Morgan Stanley

INSTITUTE FOR SUSTAINABLE INVESTING

Analyzing Portfolio Dependencies and Impacts on Nature with Morgan Stanley's Biodiversity IQ Tool

Summary

Biodiversity is a new topic for many investors, and its complexity can make it hard to know where to begin. But our analysis of ten major global equity indices suggests that around a quarter of companies have some exposure to the theme, potentially making it relevant for investors in public markets. Around 20% flag for biodiversity risk, whether from fossil fuels or other topics like deforestation or pollution, and just under 10% offer exposure to potential solutions. Many companies appear on both lists, including in sectors where sustainable funds invest at or above the rate of traditional funds. Looking ahead, forthcoming regulations and voluntary commitments are likely to drive increased corporate disclosure on biodiversity issues, which we believe should help investors develop a more robust understanding of the topic.

Morgan Stanley's proprietary Biodiversity IQ tool draws on multiple open-source and commercial datasets to analyze portfolio dependencies and exposure to nature at the industry, company and asset levels. Sector screening can be a useful starting point for investors to know where to focus their attention, with the option to add more detailed insights on factors like commodity exposure or asset locations in relation to sensitive areas. The analysis in this report focuses on listed equities, but Biodiversity IQ can be applied to a range of portfolios including both public and private investments.

Some aspects of analyzing a company's impact on biodiversity are likely to remain challenging for investors, including lack of a single metric, difficulties assessing exposure in value chains and the additional complexities of analyzing location-specific data. But over time, several new regulations as well as voluntary commitments are likely to increase the quantity, quality and type of corporate disclosure on biodiversity topics.

SUMMARY

~25%

of companies have some connection to biodiversity risks or opportunities

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For any questions related to the report, please reach out to the Institute for Sustainable Investing team at **globalsustainability@morganstanley.com**.

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Key Takeaways

We used Morgan Stanley's Biodiveristy IQ tool to analyze nature impact, dependency and opportunities in ten major global indices.

1 Biodiversity risks have broad relevance across geographies.

Across the ten indices, which include North and South America, Europe, Japan and APAC ex Japan, an average of 20% of constituents by weight are exposed to biodiversity risks. Half of these are linked to fossil fuel exposure (climate change is a driver of biodiversity loss, and fossil fuel extraction can have other impacts on nature), while the remaining half reflect other biodiversity issues such as pollution and water usage.

2 Biodiversity revenue risks are lower in broad ESG indices, but still remain.

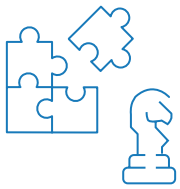
In developed markets, almost 16% of the MSCI World ESG Leaders benchmark screens for revenue with biodiversity risks, compared to nearly 19% of the MSCI World. Similarly, in emerging markets, the Low Carbon SRI Leaders benchmark is slightly less exposed to revenue risk at 11.4% versus 16.3% for MSCI Emerging Markets. This suggests that ESG index construction may leave investors exposed to biodiversity risk even if other ESG risks are reduced.

3 Sector screening can inform further work.

All GICS® sectors have companies with some degree of risk. However, Consumer Staples, Consumer Discretionary, Energy, Materials and Industrials together account for more than 80% of the index weight flagged for revenue risk in the MSCI ACWI. Many of the differences in biodiversity exposure across geographies are driven by sector exposure, implying this is a clear starting point. Biodiversity IQ can help to identify the key issues for each sector and inform further work.

4 Tailored insights can address specific investor needs.

Biodiversity IQ helps investors in a range of different ways. For example, geospatial analysis can help explore the impact of mining operations in sensitive areas, while commodity exposure data highlights risks in sectors like Consumer Staples and Discretionary.



5 Solutions can sit alongside risk.

Between 4%-16% of each index analyzed is exposed to biodiversity solutions, including certification schemes for agricultural products, recycling or waste treatment. Over 90% of opportunities identified within the MSCI ACWI sit within Consumer Staples, Consumer Discretionary, Materials and Industrials. More than half of these companies are also flagged for risk to nature, demonstrating that solutions can sit alongside risks.

Connecting Biodiversity and Corporate Activity

72% of corporates surveyed by the Morgan Stanley Institute for Sustainable Investing expect biodiversity loss to pose a risk to their business model by 2030.[1] In anticipation of this, we believe investors are likely to start considering how their portfolio companies interact with the natural world beyond just greenhouse gas emissions. This may mean considering a company's dependencies on nature, or the environmental assets and ecosystem services that an organization relies on to function. Alternatively, investors may need to analyze whether a company's actions may result in positive or negative changes to nature's ability to provide social and economic functions.

At the UN Biodiversity Conference (COP 15) in December 2022, close to 200 governments adopted The Kunming-Montreal Global Biodiversity Framework, which seeks to address five direct drivers of biodiversity loss related to human activity. These five drivers, as identified by IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services), can be directly linked with specific corporate activities.

As a starting point for exploring how corporate activities are connected to biodiversity, the ENCORE[2] database is an open source nature risk tool which identifies a set of commercial activities with impact or dependency on nature.[3] Figure 1 shows each of the five drivers, with some examples of ecosystem services and industries which have dependencies or negative impacts on nature. Examples of both dependency and negative impact are taken from the ENCORE database. All the example activities selected have "very high" dependency or impact as defined by ENCORE,[4] other than the biological control example, which is "high."

"Understanding the connections between corporate activities and biodiversity loss is an increasingly important lens for investors and builds on the practice of integrating climate considerations into investment portfolios. Forward-thinking investors will need a shift in mindset to consider complex supply chains and other nature-related impacts and dependencies that may not be easily quantifiable or comparable in the near term."

COURTNEY A. THOMPSON
Managing Director, Head of Sustainable Products and Solutions
Morgan Stanley

TERMINOLOGY

Biodiversity, nature or natural capital? *Nature* refers to living and non-living components of the atmosphere, land, ocean and freshwater, while *biodiversity* is the variability of the living components. That variability supports nature's resilience, which is a key reason that *biodiversity loss* is of concern. *Natural capital* is the stock of natural resources that yield benefits to people, known as *ecosystem services*. Nature and climate are inherently interlinked: climate change is among the main drivers of biodiversity loss, while nature is essential to mitigating the impacts of climate change. In practice, the three terms are often used interchangeably by investors.

Dependencies and impacts: The Taskforce on Nature-related Financial Disclosures (TNFD) defines *dependencies* as "aspects of environmental assets and ecosystem services that… an organization relies on to function." *Impacts*, which may be positive or negative, are the result of an organization's actions that "may result in changes to the capacity of nature to provide social and economic functions."[5] In practice, there is a lot of overlap between companies with high nature dependency and high impact on nature, and both can be considered risks from a portfolio perspective as regulation and/or litigation could require high-impact companies to change their business practices, even if they are not dependent on nature.

1 Sustainable Signals Understanding Corporates' Sustainability Priorities and Challenges, May 2024

2 ENCORE (Exploring Natural Capital Opportunities, Risks and Exposure) is an open source nature risk tool connecting economic activity to nature.

3 The work to map the ISIC classification system of productive activities, used by ENCORE, to the GICS® framework (at the sub-industry level) was done by Morgan Stanley based on prior mapping provided by ENCORE as well as some internal assumptions.

4 "Very high" dependency means the economic activity could experience both a severe loss of function and severe financial cost if the ecosystem service was disrupted; "Very high" impact—called "pressure" in ENCORE—means that the activity exerts a high magnitude of pressure on an aspect of nature, and has medium or high financial output."

5 Recommendations of the Taskforce on Nature-related Financial Disclosures, September 2023

FIGURE 1

Connecting biodiversity loss with corporate activity

Impact Examples	IMPACTS	5 DIRECT DRIVERS OF BIODIVERSITY LOSS	DEPENDENCIES	Dependencies Examples
Logging, silviculture (commercial forestry) and raising of cattle all require large areas and can contribute to degradation of nearby lands. SECTORS EXPOSED **Forest Products** *(Materials)*; **Agricultural Products** *(Consumer Staples)*	Area of Land Use	Land, Fresh Water, Sea Use Change	Pollination	Fiber crops (e.g., cotton) and many perennial crops (e.g., fruit) rely on insects like hoverflies, bees and moths to pollinate for higher yield and quality. Pollinators are under pressure from land use change such as deforestation. SECTOR EXPOSED **Agricultural Products** *(Consumer Staples)*
Farming shrimp larvae results in 4x–7x higher mortality rates for other organisms trapped in the nets of fish farms. SECTOR EXPOSED **Agricultural Products** *(Consumer Staples)*	Fishing	Overexploitation of Resources	Wild Plants Used for Feedstock	Aquaculture depends on the growth of animals and plants (e.g., fish, shellfish, seaweed) in natural ecosystems to serve as feedstock for animals harvested in aquaculture. SECTOR EXPOSED **Agricultural Products** *(Consumer Staples)*
Fossil fuel energy production, steam and air conditioning supply, mining of hard coal and lignite can all release large volumes of GHG. SECTORS EXPOSED **Independent Power Producers** *(Energy)*; **Water Utilities** *(Utilities)*; **Coal & Consumable Fuels** *(Energy)*	GHG Emissions	Climate Change	Global Climate Regulation	Food and fiber crops rely on climate regulation to maintain appropriate growing conditions; wind and solar energy generation depend on a relatively steady climate. Both crops and energy are vulnerable to major climate events. SECTORS EXPOSED **Agricultural Products** *(Consumer Staples)*; **Renewable Electricity** *(Utilities)*
Improper waste disposal and accidental spread of seeds and plants can bring invasive species. Herbicides, pesticides and fertilizer as well as irrigation can impact the ability of surrounding ecosystems to control the spread of invasive species. SECTOR EXPOSED **Agricultural Products** *(Consumer Staples)*	Introduction of Invasive Species	Invasive Species	Biological Control	Growing a variety of crops as well as silviculture and logging relies on insects, birds and small mammals to destroy pests like aphids. SECTORS EXPOSED **Agricultural Products** *(Consumer Staples)*; **Forest Products** *(Materials)*
Chemical discharge, improper waste disposal and landfill practices can contaminate soil and water with toxic substances. SECTORS EXPOSED **Precious Metals & Minerals, Commodity/Special Chemicals, Industrial Gases** *(Materials)* Exhaust fumes, drilling fluids, drill cuttings and accidental spillages can drastically contaminate water and kill coastal and freshwater plants. SECTOR EXPOSED **Integrated Oil & Gas, Oil & Gas Exploration & Production** *(Energy)* Mines can leach toxic pollutants that contain high concentrations of heavy metals and other toxic chemicals. SECTORS EXPOSED **Gold, Silver, Diversified Metals & Mining** *(Materials)*; **Coal & Consumable Fuels** *(Energy)*	Emissions of Toxic Soil and Water Pollutants	Pollution	Water Purification	Many products require clean water, purified by ecosystems. SECTORS EXPOSED **Integrated Oil & Gas, Oil & Gas Exploration & Production, Coal and Consumable Fuels** *(Energy)*; **Life Sciences, Pharmaceuticals** *(Health Care)*; **Packaged Food & Meats** *(Consumer Staples)* Some accommodation and food service uses water from the ground or lakes/rivers for cleaning/maintenance, depending on purification by ecosystems. SECTOR EXPOSED **Restaurants, Hotels, Resorts & Cruise Lines** *(Consumer Discretionary)*

Source: TNFD, ENCORE, Morgan Stanley Biodiversity IQ.

What Investors Can Learn from Climate Analysis

Applying lessons from climate analysis provides a helpful roadmap for investors considering biodiversity. However, because biodiversity is broader, more complex and inherently harder to quantify or forecast, there are additional considerations for investors.

"We understand the attraction to investors of being able to assign a single value to a complex issue like biodiversity, as is the case for climate with carbon emissions data. Ultimately, we don't think a single footprinting measure can capture everything for biodiversity and still be decision-useful for investors, and would think of sector, company and asset level data as a starting point for assessing risk(s) and engaging with portfolio companies."

ANDREW FORD
Executive Director, Head of Sustainable Insights Lab
Morgan Stanley

FIGURE 2

Applying lessons from climate analysis to biodiversity

Source: Biodiversity IQ, Sustainable Insights Lab, Morgan Stanley, January 2025.

Using Biodiversity IQ to Analyze Risks and Opportunities in Major Global Indices

To explore how biodiversity risks and opportunities are embedded in public equity markets, we used the Morgan Stanley Biodiversity IQ tool to analyze the constituents of ten indices representing global developed markets, emerging markets, ESG-specific products and major regions. Our index analysis looked at how companies are dependent on nature; revenues from activities that have a negative impact on biodiversity; and revenue from activities that help biodiversity. In addition, we analyzed company asset locations in sensitive geographic areas.

The Morgan Stanley Biodiversity IQ Approach

A survey of 900 global institutional investors by the Morgan Stanley Institute for Sustainable Investing finds that 88% and 79% want to better understand companies' impacts and dependencies on nature, respectively.[6]

Morgan Stanley's proprietary Biodiversity IQ tool draws on multiple open-source and commercial data sets including the Integrated Biodiversity Assessment Tool (IBAT), ENCORE, and Stanford's Natural Capital Project, as well as third-party ESG data sets that can be applied to biodiversity analysis.

Biodiversity IQ is typically used by institutional investors and offers a range of options that can be tailored for breadth and depth. It is generally applied to publicly listed companies, but certain components can be tailored for privately held assets as well.

"From a data perspective, there are two aspects about biodiversity that make it particularly challenging. First, it is inherently location-based, which means ideally analyzing individual assets for a company to fully examine their impacts. Even then, an asset's proximity to a key biodiversity area may not automatically mean an adverse impact. Second, assessing a company or portfolio's risk from biodiversity dependencies needs to look at the full value chain, not just direct operations; however, accurate supply chain data is very hard to come by.

There are ways to manage both of these issues, but it's important to highlight that this is more structural than just a temporary lack of disclosure. Public market investors are more likely to face these challenges than private investors who may have more information at their disposal."

ANDREW FORD
Executive Director, Head of Sustainable Insights Lab
Morgan Stanley

FIGURE 3

Biodiversity IQ offers a range of options which can be tailored for breadth and depth

*Not explicitly covered in Biodiversity IQ, other than where revenue screening may capture value chain data. Some organizations have used the EXIOBASE model of country-level trade flows as an overlay for the ENCORE data on industry processes to analyze nature dependency reflecting the full value chain at the industry level. This is the basis for the World Economic Forum's 2020 estimate that more than half of the world's GDP is dependent on nature.[7] For company-specific assessments, identifying particular companies up and down the value chain can be a challenge for investors and a potential focus for engagement efforts.

[6] Sustainable Signals Institutional Investors, December 2024

[7] Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy, WEF with PWC, January 2020

Analyzing Biodiversity Risks and Opportunities in Major Global Indices

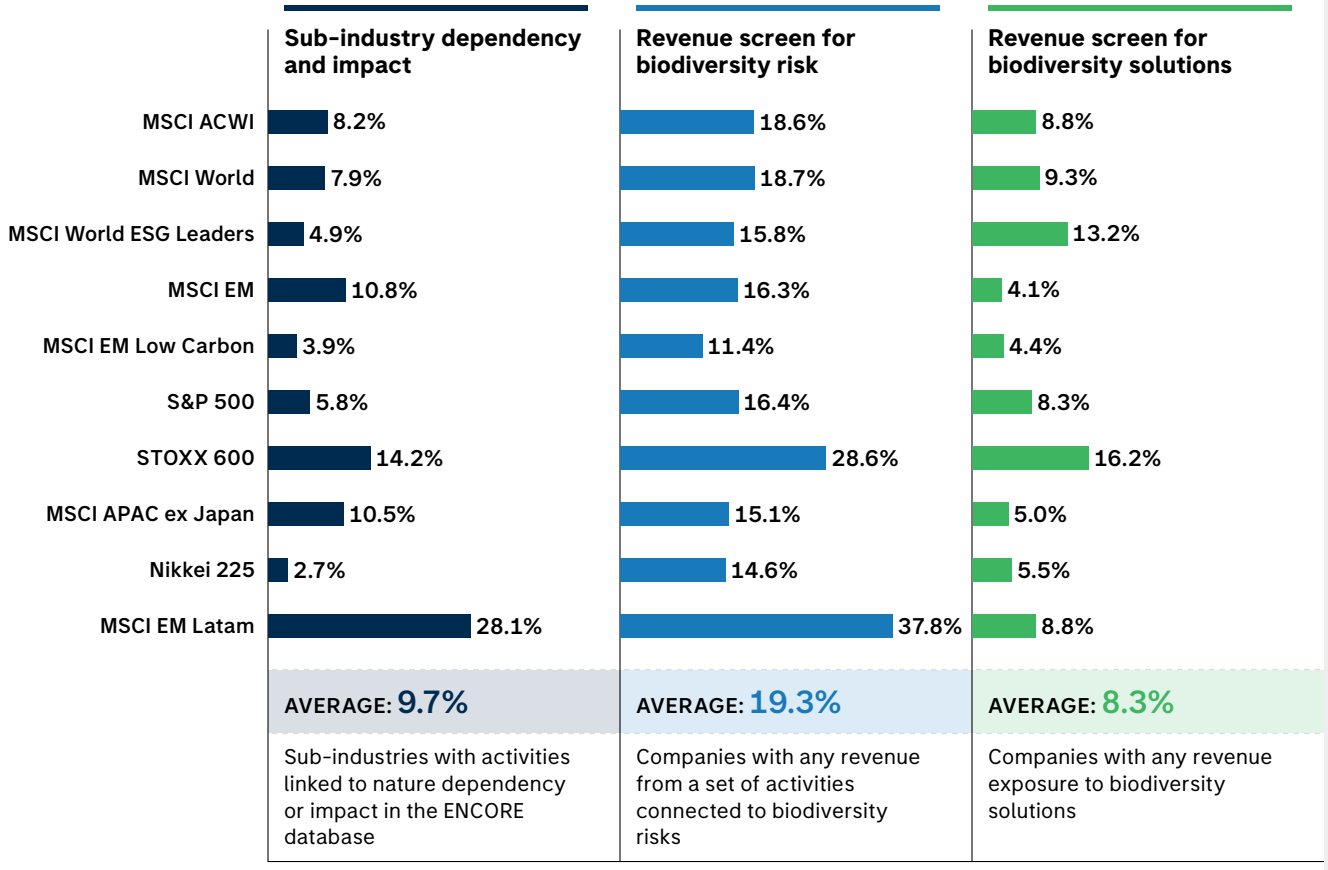
1 Biodiversity Risks Have Broad Relevance Across Geographies

The main driver of variation across these ten indices is the difference in sector exposure. For example, the highest rate of revenue screening for risk is in LATAM, which is driven by exposure to Consumer Staples, Energy and Materials which are respectively 2x, 3x and 4x the weight in the MSCI ACWI.

FIGURE 4

Impact and dependency, risk and opportunity by index weight

The ten major global indices analyzed have around 10% of their weight flagged for dependency/impact at the sub-industry level, around 20% captured by revenue screens for biodiversity risk, and around 8% in companies offering exposure to biodiversity solutions. For a detailed methodology, please see page 18 in the Appendix.



Source: Biodiversity IQ, Sustainable Insights Lab, Morgan Stanley, January 2025.

2 Biodiversity Revenue Risks Are Lower in ESG Indices, But Still Remain

ESG INDICES MODESTLY REDUCE, BUT DON'T ELIMINATE, EXPOSURE TO BIODIVERSITY RISK

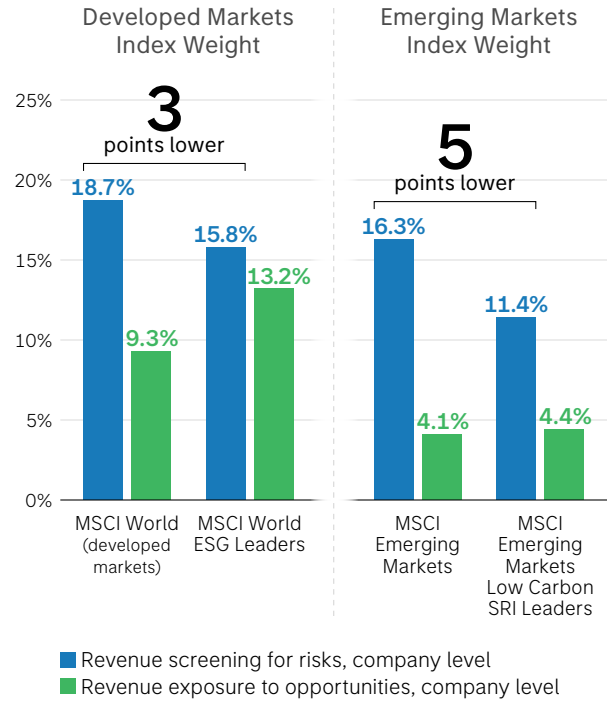
Biodiversity risk in ESG indices is not markedly lower than other global indices, as shown in Figure 5. ESG indices reduce biodiversity risk by only three percentage points in developed markets and by five percentage points in emerging markets, compared with their reference indices. Lower exposure to certain sectors, particularly Energy, helps reduce this risk, as does as an element of stock selection. Energy makes up 2.4% of the MSCI World ESG Leaders index, compared to 3.8% of the MSCI World; MSCI Emerging Markets Low Carbon has zero energy exposure compared to 4.7% of MSCI Emerging Markets.

CLIMATE RISK IS PART OF BIODIVERSITY RISK, BUT THERE ARE WIDER ISSUES TO CONSIDER

There are three ways in which companies can be flagged for revenue risk in Biodiversity IQ. First, climate change is one of the five direct drivers of biodiversity loss, meaning that a company with high greenhouse gas emissions also has a negative impact on biodiversity. Second, companies without high emissions may still have a negative impact from other biodiversity issues, such as pollution from pesticides. Third, many fossil-fuel related activities also have a broader impact on nature. For example, the dependency and impact assessment for the Coal and Consumable Fuels sub-industry finds high impact on freshwater use, seabed use and toxic soil and water pollutants, as well as greenhouse gas emissions. Figure 6 shows how this breaks down for companies in the MSCI ACWI, with revenue risks from greenhouse gas emissions[8] at 5.1%, those from other activities harming ecosystems[9] at 10.4%, and companies identified for both at 3.2%.

FIGURE 5

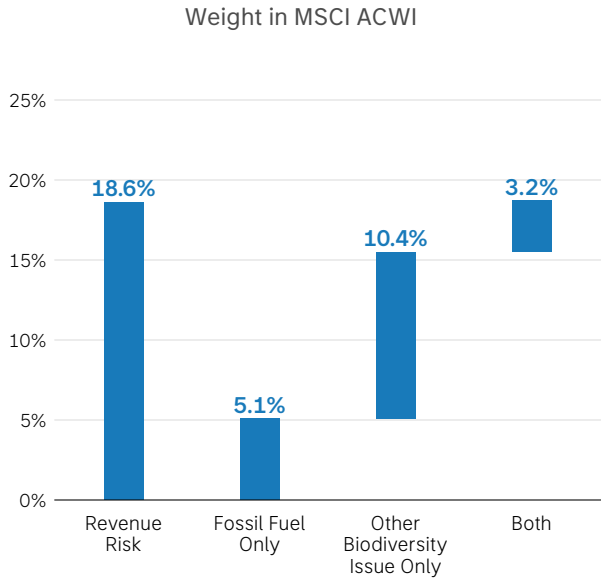
Broad ESG indices vs. benchmarks



Source: Biodiversity IQ, Sustainable Insights Lab, Morgan Stanley, January 2025.

FIGURE 6

Revenue risk



Source: Biodiversity IQ, Sustainable Insights Lab, Morgan Stanley, January 2025. Numbers may not add due to rounding.

[8] ISS revenue flags for arctic drilling, coal mining, hydraulic fracking or oil sands.

[9] ISS revenue flags for palm oil, tobacco, pesticides, genetically modified organisms.

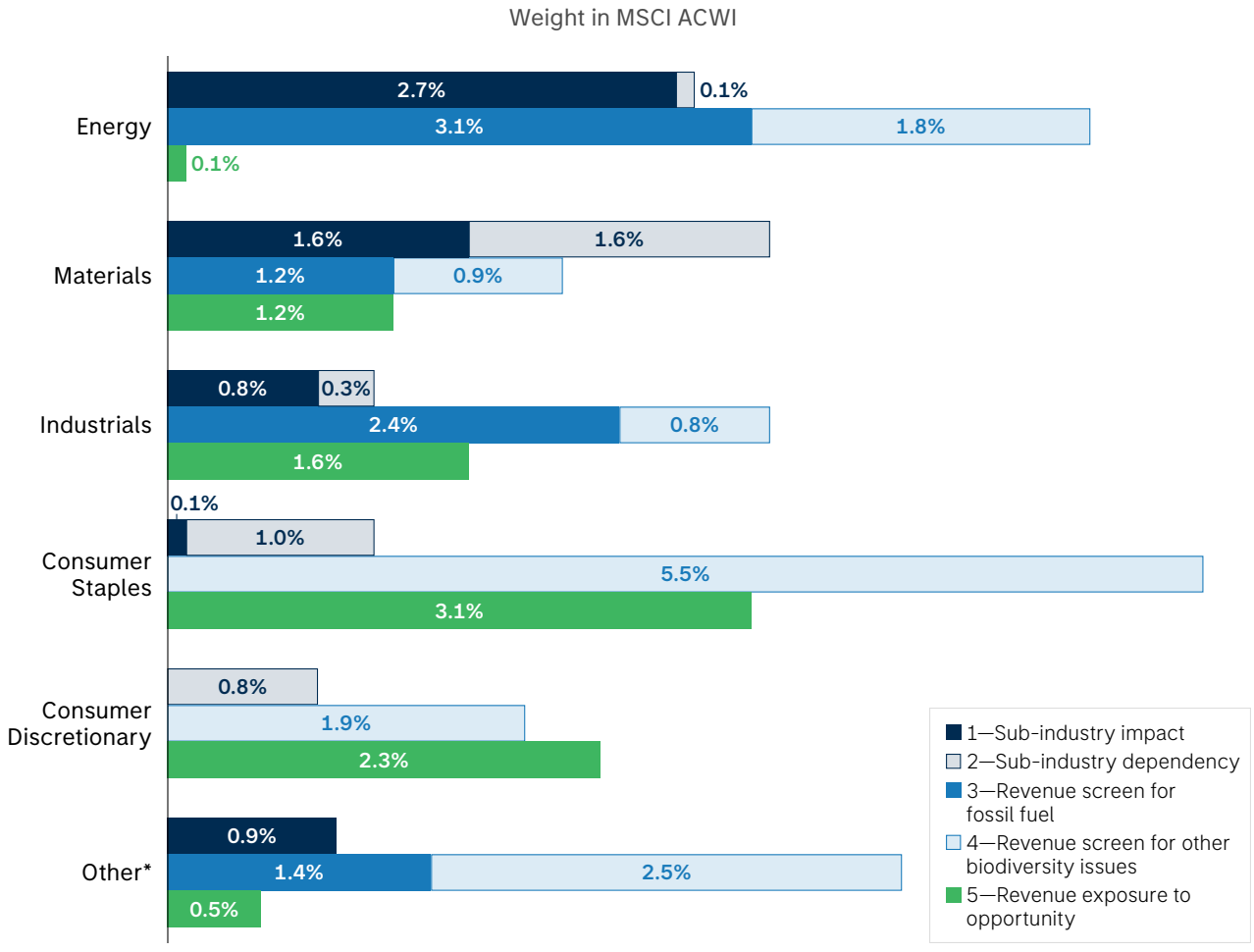
3 Sector Screening Can Inform Further Work

Companies from all eleven GICS® sectors were identified in our revenue screens for biodiversity-related risks and opportunities. However, most are concentrated in five sectors: Energy, Materials, Industrials, Consumer Staples and Consumer Discretionary, which account for more than 80% of companies by index weight in the MSCI ACWI flagged for risk. For opportunities, more than 90% of companies by index weight sit in Materials, Industrials, Consumer Staples and Consumer Discretionary. Biodiversity IQ can help to identify key issues by sector, as laid out in the table on page 11, which could be used to inform further work.

FIGURE 7

Identifying key biodiversity issues by sector

The chart shows the index weight of companies by sector that are captured in each category, e.g., within Consumer Staples, companies making up just under 6% of the MSCI ACWI have flags for non-fossil fuel biodiversity issues.



Source: Biodiversity IQ, Sustainable Insights Lab, Morgan Stanley, January 2025.

*Other sectors not shown are Financials, Real Estate, Information Technology, Communication Services, Utilities and Health Care. The chart distinguishes between biodiversity risk related to fossil fuels and those related to other issues such as pollution or land use.

FIGURE 8

Key Biodiversity Issues by GICS Sector

Companies making up >50% of the sector are flagged for revenue risk
Companies making up <10% of the sector are flagged for revenue risk

>50% flagged for revenue opportunities
<10% flagged for revenue opportunities

GICS SECTOR	SUB-INDUSTRY DEPENDENCY AND IMPACT ASSESSMENT		REVENUE SCREEN		REVENUE EXPOSURE
	1 Examples of High Impact	2 Examples of High Dependency	3 Fossil Fuel-related Biodiversity Issues	4 Other Biodiversity Issues	5 Opportunities
Energy	Pollution, water and land use, as well as GHG emissions, across coal, oil and gas	Water supply, water purification, flood control and climate regulation are all important for coal, oil and gas	**Most companies have revenue exposure to the points identified at the sub-industry level**		*Small exposure to biofuels based on waste or innovation in textiles*
Consumer Staples	Agricultural products—crops, livestock, tobacco—have high impact across most natural capital assets especially land use, pollution and water use	Very broad dependence in agriculture across water, land and climate	**Most companies have revenue exposure to the points identified at the sub-industry level, particularly in Packaged Foods & Meats, Food Retail, Personal Care Products, Tobacco, Household Products sub-industries**		**Products or inputs meeting certification standards, and/or company sustainability policy, across food, forestry, textiles, palm oil, other ingredients**
Materials	GHG emissions, pollution, water and land use impact across construction materials, gold, steel, metals & mining, fertilizer and agricultural chemicals	Water flow, supply and purification are important for gold, silver, steel, other metals & mining and construction materials	**Around half of companies have revenue exposure to the points identified at the sub-industry level**		Chemicals: Biological crop protection/yield enhancers; sustainable palm oil certification Paper: certified sustainable forestry
Consumer Discretionary	[Agricultural products sit in Consumer Staples but include crops like cotton which are inputs for Consumer Discretionary]	Hotels, resorts and cruise lines depend on water purification, flood control and climate	*Small fossil fuel exposure in autos*	Retail—tobacco, palm oil exposure Clothing/luxury—fiber crops like cotton have high impact and dependency; palm oil, pulp/paper and leather can have land use impact	Products or inputs certified sustainable, and/or company sustainability policy, in forestry, textiles and palm oil Use of recycled textiles Second-hand products
Industrials	High impact from waste, noise and light pollution and water usage in construction and engineering	Environmental and facilities services—waste and water purification Marine transportation depends on water supply and flood mitigation	Fossil fuel exposure in conglomerates, distribution, machinery and electricals	Conglomerate subsidiaries exposure to palm oil, GMO Tobacco sales in airlines and airport services	Recycling or waste water treatment equipment; products with reusability focus; additive manufacturing Trading: sustainable forestry Conglomerates: palm oil
Utilities	GHG emissions, air pollution, water use are high for water utilities, multi-utilities, independent power producers and renewable electricity	Renewable electricity depends on climate regulation, water supply	Fossil fuel exposure across around two thirds of sector	Small exposure to palm oil production	Water and waste water services, recycling
Financials*			*Asset managers and diversified banks may have some fossil fuel revenue exposure*	*Asset managers and diversified banks may have some palm oil or tobacco exposure*	*Financing sustainable palm oil, wastewater treatment facilities/services, investments in wastewater treatment plants*
Real Estate	Pollution and solid waste generation in real estate development can have high impact	Water dependency is low overall but can be high in specific locations	*Small fossil fuel exposure in real estate development*	*Palm oil, tobacco, beef exposure via retail developments*	*Small exposure to sustainable timber/waste water treatment plants*
Information Technology			*Small fossil fuel exposure in Electronic Equipment & Instruments*		*Small exposure to additive manufacturing, components for wastewater treatment*
Communication Services				*Small exposure to tobacco*	*Paper from sustainable forestry*
Health Care		Pharmaceuticals and life sciences depend on ecosystems to purify water		*Small exposure to palm oil*	*Biological crop protection, sterilizers to reuse medical equipment*

Source: ENCORE, Biodiversity IQ, Sustainable Insights Lab, Morgan Stanley, January 2025.

*Financials: BiodiversityIQ analysis captures direct revenue exposure to risks and opportunities in financials, e.g., an asset manager which owns forestry. It does not reflect exposure to biodiversity risk/opportunity via financed activities.

4 Tailored Insights Can Address Specific Investor Needs

The following two examples illustrate how Biodiversity IQ can support investors to identify specific areas of their portfolio that may need further analysis, and how additional datasets like geospatial analysis can be applied.

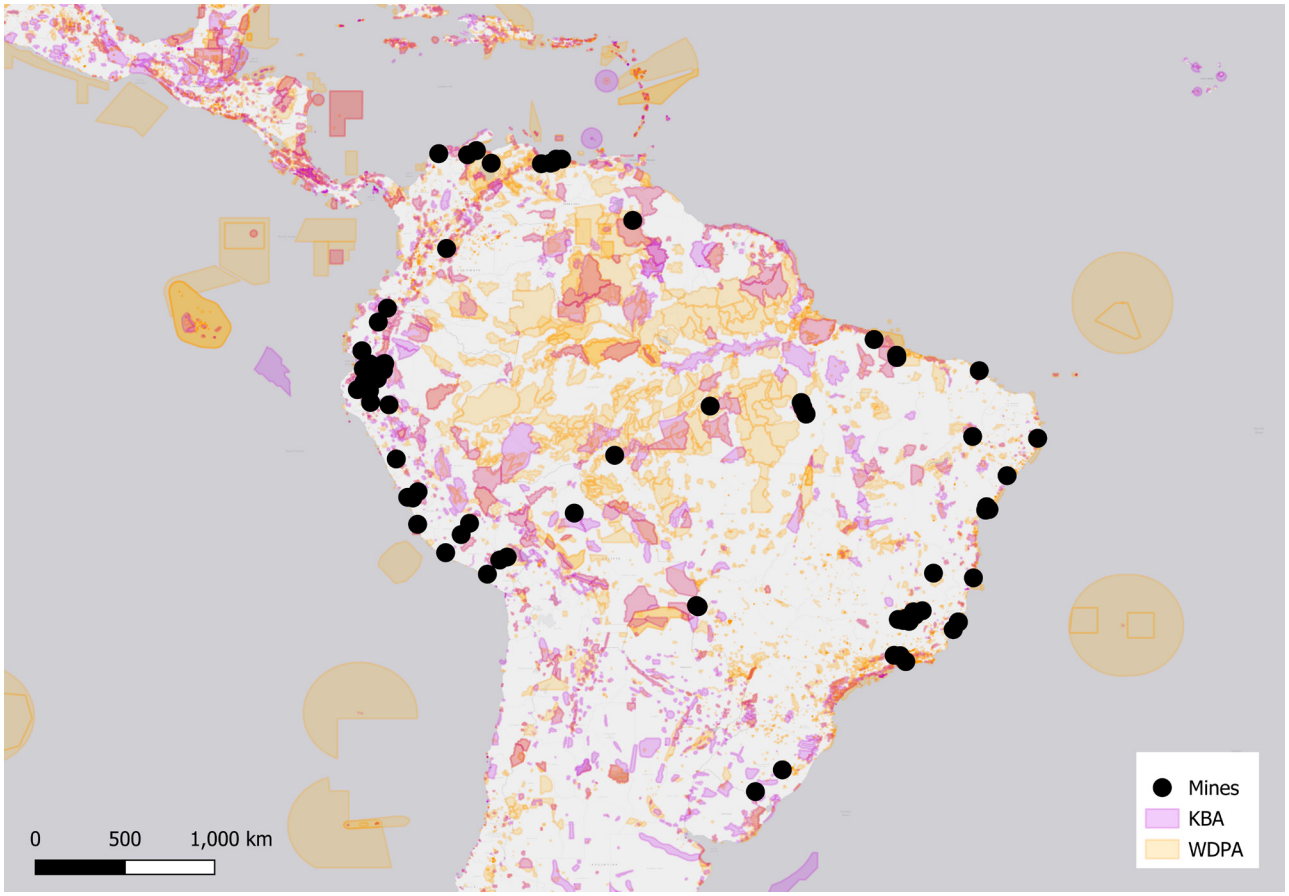
GEOSPATIAL ANALYSIS EXPLORING MATERIALS IMPACT

Location-based analysis in Biodiversity IQ provides the ability to look at how asset-level data intersects with areas that are particularly sensitive for biodiversity. When assessing the interaction between an asset and the surrounding area, it is key to consider the relevance of the type of asset and its activities to the local ecosystem. In this case, we selected mining locations in the Amazon region given the resource intensive nature of mining activities and the high number of sensitive areas for biodiversity in the Amazon. This analysis builds on other datapoints (dependency and impact assessment, revenue screening) for mining activities by providing more granular local information to capture potential impacts and dependencies.

The map includes 88 asset locations associated with mining which are within 1km of either a Key Biodiversity Area (KBA) or a World Database on Protected Areas (WDPA) location. While proximity to a sensitive area does not necessarily mean a negative impact, it could guide further analysis or engagement on topics such as pollution, water consumption and land use change.

FIGURE 9

The Amazon region includes 88 mining locations which intersect with sensitive areas for biodiversity



Source: Morgan Stanley Sustainable Insights Lab, Integrated Biodiversity Assessment Tool (IBAT), S&P Global, Global Energy Monitor, Spatial Finance Initiative.

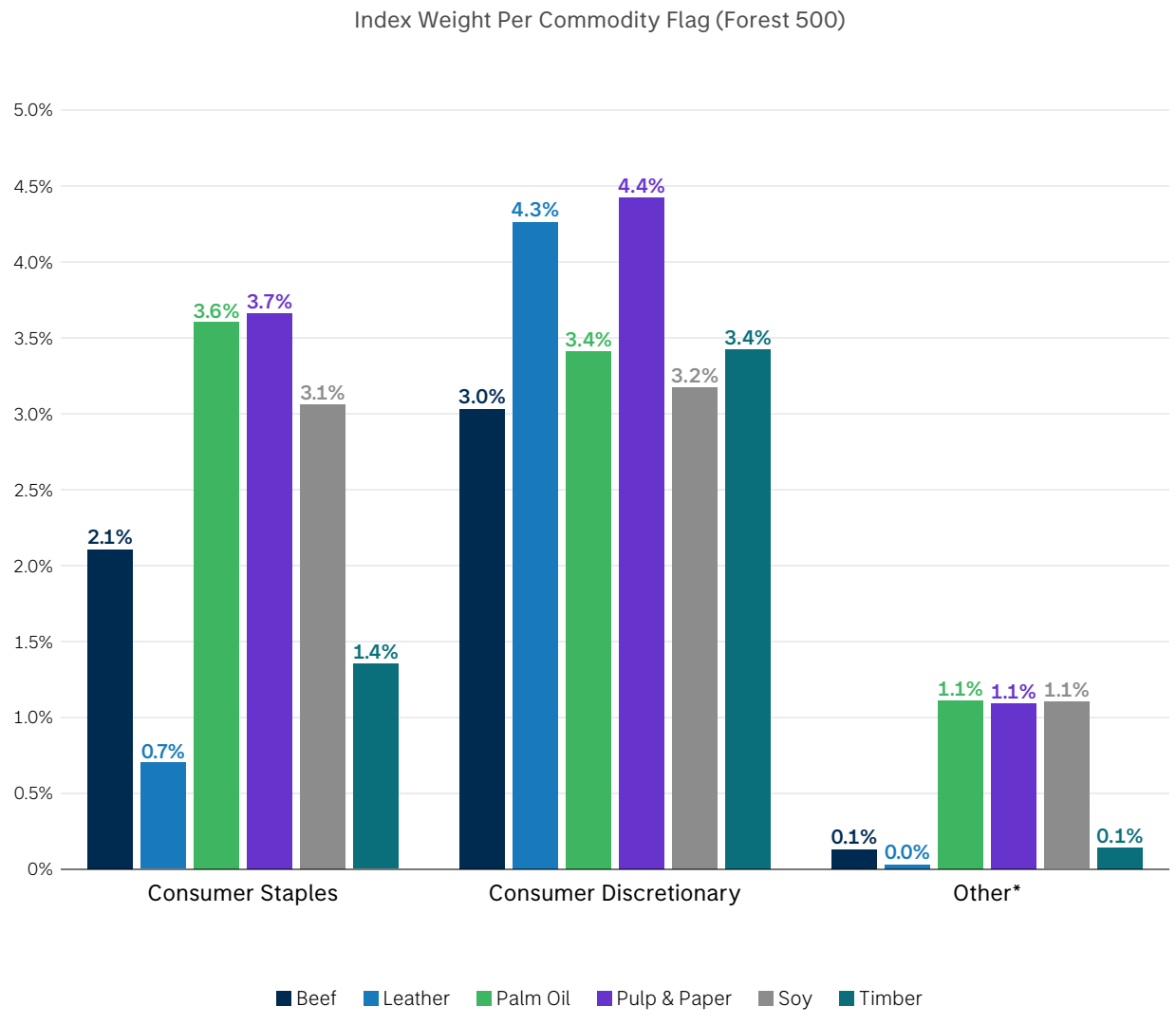
COMMODITY EXPOSURE IN CONSUMER STAPLES AND CONSUMER DISCRETIONARY

Nearly 10% of the MSCI ACWI index weight is flagged for exposure to commodities that can drive deforestation and land conversion, such as beef, leather, palm oil, pulp & sugar, soy and timber, most of which are in the Consumer Staples and Consumer Discretionary sectors. These insights can help investors prioritize areas for deeper engagement.

However, it is important to note that being flagged for commodity exposure may not be indicative of biodiversity risks. Companies can adopt certifications and standards to ensure sustainable sourcing and use of these commodities within their value chains. Approximately half of the MSCI ACWI index weight of flagged companies for commodity exposure are also members of the Roundtable on Sustainable Palm Oil (RSPO).

FIGURE 10

Commodity exposure in the MSCI ACWI



Source: Biodiversity IQ, Sustainable Insights Lab, Morgan Stanley, January 2025.
*Other: Aggregated Energy, Materials, Industrials, Financials, Real Estate, Information Technology, Utilities, Communication Services, Health Care.

5 Solutions Can Sit Alongside Risk

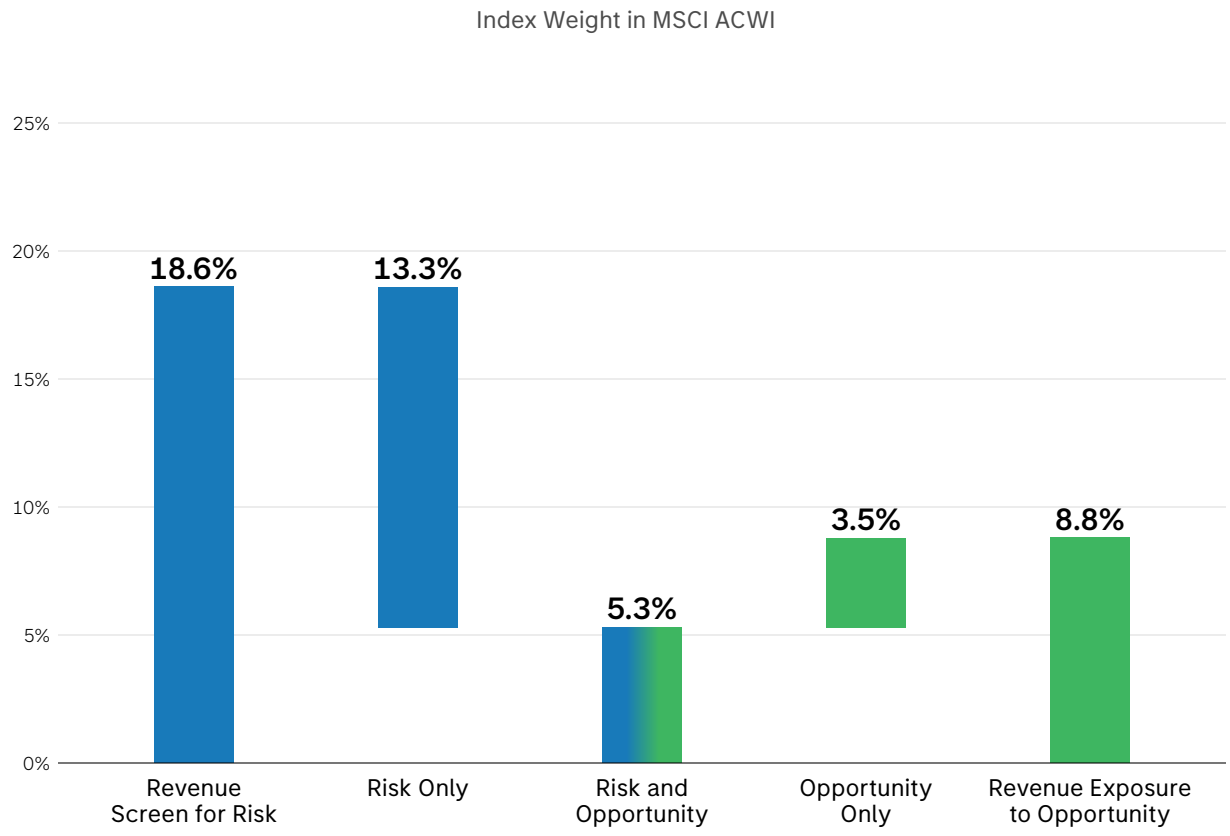
There can be significant overlap between companies generating revenues tied to risks to nature and those addressing biodiversity challenges. Within the MSCI ACWI, more than half of the companies flagged for revenue opportunities by weight also flag for revenue risks.

At the sector level, Consumer Staples has the highest index weight of companies screening for potential risks, as well as the greatest exposure to biodiversity solutions.

Companies in Consumer Discretionary, Industrials and Materials also have exposure to risks and opportunities. Energy ranks second in terms of risks but shows limited exposure to opportunities. Solutions can include the use of commodities meeting sustainable certification standards, including palm oil and forestry, as well as recycling, wastewater treatment and biological yield enhancers or crop protectors.

FIGURE 11

Many companies flagged for revenue risk also have exposure to solutions



Source: Biodiversity IQ, Sustainable Insights Lab, Morgan Stanley, January 2025.

What's Ahead

Today, Biodiversity IQ can help investors identify areas for further analysis and engagement. Even if some issues are not ultimately judged to be material, there is still value for investors in developing their understanding of this emerging topic. Over time, increased corporate disclosures on biodiversity, whether driven by regulation or voluntary commitments, should support a more robust understanding of the subject.

How Material Are the Issues Identified in Biodiversity IQ Today?

As biodiversity is a relatively new topic for investors, the data and methodologies available to analyze companies' exposure to risks and opportunities are still under development. Specifically, the datapoints for both revenue screens for risk and revenue exposure to opportunities flag companies with *any* revenue connected to the theme, even if it is small. In many cases, companies have substantial proportion of revenue exposed to biodiversity risks, but there could be some cases where an investor might conclude that biodiversity is not material for a company with only a few percentage points of its revenue generated from a commodity like palm oil, for example. However, this could still be a useful exercise, for the following reasons:

- **Developing understanding of biodiversity:** Many investors are still at the early stages of understanding biodiversity as an issue, so mapping as many potential risks and opportunities as possible can be valuable in building a full picture of the topic.
- **Double materiality:** While a company's revenues from a particular activity may be immaterial, it could still have a significant impact on nature, especially in a local area. Taking the hypothetical palm oil example, switching to a certified sustainable source could have a positive impact on nature with little impact on the company's financials.
- **Identifying specific companies:** Biodiversity IQ extracts only those activities from the ENCORE database that are already identified as significant for nature or the wider economy, so materiality is well covered by the sub-industry impact/dependency assessment. However, this step does not consider the broader value chain or identify individual companies, which the revenue screening step does.

"It's important to remember that the first global biodiversity targets were only agreed at COP 15 in Montreal in December 2022, and the 2024 biodiversity COP focused on plans for delivery, so it's not surprising that biodiversity is still relatively nascent as an investment theme. We had a lot of interest in the topic in 2023, which slowed in 2024 as investors work through the complexities of measurement and quantifying financial impacts.

Most investors we speak to today on biodiversity are looking for 'solution stocks'—companies which offer exposure to products and services that can make a positive contribution. It's less common to hear from more generalist investors looking systematically at biodiversity impacts and dependencies across their portfolio. We would think of these as tail risks, hard to quantify or assign probabilities to, but worth considering in the investment process as regulation increaseson the back of country-level commitments reached during COP 15."[10]

LAURA SANCHEZ
Executive Director, Head of Sustainability Equity Research in the Americas
Morgan Stanley

[10] Morgan Stanley Research, "Sustainability: Integrating Biodiversity into Investment Frameworks," February 10, 2023. For a copy, please reach out to your Morgan Stanley representative.

New Guidance and Forthcoming Regulation Could Drive Increased Disclosure

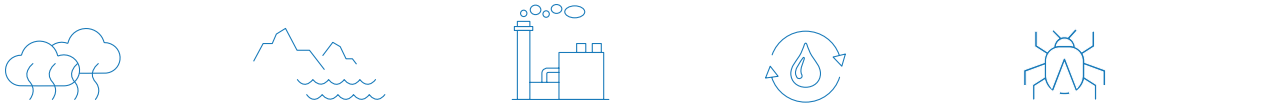
Both voluntary and mandatory corporate disclosure on sustainability issues could increase in the coming years, potentially resulting in a more detailed picture of companies' biodiversity exposure as the breadth of data captured in Biodiversity IQ increases. The Taskforce on Nature-related Financial Disclosures (TNFD) released its Final Recommendations[11] in September 2023, offering corporates guidance on voluntary disclosures. By October 2024, TNFD announced that over 500 companies and financial institutions had committed to aligning their voluntary reporting in line with these recommendations in 2024 or 2025. For financial institutions, this covers $17.7 trillion in assets under management (AUM),[12] more than one-third of global AUM.

In addition to voluntary efforts, a range of EU regulations could also require corporates to disclose or act on sustainability topics, including many relevant to biodiversity. These regulations have global relevance as some apply to companies with EU revenues over set thresholds.

- **European Union Deforestation Regulation (EUDR):** Requires companies trading certain commodities into or out of the EU to conduct diligence on their value chains to ensure that they do not originate from areas deforested since 2020 or contribute to forest degradation. Affected commodities include cocoa, coffee, soy, palm oil, cattle, natural rubber and wood.
- **Corporate Sustainability Reporting Directive (CSRD):** Being phased in between 2024 and 2028, CSRD requires audit assurance of sustainability disclosures, the introduction of a new suite of European Sustainability Reporting Standards and a double materiality assessment to consider a company's impacts on people and the environment as well as the impact of ESG matters on the company. Depending on the company's business model, this may mean statements on current and anticipated financial effects of ESG matters like climate, pollution, water, biodiversity and circular economy.
- **Corporate Sustainability Due Diligence Directive (CSDDD):** Requires firms to adopt specific due diligence methods, and to prevent or end adverse environmental or human rights impacts in their operations and supply chains.

FIGURE 12

TNFD RECOMMENDED CORE METRICS



Climate Change
- GHG emissions (scope 1, 2, 3)

Land/Freshwater Use
- Total spatial footprint
- Extent of land, freshwater, ocean-use change

Pollution Removal
- Pollutants released to soil
- Waste generation and disposal
- Plastic pollution

Resource Use
- Water withdrawal and consumption from areas of water scarcity

Invasive Species
- Measures against unintentional introduction of invasive alien species

Source: TNFD Final Recommendations

[11] Taskforce on Nature-related Financial Disclosures, Final Recommendations, September 2023 Disclosure recommendations—TNFD

[12] TNFD press release, 25 October 2024 Over 500 organisations and $17.7 trillion AUM now committed to TNFD-aligned risk management and corporate reporting

[13] Morgan Stanley Research, "Supplying Sustainably: EU Rules With Far-Reaching Impacts," 25 October 2024 and "European Regulation: The Road Ahead," 7 January 2025. For a copy, please reach out to your Morgan Stanley representative.

Appendix

Table of Indices Used and Headline Results

FIGURE 13

List of indices used

NAME	DESCRIPTION	NUMBER OF HOLDINGS	DEPENDENCY/IMPACT Index weight flagged for dependency/ impact assessment, sub-industry level	RISK Index weight flagged for risk to nature, company level	OPPORTUNITY Index weight flagged for opportunity, company level
MSCI All Country World	Broad global index	2648	**8.2%**	**18.6%**	**8.8%**
MSCI World	Global developed markets index	1395	**7.9%**	**18.7%**	**9.3%**
MSCI World ESG Leaders	Selection from MSCI World on ESG criteria	694	**4.9%**	**15.8%**	**13.2%**
MSCI Emerging Markets	Global emerging markets index	1253	**10.8%**	**16.3%**	**4.1%**
MSCI Emerging Markets Low Carbon SRI Leaders	Selection from MSCI Emerging Markets on ESG criteria	333	**3.9%**	**11.4%**	**4.4%**
S&P 500	Broad U.S. index	503	**5.8%**	**16.4%**	**8.3%**
STOXX 600	Broad Europe index	600	**14.2%**	**28.6%**	**16.2%**
MSCI APAC ex Japan	Broad Asia Pacific index	1113	**10.5%**	**15.1%**	**5.0%**
Nikkei 225	Broad Japan index	225	**2.7%**	**14.6%**	**5.5%**
MSCI Emerging Markets Latin America	Broad Latin America index	89	**28.1%**	**37.8%**	**8.8%**

Source: Biodiversity IQ, Sustainable Insights Lab, Morgan Stanley, January 2025.

Index Analysis Methodology

To explore how biodiversity impacts and dependencies are embedded in equity markets, we selected ten indices representing global developed markets, emerging markets, ESG-specific products and the major regions. We then used the Biodiversity IQ tool to analyze the constituent companies for each index, taking the following datapoints.[14]

Sub-industry dependency and impact assessment	Percent of the index weight, *at the GICS® [15] sub-industry level*, with potential dependencies across 14 ecosystem services and potential impacts on nature across 10 natural capital assets to identify tail risk in the portfolio. This is based on the ENCORE database aggregated by Morgan Stanley at the GICS® sub-industry level and only covers the company's own operations, not the wider value chain. In Biodiversity IQ, sub-industries are flagged as high impact or high dependency if they have more than four "high" or "very high" impact/dependency scores, which was based on the distribution. This step is comparable to the SASB materiality map[16] approach, which highlights which sustainability issues are most relevant across a range of industries.
Revenue screening for risk to nature	Percent of the index weight, *at the company level*, that assesses companies' involvement in sectors, products and/or activities which may have a negative impact on biodiversity. Companies are flagged if they derive any revenue from a specific set of activities, as assessed by ISS ESG, which we have split into fossil fuel-related activities and other activities with biodiversity implications.[17]
Revenue exposure to opportunities addressing biodiversity challenges	Percent of the index weight, *at the company level*, where a company derives revenues from products or services tied to mitigating biodiversity challenges across several thematic areas. Companies are flagged if they derive any revenue from a specific set of products and services.
Asset-level analysis	Asset-level analysis of company locations using maps of sensitive areas, with location data drawn from third-party datasets where available, or provided by investors. Asset-level analysis is only included in the Materials example on page 12 because it does not lend itself to high-level conclusions across indices with a large number of components.

[14] A full Biodiversity IQ analysis includes additional asset-level data and controversy screening.

[15] GICS® (Global Industry Certification Standard) is an industry analysis framework. More detail can be found here: GICS®—Global Industry Classification Standard—MSCI

[16] The Sustainability Accounting Standards Board is now part of the International Financial Reporting Standards (IFRS) Foundation. The materiality map can be found here: Exploring materiality—SASB

[17] Fossil fuel-related activities: Arctic drilling, coal mining, hydraulic fracking, oil sands. Other activities with biodiversity implications: palm oil, tobacco, pesticides, genetically modified organisms.

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ESG investments may also be referred to as sustainable investments, impact aware investments, socially responsible investments or diversity, equity, and inclusion ("DEI") investments. It is important to understand there are inconsistent ESG definitions and criteria within the industry, as well as multiple ESG ratings providers that provide ESG ratings of the same subject companies and/or securities that vary among the providers. This is due to a current lack of consistent global reporting and auditing standards as well as differences in definitions, methodologies, processes, data sources and subjectivity among ESG rating providers when determining a rating. Certain issuers of investments including, but not limited to, separately managed accounts (SMAs), mutual funds and exchange traded-funds (ETFs) may have differing and inconsistent views concerning ESG criteria where the ESG claims made in offering documents or other literature may overstate ESG impact. Further, socially responsible norms vary by region, and an issuer's ESG practices or Morgan Stanley's assessment of an issuer's ESG practices can change over time.

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The appropriateness of a particular ESG investment or strategy will depend on an investor's individual circumstances and objectives. Principal value and return of an investment will fluctuate with changes in market conditions.

For more information about the Morgan Stanley Institute for Sustainable Investing, visit **morganstanley.com/sustainableinvesting**.

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