



NORTHERN TRUST
ASSET MANAGEMENT

RESEARCH INSIGHTS

NATURE IN PORTFOLIOS: A PRACTICAL FRAMEWORK FOR INVESTMENT DECISION-MAKING

Translating nature-related impacts, risks,
dependencies and opportunities into
portfolio implementation

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KEY TAKEAWAYS

- **A double materiality-based framework enables informed investment implementation despite nature-related data gaps.** Although nature-related datasets, disclosures and methodologies continue to evolve, a double materiality-based approach can generate meaningful insight. Information should not delay action.
- **Nature integration can be aligned with broader investment objectives.** The analysis shows that meaningful improvements in nature-related portfolio characteristics can be achieved within a modest tracking error budget. This allows investors to use the framework either as a stand-alone integration approach or, more importantly, in combination with other investment objectives, such as climate resilience, governance quality and long-term value creation.
- **Nature-related considerations can be integrated into investment portfolios through a practical implementation framework.** Growing evidence of nature-related financial risks and opportunities makes implementation an increasingly important challenge for investors. To address this, Northern Trust Asset Management (NTAM) developed a Nature Framework that holistically incorporates nature-related impacts, risks and contributions into portfolio construction, risk management and investment decision-making.
- **A comprehensive approach requires both portfolio construction and stewardship.** The framework provides a means of integrating nature considerations into portfolio construction, while active stewardship remains essential for encouraging improved corporate practices and outcomes, particularly in Taskforce on Nature-related Financial Disclosures' (TNFD) priority sectors where nature-related dependencies, impacts and risks are most concentrated.

Why We Developed the Nature Framework

Nature underpins economic activity through the ecosystem services it provides, including food production, freshwater availability, climate regulation, resource security and supply-chain resilience. Healthy ecosystems also support climate mitigation and adaptation by acting as natural carbon sinks through forests, wetlands, soils and oceans. Historically, companies have not calculated nature-related capital impacts on balance sheets, leading to potential mispricing of assets.

As biodiversity loss and ecosystem degradation accelerate globally, companies increasingly face risks associated with resource scarcity, supply-chain disruption, operational constraints, regulatory change and reputational impacts. These pressures can affect revenues, costs, asset values and long-term corporate profitability, making nature-related considerations increasingly financially material for investors. This is evidenced by forthcoming proposed changes to International Financial Reporting Standards (IFRS) disclosure guidance relating to land use & ecological impacts and environmental supply chain in the meat, poultry and dairy industries' Sustainability Accounting Standards Board's (SASB) standards.¹ For instance, in 2023, 3M faced a US\$10 billion liability settlement for contaminating water with "forever chemicals", incurring significant costs due to its environmental impact.²

¹ See: IFRS Sustainability. Proposed amendments to the SASB Standards and IFRS S2 Industry-based Guidance. March 2026.

² Source: 3M. "3M Settlement with Public Water Suppliers to Address PFAS in Drinking Water Receives Final Court Approval," Press Release, April 1, 2024..

The challenge is determining how to translate nature-related information into investment decisions in a way that is financially material, scalable and compatible with portfolio objectives. Company exposure to natural capital risks cannot be captured by a single metric. Existing nature-related data toolkits and analytical frameworks primarily focus on risk identification, impact measurement and disclosure, rather than assessing financial materiality or informing portfolio-level investment decisions leading to investor uncertainty for portfolio implementation.

This paper addresses the portfolio implementation gap by providing a straight-forward, practical approach to integrate nature considerations into the investment lifecycle. It introduces NTAM's proprietary Nature Framework, a practical decision-support framework structured around three pillars: Impact on Nature, Risk and Dependencies, and Contribution. The framework draws on established market tools, third-party datasets and proprietary research to identify where nature-related considerations are most relevant to diversified portfolios.

By focusing on financial materiality, the framework helps investors prioritize the nature-related exposures most likely to impact portfolio outcomes. Rather than attempting to measure every dimension of nature, it is designed to support investment implementation today while remaining adaptable as corporate disclosure, data quality and market standards continue to improve.

The interrelated risks of climate change and nature loss, often referred to as the "Twin Crises", create a negative feedback loop whereby global warming degrades natural systems, which in turn weakens nature's ability to regulate the climate.³ However, carbon emissions alone do not capture the full range of nature-related dependencies, impacts and risks. Additional metrics are required to assess issues such as biodiversity loss, water stress, land-use change and ecosystem degradation. This paper focuses specifically on nature-related considerations, while recognizing that climate and nature should be considered together wherever practical.

THREE DESIGN PRINCIPLES

The framework is guided by three design principles:

- **Financial materiality:** Focus on nature-related factors most financially relevant to long-term investment outcomes across industries.
- **Measurability and scalability:** Use available datasets and methodologies that can be applied across large, diversified portfolios while remaining adaptable as data quality and coverage improves.
- **Double materiality ("inside-out" and "outside-in"):** We assess both how companies' impact nature ("inside-out"), as well as how nature-related risks and dependencies may affect company performance ("outside-in").

³ Note: For more see our [Five Sustainable Investing Themes for 2025](#).

Developing the NTAM Nature Framework

The Nature Framework extends NTAM's materiality-based sustainable investing philosophy to nature-related considerations. Framework development began with an assessment of leading nature-related frameworks, datasets and analytical tools, including TNFD locate, evaluate, assess, prepare (LEAP) approach and sector guidance;⁴ the Exploring Nature Opportunities, Risks and Exposure (ENCORE) tool's dependency assessment;⁵ the Sustainability Accounting Standards Board's (SASB) industry-specific materiality framework;⁶ biodiversity footprint metrics such as Potentially Disappeared Fraction (PDF) and Mean Species Abundance (MSA);⁷ deforestation datasets; nature-related opportunity measures; and asset-location-based datasets covering water risk and biodiversity-sensitive areas. These inputs are complemented by NTAM's proprietary research and practical experience integrating sustainability considerations into investment portfolios.

Consistent with our approach to climate integration and Scope 3 emissions analysis,⁸ the objective is not to measure every dimension of nature. The framework instead focuses on financially material issues supported by decision-useful data, enabling implementation today while remaining adaptable as standards and datasets mature.

The resulting framework, illustrated in **Exhibit 1**, is structured around three complementary pillars: Impact on Nature, Risk and Dependencies, and Contribution — reflecting the different ways that companies both influence and depend on nature.

⁴ See: [TNFD: Additional guidance for financial institutions \(v2.0\): Annex 1](#). As of June 2024.

⁵ See: Exploring Natural Capital Opportunities, Risks and Exposure: A practical guide for financial institutions. Natural Capital Finance Alliance and UN Environment World Conservation Monitoring Centre (Geneva, Oxford and Cambridge), 2018; Integrating Natural Capital in Risk Assessments: A step-by-step guide for banks, Natural Capital Finance Alliance and PricewaterhouseCoopers (Geneva, Oxford and London), 2018.

⁶ See: [SASB Standards Materiality Finder](#). As of July 2026.

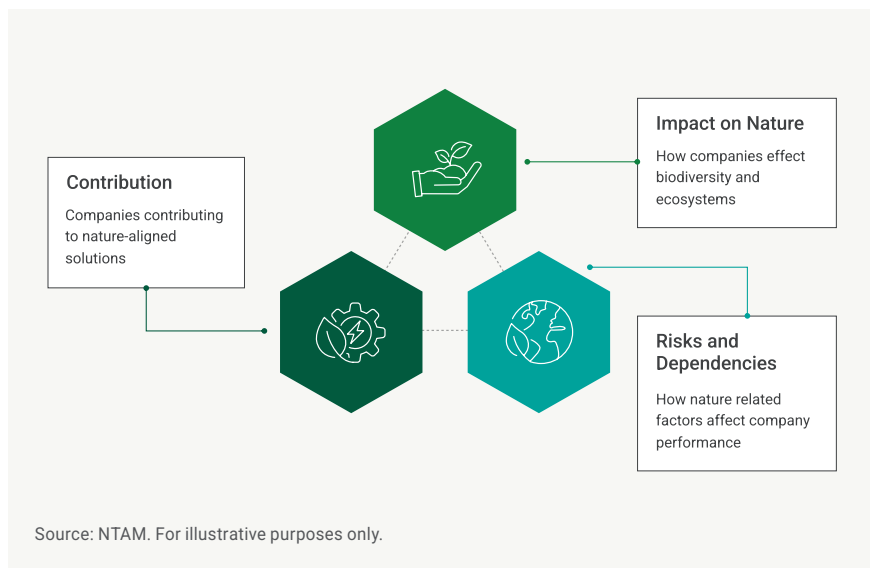
⁷ Note: Biodiversity footprint models measure changes in ecosystem condition and biodiversity outcomes. PDF estimates the proportion of species lost in a given area as a result of environmental pressures, while MSA compares the abundance of native species in a disturbed ecosystem with that of an equivalent undisturbed ecosystem. Source: Finance for Biodiversity Foundation. Biodiversity Measurement Approaches Guide (5th Edition): A Practitioner's Guide for Financial Institutions. June 17, 2026.

⁸ See: Dinershteyn, V., Rummyin, I., and M. Vidojevic. [Making Scope 3 Work: How Investors Can Navigate Complexity and Manage Climate Risk](#). Northern Trust Asset Management Sustainable Insights. March 2025.

EXHIBIT 1

NTAM's Nature Framework

A practical three pillar lens for integrating nature into investment decisions



IMPACT ON NATURE

The impact pillar evaluates companies' contributions to biodiversity loss and ecosystem degradation through their operations. It represents the framework's "inside-out" perspective, focusing on identifying where portfolio companies exert the most significant pressures on nature systems and where these impacts may become increasingly material to company's cash flow or come under regulatory scrutiny.

The framework incorporates biodiversity footprint metrics utilizing Land Conversion Equivalent (LCE) relative to sales (in US\$ millions)⁹ to assess the magnitude of a company's impact on nature. These metrics are applied primarily within TNFD priority sectors, where biodiversity-related impacts tend to be most concentrated and financially material. This targeted approach helps identify high-impact industries, and companies, with outsized exposure to nature-related risks, supporting portfolio construction and stewardship decisions aimed at reducing biodiversity impact footprint.

RISKS AND DEPENDENCIES

This pillar assesses how companies' reliance on ecosystem services and exposure to nature-related risks may affect financial performance. It captures the framework's "outside-in" perspective by identifying where resource scarcity, ecosystem degradation, location-specific physical risks, and evolving regulatory or market expectations may lead to potential asset impairment.

⁹ Note: LCE/sales metric expresses the biodiversity impact (PDF), which measures total impacts of the company on nature from multiple environmental pressures (e.g., greenhouse gas emissions, water use, and pollution) into a single, standardized spatial area, showing how much land use change from pristine to urban land use condition would result in a similar level of potential species loss, usually measured in square kilometers (km²).

To identify these risks, the framework combines multiple complementary datasets. First, dependency assessments from the ENCORE framework are used to identify industries and companies that rely heavily on ecosystem services and are therefore exposed to nature-related risks. Water stress and freshwater availability are a key focus given their broad relevance across sectors and the availability of mature disclosure, third-party and asset-location-based datasets that enable granular risk assessment. We then apply the SASB materiality framework to identify the industries and companies where water availability and water management are financially material. This allows the framework to focus on companies where water-related exposure can impact operating continuity, reduce earnings and cash flows through higher water costs, and create additional regulatory and compliance risks.

Second, the framework incorporates deforestation-risk metrics to identify companies with exposure to commodities and supply chains linked to forest loss. Deforestation within company operations creates transition, regulatory and reputational risks, particularly as companies face increasing scrutiny from regulators, customers and investors regarding land-use practices and supply-chain transparency.

Third, biodiversity-sensitive location data is used to assess whether corporate operations intersect with ecologically important or vulnerable areas. Asset-level location analysis provides an additional lens for identifying potential exposure to biodiversity-related physical, regulatory and social risks that may not be captured through sector-level assessments alone.

These risk exposures are combined with indicators of corporate governance practices to differentiate between companies that are actively managing nature-related risks and those that remain more exposed. Taken together, the Risk and Dependencies pillar translates nature-related exposure data into a practical portfolio signal. By integrating a materiality based approach focused on water stress, deforestation risk and biodiversity-sensitive locations with materiality and management-quality assessments, the framework helps identify unmanaged risks, reward stronger corporate practices and highlight issuers where stewardship can complement portfolio construction.

MARKET CONTEXT

Taken together, the Risk and Dependencies pillar translates nature-related exposure data into a practical portfolio signal.

CONTRIBUTION

The final pillar assesses the extent to which companies support nature-aligned outcomes through their products, services, or business activities. This intentionally forward-looking assessment recognizes that the transition to a more sustainable and resource-efficient economy can create opportunities for companies providing solutions that help protect, restore, or sustainably manage natural resources.¹⁰

This pillar incorporates NTAM's proprietary SDG framework to identify nature-aligned revenue opportunities,¹¹ with emphasis on company revenues linked to SDG 6 (Clean Water and Sanitation), SDG 12 (Responsible Consumption and Production), SDG

¹⁰ Source: WEF. (2026). 50 Investible Opportunities for a New Nature Economy. March 2026.

¹¹ Note: We utilize Sustainable Development Investment's (SDI) Asset Owner Platform (AOP). For more info, see: Sustainable Development Investments (SDIs) Taxonomy & Guidance. As of December 2025.

14 (Life Below Water), and SDG 15 (Life on Land). These SDGs capture direct links between corporate products and services and outcomes such as sustainable water management, resource efficiency, circular production,¹² and protection or restoration of terrestrial and marine ecosystems. This opportunity-oriented perspective complements the impact and risk pillars by increasing exposure to companies contributing to supporting natural capital or reducing negative consequences.

Applying the Framework in Portfolios

Managing nature-related impacts, risks and dependencies, and contributions within portfolios requires investors to balance sustainability objectives, active risk and expected investment outcomes. Broad exclusions or unconstrained tilts away from high-impact sectors can introduce unintended sector, regional, and factor exposures. This approach can help investors improve nature-related portfolio characteristics while preserving core investment objectives.

To demonstrate the practical application of the framework, we applied it to global equity universes, specifically the MSCI World Index and MSCI Emerging Markets (EM) Index. The objective was to assess whether meaningful improvements across the three pillars can be achieved while maintaining a modest active risk budget and preserving core portfolio characteristics. **Exhibit 2** outlines the objectives and portfolio implementation targets of each pillar. We applied this to a representative portfolio and outline the results below.

EXHIBIT 2: PORTFOLIO IMPLEMENTATION OBJECTIVE ACROSS THREE PILLARS

Pillar	Objective	Target
Impact on Nature	Reduce biodiversity footprint in TNFD high-priority sectors using LCE/sales metric	Target a 50% reduction in biodiversity footprint relative to the benchmark
Risk and Dependencies (biodiversity)	Manage exposure to companies linked to deforestation risk or operating in biodiversity-sensitive locations	Avoid overweighting exposure to companies operating in biodiversity sensitive locations and with links to deforestation activities that have no policies and commitments to address these risks
Risks and Dependencies (water)	Manage exposure to companies operating in high water stress locations and reward stronger water risk management practices using a SASB materiality driven approach	Overweight companies in water-material industries and assets in high water-stress locations, with stronger risk management and improving water-intensity trend and reduce exposure to companies with assets in high water-stress locations by 20%
Contribution	Increase exposure to companies with nature-aligned products and services	Overweight companies with positive nature-aligned revenue exposure and underweight companies with negative revenue alignment

¹² See: De Lange, G., Smit, M., and E. Geczko. [Long-Term Stakeholder Value \(LTSV\) Identifying Companies that Create Long-Term Value for all Stakeholders](#). Northern Trust Asset Management Research Insights. April 2023.

IMPACT ON NATURE

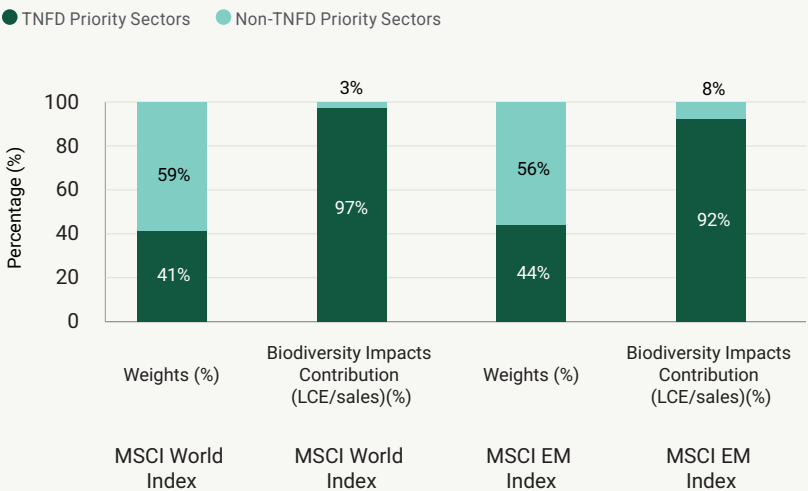
Our findings show that biodiversity impacts are highly concentrated. Within the MSCI World Index and MSCI EM Index, approximately 30 companies contribute around two-thirds of the benchmarks’ biodiversity footprints.¹³ This concentration suggests that nature-related impacts are not evenly distributed across the market and supports a targeted, priority sector-based approach to portfolio implementation.

As shown in **Exhibit 3**, TNFD high-priority sectors¹⁴ represented 41% of the MSCI World Index by weight but accounted for approximately 97% of the index’s total biodiversity impact at the time of analysis. A similar pattern was observed in the MSCI EM Index. These findings highlight why a priority-sector approach can be effective: it allows investors to focus research, portfolio construction and stewardship on the areas that drive the majority of biodiversity impacts.

EXHIBIT 3

Less Than Half of Companies Contribute Almost All Biodiversity Impacts

Comparing biodiversity impacts (measured in LCE/sales US\$M) in TNFD high-priority sectors by index weight, MSCI World Index vs. MSCI EM Index



Sources: NTAM, GIST Impact. Data as of October 31, 2025.

MARKET CONTEXT

Although TNFD high-priority sectors represent only 41% of the MSCI World Index, they account for approximately 97% of its biodiversity footprint, highlighting the potential effectiveness of a priority sector-based approach to managing nature-related impacts.

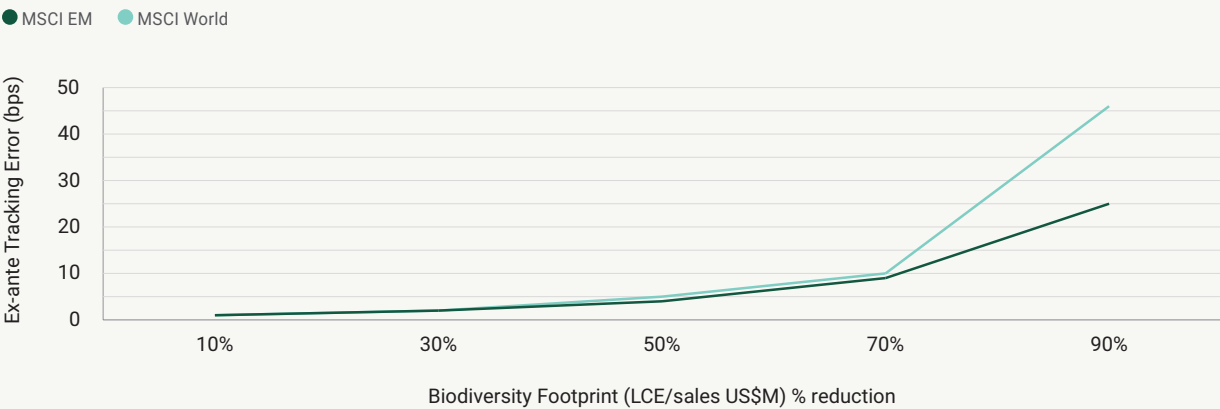
This concentration also has important portfolio construction implications. **Exhibit 4** shows that meaningful reductions in biodiversity footprint can be achieved with a limited increase to active risk. For example, a 50% reduction in

¹³ Source: NTAM, GIST Impact. Data as of October 31, 2025.

¹⁴ See: [TNFD: Additional guidance for financial institutions \(v2.0\): Annex 1](#). As of June 2024.

biodiversity footprint required approximately 4 basis points (bps) of additional ex-ante tracking error in the MSCI World Index, while the active risk impact increased as targeted reductions approached 90%.

EXHIBIT 4
Targeted Biodiversity Reductions Can Be Achieved with Limited Active Risk
Comparing MSCI World Index vs. MSCI EM Index biodiversity footprint (LCE/sales US\$M) % reduction vs. additional ex-ante tracking error (bps)



Sources: NTAM, GIST Impact. Data as of October 31, 2025. Analysis is based on hypothetical optimization scenarios and is shown for illustrative purposes only.

RISKS AND DEPENDENCIES

The Risk and Dependencies pillar highlights the importance of combining exposure data with management-quality indicators. Water risk is a useful example because exposure is highly location-specific and financially material for certain industries. As shown in **Exhibit 5**, companies with more assets (>50%) in high water-stress locations have lower water-risk management and water-intensity trend score ranges (ranging from 0 to 100, with higher scores being better),¹⁵ indicating that many exposed companies may not yet demonstrate strong management practices.

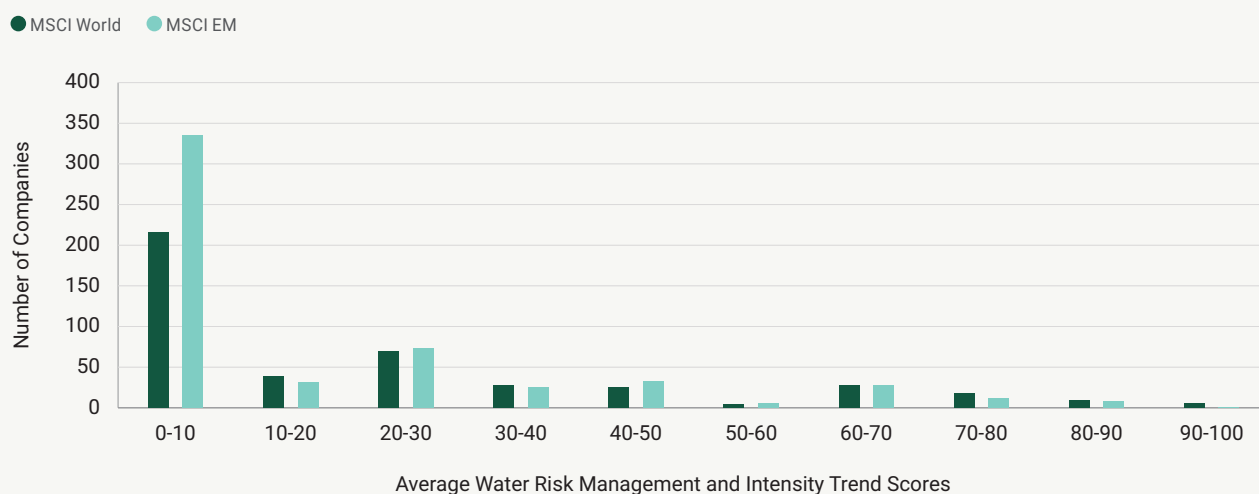
This supports a differentiated approach to portfolio construction. Rather than reducing exposure to all companies operating in water-stressed areas, the framework focuses on material industries and distinguishes between companies with stronger versus weaker water-risk management. This metric allows investors to reduce exposure to unmanaged risks while recognizing companies with better practices.

¹⁵ Note: Water Risk Management indicators assesses a company’s initiatives to manage physical, regulatory and reputational water related risks within its own operations while water intensity trend indicator assesses a company’s performance, over time, on water withdrawal intensity. It compares the change in the company’s water withdrawal intensity over its three-year average relative to the subindustry or industry change.

EXHIBIT 5

Water Stress Exposure Reveals Variation in Corporate Risk Management

Comparing MSCI World Index vs. MSCI EM Index water risk management and intensity trend scores for companies with >50% assets in high water-stress locations



Sources: NTAM, Sustainalytics, GIST Impact. Data as of October 31, 2025.

Deforestation presents a related but distinct risk channel. Our findings identified that in MSCI World Index, more than 80 companies contribute to deforestation, mainly commodity producers such as palm oil, soy, beef, and timber companies, representing approximately 12% of market value (MV). However, only 27 companies, representing approximately 6% of MV, have a formal deforestation policy. A similar trend is observed in the MSCI EM Index, where 33 companies, representing approximately 6% of MV, contribute to deforestation; but only nine companies, representing approximately 0.8% of MV, have a formal deforestation policy.¹⁶ This suggests that management practices and policy commitments have yet to keep pace with the scale of deforestation-related exposure and associated business risks. It also highlights the importance of assessing both exposure and corporate response. A company's link to deforestation-relevant products or services does not automatically imply the same level of residual risk across all issuers, as policies, traceability commitments, supply-chain controls and disclosure practices can vary significantly.

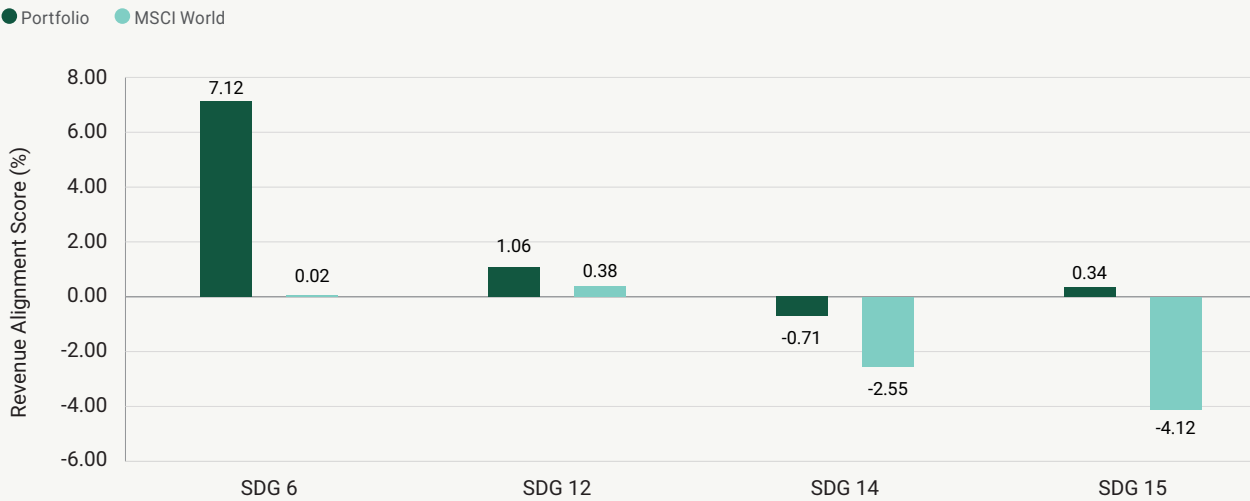
For this reason, the framework seeks to avoid overweighting companies where these exposures are not accompanied by credible policies or commitments, while also identifying companies that may warrant stewardship engagement.

¹⁶ Source: NTAM, MSCI. Data as of October 31, 2025.

CONTRIBUTION

The Contribution pillar demonstrates how investors can identify companies with revenue exposure to nature-aligned products and services. As shown in **Exhibit 6**, the representative portfolio increases positive revenue alignment to SDG 6 and SDG 12, while reducing negative alignment to SDG 14 and SDG 15 relative to the MSCI World Index.¹⁷ These results indicate that nature-aligned revenue exposure can be enhanced through targeted portfolio improvements, even with a limited opportunity set in listed equity markets.

EXHIBIT 6
Contribution Pillar Increases Exposure to Nature-Aligned Revenue
Comparing SDG Revenue Alignment % of MSCI World Index versus a representative portfolio



Source: NTAM. Data as of October 31, 2025. Representative portfolio results are based on the optimization approach described in Appendix 1 and are shown for illustrative purposes only.

MEANINGFUL NATURE IMPROVEMENTS AT MODEST ACTIVE RISK
AND PRESERVING FACTOR CONTENT

In aggregate, the results suggest that the Nature Framework can be implemented within a modest active risk budget. Applying the three pillars together in a representative model portfolio, the framework achieved its sustainability objectives with approximately 59 bps of active risk in the MSCI World Index universe and 49 bps in the MSCI EM Index universe.¹⁸ These results suggest

¹⁷ NTAM SDG scores incorporate a sector-based materiality assessment to measure a company's alignment with individual SDGs based on their products and services revenues. Scores range from -10 to +10, where negative values indicate misalignment with the SDG, positive values indicate alignment, and 0 represents a neutral or immaterial contribution.

¹⁸ The representative portfolio analysis is hypothetical and model-based. It is provided for illustrative purposes only and does not represent an actual client portfolio. Results are based on data available as of October 31, 2025, and depend on the assumptions, constraints, datasets and optimization approach used in the analysis. Please refer to the methodology notes in Appendix 1 for further details. Results do not reflect transaction costs, taxes, fees or other implementation considerations unless otherwise stated.

that meaningful improvements in nature-related impacts, risks and contribution exposure can be achieved without substantial deviation from benchmark characteristics when implementation is targeted and materiality-driven. **Exhibit 7** summarize the improvement achieved across the various dimensions within the framework in the MSCI World Index.

EXHIBIT 7: SUMMARY OF REPRESENTATIVE PORTFOLIO IMPROVEMENTS (MSCI WORLD INDEX)

Metric	Portfolio	Benchmark	Portfolio outcome versus benchmark
Biodiversity Footprint	0.0024	0.0048	50% lower
% Weight in companies with deforestation related risks and no policy	4.5%	6.0%	25% lower
% Weight in companies operating near biodiversity sensitive locations with no target, commitment, or policy	3%	3%	At benchmark weight
% Weight in companies operating in areas with high water stress	33.7%	49.0%	~30% lower
% Weight in companies where water is a material risk, operating in high water-stress regions and demonstrating strong water risk management practices	10.4%	9.7%	Higher Exposure
SDG 6: Weight in aligned companies	5.4%	3.4%	Higher Exposure
SDG 12: Weight in aligned companies	4.4%	2.4%	Higher Exposure
SDG 14: Weight in aligned companies	0.0%	0.0%	Same Exposure
SDG 15: Weight in aligned companies	5.7%	3.7%	Higher Exposure

Source : NTAM. Data as of October 31, 2025. Representative portfolio results are based on the optimization approach described in Appendix 1 and are shown for illustrative purposes only.

The findings suggest that investors need not choose between nature-related objectives and financial outcomes. By adjusting implementation targets, active risk can be reduced while still delivering meaningful improvements in portfolio nature characteristics and maintaining the intended risk-return profile.

COMPANY-LEVEL DIFFERENTIATION WITHIN SECTORS

A key advantage of the framework is that it does not rely solely on broad sector exclusions. Instead, it differentiates between companies within the same sector or industry based on biodiversity impacts, nature-related risk exposure, management oversight and contribution to nature-aligned outcomes.

This is particularly important in industries such as metals & mining, food & beverage etc., where nature-related risks may be financially material but company-level exposures and management practices can vary significantly. By applying an industry-specific and materiality-driven approach, the framework can support a more nuanced portfolio construction and stewardship process.

As shown in **Exhibit 8**, two companies in the same industry can have meaningfully different nature-related profiles. The framework evaluates companies across multiple dimensions rather than relying on any single indicator. Company A exhibits lower biodiversity impacts, lower water-stress exposure, no identified deforestation linkage and positive SDG contribution, resulting in a more favorable overall framework assessment, while, Company B demonstrates stronger water management practices. This type of company-level differentiation allows the framework to identify potential overweight, underweight and engagement candidates within industries rather than relying on exclusions alone.

EXHIBIT 8: DIFFERENTIATING LEADERS AND LAGGARDS WITHIN SECTORS

	Company A	Company B
Company Profile	Extractive (SICS); Materials (GICS)	Extractive (SICS); Materials (GICS)
Active Weight	0.15%	-0.10%
Biodiversity footprint (LCE/sales US\$M)	0.039	0.13
% of assets in high water stress area	24%	55%
Water management score	48	75
Deforestation exposure	No link to deforestation	Activities leading to deforestation
SDG Contribution	Positive contribution to SDG 12: Responsible Consumption and Production	No material contribution to SDGs

Source: NTAM. Data as of October 31, 2025. Company names have been anonymized. The data is shown for illustrative purposes only.

DATA LIMITATIONS

The framework is intentionally designed to acknowledge the current limitations of nature-related data. Compared with more mature areas of sustainability analysis, corporate disclosure of biodiversity-related impacts, potential asset impairment, dependencies and risks remains relatively limited, resulting in a greater reliance on estimation techniques and third-party datasets. These challenges are particularly relevant for location-based assessments, where asset locations, biodiversity sensitivities, water stress and deforestation exposure are often estimated rather than directly reported.

The framework therefore does not rely on any single metric or dataset. Instead, biodiversity footprint metrics, location-based datasets, materiality assessments, corporate disclosures and other indicators are considered together to provide

a more comprehensive view of potential risks and opportunities. As with Scope 3 emissions,¹⁹ the goal is not perfect precision but identification of financially material considerations that may influence long-term investment outcomes.

Accordingly, the framework should be viewed as a decision-support tool rather than a definitive measure of a company's nature-related impacts, dependencies or contribution to biodiversity outcomes. As corporate disclosure, asset-level reporting, supply-chain transparency and datasets improve, stewardship and engagement can help accelerate progress by encouraging more decision-useful information for investors. We view emerging efforts to strengthen the governance and interoperability of nature-related reporting, including consideration of TNFD recommendations within the broader IFRS sustainability reporting ecosystem, as an important step towards improving the consistency, comparability and decision-usefulness of nature-related information available to investors

Our analysis highlights biodiversity footprint metrics as useful tools for portfolio assessment and implementation. To support this claim, we include the correlation analysis across various data providers across the PDF and MSA metrics (**Exhibit 9**) which indicate the correlations are often moderate and the metrics generally align in identifying companies with significant nature-related impacts. Differences across providers reflect variations in modelling approaches, underlying datasets, impact pathways, geospatial assumptions and methods used to address company-level data gaps. These differences reinforce the need to understand methodology, while still allowing investors to use available data as practical inputs into portfolio construction and stewardship.

¹⁹ See: Dinershteyn, V., Rumyn, I., and M. Vidojevic. [Making Scope 3 Work: How Investors Can Navigate Complexity and Manage Climate Risk](#). Northern Trust Asset Management Sustainable Insights. March 2025.

EXHIBIT 9

Biodiversity Metrics Vary Across Data Providers

Comparing PDF/MSA metric values across data providers, MSCI World Index (left) and MSCI EM Index (right)



Source: NTAM. All index holdings and data as of October 31, 2025.

Beyond Portfolio Construction: The Role of Stewardship

The primary objective of the NTAM Nature Framework is to support the integration of nature-related considerations into investment decision-making. Portfolio construction techniques can tilt portfolios toward companies with lower biodiversity impacts, stronger management of nature-related risks and dependencies with greater contribution to nature-aligned outcomes. However, some of the most significant biodiversity challenges remain concentrated in industries that are difficult to avoid entirely in broad market portfolios.

As a result, company engagement remains an important step for improving disclosure, governance and risk management. The framework complements NTAM's existing natural capital stewardship approach by helping identify companies where engagement may be most effective to manage natural-related risks.²⁰

Together, portfolio integration and stewardship enable investors to move beyond nature-related assessment towards practical implementation.

²⁰ See: [Stuart, L. and P. Vernardis. Natural Capital Stewardship at Northern Trust Asset Management. August 2025.](#)

Conclusion

For investors still developing or refining their climate transition policy, nature should not be viewed as a separate or competing priority that must wait until climate work is complete. A practical starting point is to consider nature in parallel with climate transition planning, initially through the most material areas of overlap, such as deforestation, water stress, biodiversity-sensitive locations and ecosystem services that support climate mitigation and adaptation. This allows investors to build awareness of nature-related risks and dependencies without diluting the focus on decarbonization, net zero alignment or climate-risk management.

Nature-related considerations are increasingly relevant to corporate risk management and long-term investment outcomes, but investors do not need perfect data before taking action. Our analysis demonstrates how a materiality-based framework can translate nature-related impacts, risks, dependencies and contribution opportunities into practical portfolio construction and stewardship decisions using currently available information.

Three key lessons emerge from the analysis:

- **Biodiversity impacts are often highly concentrated**, supporting a targeted priority-sector approach;
- **Nature-related risks and opportunities are multi-dimensional** and cannot be captured through a single metric alone;
- **Nature-related objectives can be integrated into portfolios** in a manner that is consistent with investment and sustainability risk budget, rather than as a standalone allocation of active risk.

The NTAM Nature Framework demonstrates that nature integration can move beyond assessment and into investment practice. By focusing on financially material impacts, risks, dependencies and contribution opportunities, investors can begin incorporating nature-related considerations today while remaining adaptable as data, disclosure and methodologies continue to evolve. Ultimately, the question is no longer whether nature should be considered in investment portfolios, but how investors can systematically incorporate nature-related considerations into investment decision-making in a practical, scalable and investment-relevant manner.

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Appendix 1

Methodology Notes

ACTIVE RISK EFFICIENT FRONTIER OPTIMIZATIONS

Objective function

- Minimize active risk

Subject to the following constraints

- Reduce / Uplift the cap weighted sustainability metric relative to underlying index

REPRESENTATIVE PORTFOLIO OPTIMIZATION (MSCI WORLD INDEX)

Objective function

- Minimize active risk

Subject to the following constraints

- Biodiversity footprint in TNFD Priority Sectors $\leq$ 50% lower relative to Benchmark Universe
- Water Risk Management and Water Intensity Scores in SASB material companies operating in areas with high water stress $\geq$ 20% relative to Benchmark Universe
- Portfolio exposure to companies with high water stress $\leq$ 30% lower relative to Benchmark Universe
- Portfolio weight in companies producing products linked to deforestation and not having a deforestation policy $\leq$ Benchmark Universe Weight
- Portfolio weight in companies operating close to high biodiversity sensitive locations $\leq$ Benchmark Universe Weight
- Portfolio weight to companies with misalignment of revenue to SDG 6 or SDG 12 or SDG 14 or SDG 15 $\leq$ Benchmark Universe Weight
- Portfolio exposure to companies with alignment of revenue to SDG 6 or SDG 12 or SDG 14 or SDG 15 $\geq$ Benchmark Universe Weight
- Sector : $\pm$ 200bps; Region : $\pm$ 200bps ; Security: $\pm$ 50bps

NOTES:

- Data Sources: Northern Trust Quantitative Research, MSCI, Sustainalytics, GIST Impact, FactSet, Bloomberg, ISS, SDI AOP
- Benchmark Universe: MSCI World Index/ MSCI Emerging Market Index
- Date of Analysis: October 31, 2025

ABOUT SUSTAINABLE INVESTING

Northern Trust Asset Management incorporates sustainability-related considerations across a range of investment approaches, including exclusionary screening, ESG integration, thematic strategies, stewardship activities and strategies that promote environmental and/or social characteristics. Certain strategies may also invest in sustainable investments as defined under Regulation (EU) 2019/2088 (SFDR), subject to the specific objectives and disclosures applicable to each product.

Sustainable Finance Disclosure Regulation (SFDR)

Our UCITS Funds have been categorized in accordance with the SFDR categorisation. For more information please visit:

<http://www.northerntrust.com/europe/what-we-do/investment-management/sustainable-finance-regulation> www.northerntrust.com/europe/what-we-do/investment-management/sustainable-finance-regulation

<https://www.fgrinvesting.com/en/sustainable-investing-regulation>

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