiversity loss instead of improvements

Sustainable bond issuance by issuer type



Source: [SEEA](#), Deutsche Bank AG. Data as of January 2023.

Source: Refinitiv Eikon, Deutsche Bank AG. Data as of October 2022.

Green debt

Definition

- Green debt instruments are defined as any type of **loan** or **bond** where **proceeds** are used for **green, predefined purposes** or **projects**
- Green bonds must be aligned with the **Green Bond Principles (GBPs)**

Applicability to nature

- Compliance with **Green Loan Principles (GLP)** and **Green Bond Principles (GBP)**
- The GBP identified natural resource & biodiversity conservation as two of their five high level environment objectives

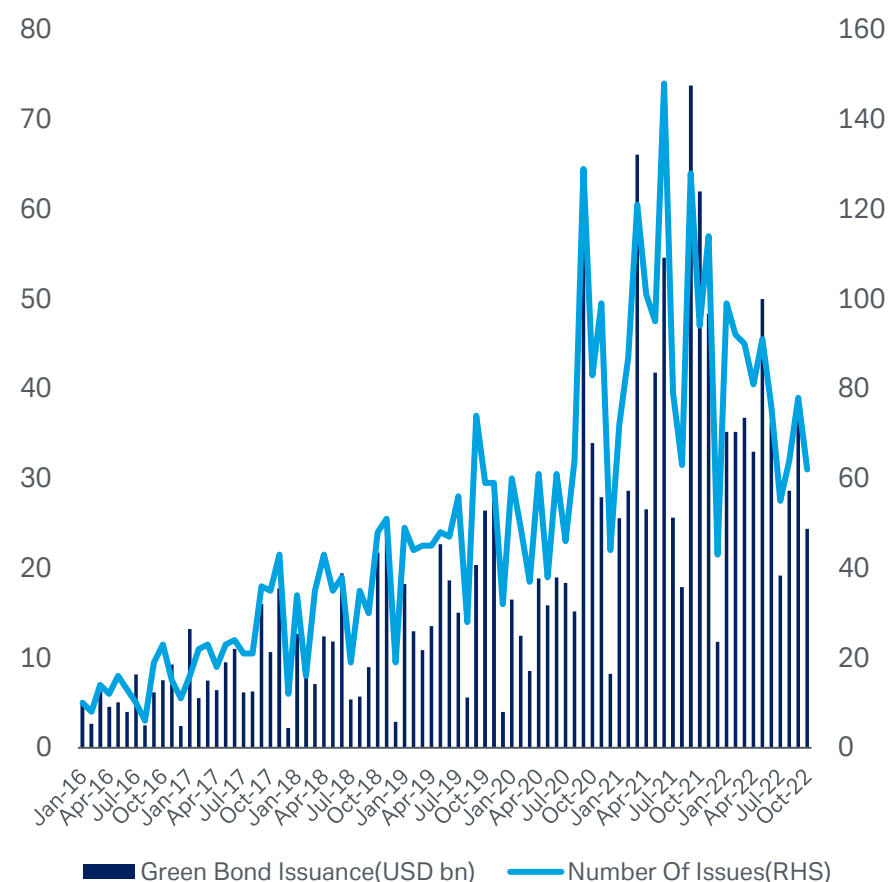
Benefits

- Signal **heightened priority** for green initiatives with reputation benefits
- Greater levels of **transparency**
- Green bonds may provide **“greenium”** (price premium due to excess demand)

Drawbacks

- Short-term time horizons may not match with long-term investments
- Increased **complexity**
- Impact may be hard to identify
- Greenwashing risks

Green bonds issuance remains robust following record year 2021



Source: AFME, Deutsche Bank AG. Data as of January 2023.

Source: Refinitiv Eikon, Deutsche Bank AG. Data as of October 2022.

Specialised instruments

Natural Capital Funds

Definition

- Investment pool that can hold [equity or debt instruments](#)
- Proceeds exclusively used to (re-) finance green projects

Applicability to nature

- Banks can [pool their capital](#) alongside other investors and engage with companies that are driving [fundamental impacts](#)
- Target companies that actively [manage their impact](#) on nature and exclude those who do not

Benefits

- [Investment mandates](#) can be geared towards nature and biodiversity
- Relatively [easy](#) to understand concept, because of [familiarity](#) with collective investment schemes

Drawbacks

- Generating an [acceptable expected financial return](#) to attract institutional investors (Nature capital funds are perceived as high risk → investors require a risk premium)
- Excluding companies is [limiting engagement](#) with evolving companies

Structured notes and Derivatives

- Derivatives and structured notes with underlying assets that are [linked to sustainability through KPIs](#) (sometimes referring to Sustainability-linked Derivatives (SLD))
- [Highly customizable](#) transactions that can be applied in a variety of context including nature and biodiversity

- SLDs can create [nature-linked cashflow](#) related to a conventional derivative instrument, through the use of [KPI compliance monitoring](#)
- KPIs can generally be clustered in two categories:
 1. [Reducing negative impact behaviour](#)
 2. [Encouraging beneficial impact behaviour](#)

- Using the role of derivatives in financial markets to [boost](#) corporates' sustainable finance strategies by providing [market access](#), [risk management](#), [hedging](#) and [pricing](#)
- Allowing banks to [diversify](#) their funding sources and offer investors differentiated green investment opportunity
- [Customizability](#) can enhance the flow of private capital

- [Lack of a uniform standard](#) to measure environmental performance in the derivate market → [greenwashing risk](#)
- [Use of proceeds](#) for SLDs are not generally affected or limited

Source: AFME, Deutsche Bank AG. Data as of January 2023.

Key takeaways

1

Biodiversity provides **key ecosystem services** that are crucial for human wellbeing and the prosperity of the global economy. Biodiversity loss is a clear result of **market failure** as our current economic model **does not take into account its systemic value**.

3

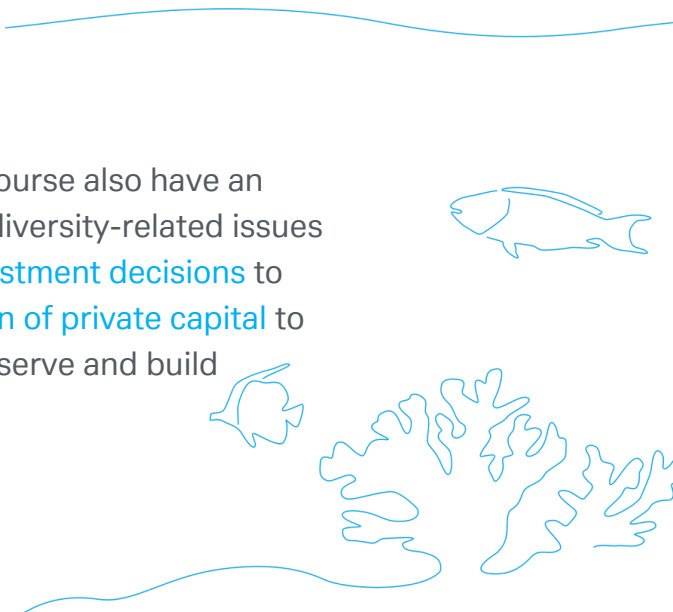
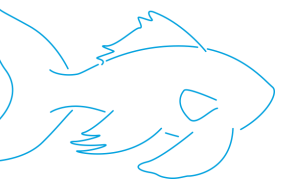
Several **enabling conditions** are necessary in order to change our current economic paradigm in such a way that biodiversity is considered. A cooperative and **dynamic legal and regulatory framework** is a first step. Establishing **biodiversity metrics** – ensuring **data is available** and **measurable** – is one of the **biggest challenges**.

2

Moving towards an **economic model** that takes nature into account, mankind might establish a **circular economy** that is based on investments that **reduce carbon emissions** and **pollution**, enhancing **energy efficiency**, **harnessing the power of natural capital** and the **benefits** that these ecosystems provide, and **halting the loss of biodiversity**.

4

This transformation will of course also have an **impact on investments**. Biodiversity-related issues must be **integrated into investment decisions** to ensure an **effective allocation of private capital** to economic activities that conserve and build biodiversity.



Authors (1/3)



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Chief Investment Officer ESG &
Global Head Chief Investment Office

Markus Müller is Global Head of the Chief Investment Office of the Private Bank, Deutsche Bank AG. In June 2022 he was appointed Chief Investment Officer ESG in addition to his current function.

Markus is a member of Deutsche Bank's Group Sustainability Council.

Markus began his career at Deutsche Bank in DB Research as executive assistant to the chief economist. During his studies at Muenster University in Germany, he acquired broad international experience with focus on China, later working as an Economist at Allianz Life Insurance in Shanghai. Markus has held teaching posts in corporate finance and economics, being a visiting scholar at the Frankfurt School of Finance and the University of Bayreuth as well as at the Banking and Finance Academy of the Republic of Uzbekistan in Tashkent. In April 2017 Markus Müller was asked by Germany's Federal Ministry for the Environment to join the advisory board of the "Carbon Bubble" project, which assessed and evaluated the risks of the transition towards a low-carbon economy for the German financial system.

In January 2019 Markus Müller published his first book under the title „Neo-Ordoliberalismus – Zukunftsmodell für die Soziale Marktwirtschaft“ at Springer-Gabler. The title of his most recent book published in May 2021 is "Deutschland und China zwischen Kooperation und Konkurrenz".

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Afif holds a Bachelor's degree in Business Administration and started his career at Deutsche Bank in 2017 through the bank's Corporate Study Programme. He studied at DHBW Mannheim and completed the practical components of the Corporate Study Programme in the cities of Frankfurt, Mannheim and Saarbrücken, where he gained deep insights into Deutsche Bank's private client business. In his current role as Investment Officer in Frankfurt, he focuses both on fundamental ESG issues such as biodiversity and nature-based solutions and on the general transformation of our entire economy.

Authors (3/3)



Daniel Sacco, CESGA
Investment Officer Europe

Daniel has an MSc degree in Finance from Bocconi University (Milan) and an MA degree in Economics from Keio University (Tokyo), both obtained with honors. During his career, he has worked for the National Bank of Canada in Dublin, focusing on risk management controls for the banks' proprietary trading activities in derivatives markets. He joined Deutsche Bank after an off-cycle internship at Mediobanca in the Private & Wealth Management division, working in the team dedicated to Italian Institutional Clients. At Deutsche Bank, he works in the Chief Investment Office of the International Private Bank, focusing on ESG topics and sustainability.

Key metrics detailed view



Carbon Emissions Performance Relative to Peers

The company's carbon emissions intensity in comparison to its competitors is shown by this metric. The company has one of the lowest carbon intensity values in the industry, as indicated by the highest score, which signifies best-in-class performance. A medium score indicates emissions intensity that is similar to peers in the industry. The company has one of the highest rates of carbon emission intensity in the industry, as indicated by the lowest score, which signifies worst-in-class performance.



Water Reduction Strategy

This metric represents an evaluation of the extent to which the company has developed a thorough plan for lowering its water intensity.



Carbon Emissions Reduction

This metric provides an evaluation of the aggressiveness of a company's carbon emissions reduction target. Companies that take actions to cut emissions from a level that is already quite low receive the highest ratings. The companies with the lowest scores, besides those without a target, are those with high emissions levels and modest reduction goals. A reasonably high score is provided for any kind of carbon reduction aim for smaller businesses, where they are rather uncommon.



Water Performance Relative to Peers

The company's water intensity in comparison to its competitors is shown by this metric. The company has one of the very lowest water intensity values in the industry, as indicated by the highest score, which signifies best-in-class performance. A medium score indicates water intensity that is comparable to peers in the industry. The company has one of the highest rates of water intensity in the industry, as indicated by the lowest score, which signifies worst-in-class performance.

Source: MSCI, Deutsche Bank AG. Data as of January 2023.

Key metrics detailed view



Use of cleaner sources of energy

This metric evaluates the company's efforts to reduce its carbon emissions by switching to cleaner energy sources like geothermal, solar, wind, co-generation, or natural gas instead of coal or oil.



Percentage of operations in low-risk business segments

This metric shows the percentage of the company's revenues generated by business segments that normally have low carbon intensity levels.



Water-efficient production

This metric provides an assessment of how effectively the company has implemented water efficiency measures into its production processes.



Estimated percentage of revenues from products with a highly carbon-intensive supply chain

Based on a life-cycle assessment methodology that estimates all GHG emissions in the supply chain, this metric shows the percentage of the company's sales that come from normally very carbon-intensive items.



Toxic releases performance relative to peers

The company's hazardous emissions intensity in comparison to its competitors is shown by this metric. The company has one of the lowest levels of hazardous emissions intensity in the industry, as indicated by the highest score, which signifies best-in-class performance. A medium score indicates harmful emissions intensity that is comparable to peers in the industry. The company has one of the highest levels of hazardous emissions intensity in the industry, as indicated by the lowest score, which signifies worst-in-class performance.



Estimated percentage of revenues from products with a moderately carbon-intensive supply chain

Based on a life-cycle assessment methodology that estimates all GHG emissions in the supply chain, this metric shows the percentage of the company's sales that come from typically moderately carbon-intensive items.

Source: MSCI, Deutsche Bank AG. Data as of January 2023.

Glossary

AuM stands for Assets Under Management which is the total market value of the investments that a person or entity handles on behalf of investors.

CEO stands for Chief Executive Officer who oversees the operation of a company.

ESG stands for Environment, Social, Governance, and is the acronym most commonly used for sustainable investments.

ESG investing pursues environmental, social and corporate governance goals.

The **European Commission (EC)** is the executive body of the European Union (EU), representing the interests of the European Union as a whole. It consists of 27 Commissioners (one from each EU Member State).

The **European Union (EU)** is an economic and political union consisting of 27 mostly European member states.

Greenhouse gas (GHG) refers to chemical elements and gases that cause the greenhouse effects on planets.

Gross domestic product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period.

ISS ESG is an independent provider of ESG solutions.

MSCI is an independent provider of market indices and other analytical tools.

Idiosyncratic risk refers to factors that can negatively impact specific securities.

The **Paris Agreement** refers to a 2015 agreement under the United Nations Framework Convention on Climate Change.

SDGs stands for Sustainable Development Goals. They are a collection of 17 global goals set by the United Nations General Assembly in 2015. They include 169 targets.

The **Sustainable Finance Disclosure Regulation (SFDR)** is a European regulation introduced to improve transparency in the market for sustainable investment products, to prevent greenwashing and to increase transparency around sustainability claims made by financial market participants.

Systematic risk refers to factors that can negatively impact broad asset classes (such as macroeconomic factors).

TCFD stands for the Task Force on Climate-related Financial Disclosures, which develops voluntary, consistent climate-related financial risk disclosures for use by companies.

UN stands for United Nations and is an international non-profit organisation to increase political and economic cooperation among its member countries.

United Nations Environment Programme Finance Initiative (UNEP FI) catalyses action across the financial system to align economies with sustainable development. UNEP FI brings the UN together with banks, insurers and investors globally to shape the sustainable finance agenda.

UNGC stands for the United Nation Global Compact, which is a non-binding UN pact to encourage businesses worldwide to adopt sustainable and socially responsible policies.

UNPRI stands for UN Principles for Responsible Investment. It is an UN-supported international network of investors working on responsible investment principles.

USD is the currency code for the U.S. Dollar.

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Important information (1/5)

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