Five Sustainable Investing Themes for 2025

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As we take stock of 2024, it is clear that events of the past year were both notable and complex for sustainable investing. Global dynamics, including geopolitical conflict, artificial intelligence (AI) innovation and energy demand, and regulatory changes set the stage for many potential developments across asset classes, presenting significant risks and opportunities. Stemming from our views on the markets and macro environment, highlighted in the 2025 Global Investment Outlook, we aim to articulate our perspectives on five key sustainable investing themes we believe will shape 2025.

First, **Navigating the Energy Transition** continues to be a strategic macro trend garnering significant attention in certain markets, while fueling heated debates in others. Additionally, transition underpins and influences many of the key themes we discuss below. In 2024, warming reached 1.5°C, the hottest year recorded;[1] representing an acceleration of warming forecasts, as just a couple years ago the 1.5°C threshold was predicted in the early- to mid-2030s. Historic droughts persisted in 2024, and the cost of the past decade's extreme weather reached US$2 trillion.[2] Looking ahead, we expect physical risks to continue to pose challenges to issuers in the near term while the global regulatory environment is likely to continue sending mixed signals, catalyzing investment opportunities and innovations. Regulatory mixed signals are likely to result in a delayed and fragmented transition, creating headwinds to climate action in markets like the U.S. and tailwinds internationally.

The interrelated risks between climate change and nature loss — referred to by some scientists and economists as the **"Twin Crises"** — drive a negative feedback loop with the frequency and intensity of extreme weather ramping up faster than expected,[3] as are negative costs to natural capital. Traditional global carbon sinks, such as mangroves and rainforest, are becoming defunct as they experience significant rates of devastation.[4] As investors step up their considerations of the economic impacts of natural capital risks, 2025 is poised to drive more attention.

Innovations in Computing Technologies are poised to drive differentiation in risks and opportunities in 2025. While AI represents a field ripe for innovation, it also represents a field rife with environmental and social risks. The mega trend of generative AI is anticipated to contribute US$19.9 trillion to the global economy by 2030 and could represent a significant driver of economic growth, particularly in China and the U.S.[5] AI is also likely to be caught in the crosshairs of escalating tensions and trade restriction tactics between these two countries, including access to rare earth elements (REE). As companies seek to diversify their supply chain sourcing, considerations for the environmental and social risks associated with raw materials should be top of mind for sustainable investors.

Changing Dynamics in Emerging Markets (EM) are improving the possibility of aligning EM portfolios with net zero objectives as a feasible outcome. However, naive implementations can come with substantial uncompensated risks. Well-designed climate solutions based on high-quality data and systematic portfolio construction techniques have the potential to deliver sustainable portfolios that meet return, risk and sustainability objectives.

Political changes are likely to drive significant impacts on the markets in 2025, including **Regulatory Tensions** that may lead to diverging expectations from regulators and increased regulatory scrutiny. Across jurisdictions, efforts to address greenwashing by stakeholders, regulators and others will likely result in increased risks. Issuers will be well served by addressing their sustainability resourcing and skills needs.

Drawing on Northern Trust Asset Management's 30 years of experience building portfolios to align with a client's custom objectives, our team of practitioners works hand-in-glove with some of the most sophisticated sustainable investors across the globe to build portfolios intentionally managing sustainability risks. In the following pages, we dig a bit deeper into the five themes, discussing challenges, risks, and opportunities investors are likely to face in 2025.

[1] Source: World Meteorological Organization. "2024 is on track to be hottest year on record as warming temporarily hits 1.5°C," Press Release. November 11, 2024. [2] Sources: Turkewitz, J., Ionova, A., and J. León Cabrera. "An Alarming Glimpse Into a Future of Historic Droughts," *The New York Times.* October 31, 2024; International Chamber of Commerce. "New report: extreme weather events cost economy $2 trillion over the last decade," Press Release. November 11, 2024. [3] Source: Vernick, D. "Is climate change increasing the risk of disasters?," WWF Stories. October 2, 2024. [4] Source: UN. "Biodiversity — our strongest natural defense against the climate," Climate Action Blog. September 2022. [5] Source: Internal Data Corporation (IDC). "Artificial Intelligence Will Contribute $19.9 Trillion to the Global Economy through 2030 and Drive 3.5% of Global GDP in 2030," News Release. September 17, 2024.

THEME ONE

Navigating the Energy Transition

Leading to COP29, there were high expectations of bridging the near-term US$3 trillion climate mitigation funding gap required to achieve Net Zero 2050. Expectations fell well short — developed markets (DM) dedicated US$300 billion by 2035 via grants and low interest loans to EM to support transition. Looking to 2025, the third round of nationally determined contributions (NDC's) are due to the United Nations Framework Convention on Climate Change (UNFCCC) by February and hopefully provide investors more clarity on global regulatory direction.

If the announcements released at COP29 are any indication of the global direction, companies and investors will likely see risks and opportunities arise in the market as a result of the fractured geopolitical environment.

Weighing the likely increase in energy demand and need for energy security with NDCs ratcheting up, we will likely see a focus on energy infrastructure and storage technology, presenting opportunities in listed infrastructure as well as utilities. Listed infrastructure performed well in 2024,[6] and we believe will continue to play important roles as a portfolio diversifier, income generator and inflation hedge in 2025. Utilities, a sector which typically exhibits moderate growth, is likely to benefit from the forecasted demands for energy needs and investment in transmission, distribution, and storage. These drivers reveal potential growth opportunities in renewable energy, nuclear energy, and the associated supply chains as countries move to cleaner power sources.

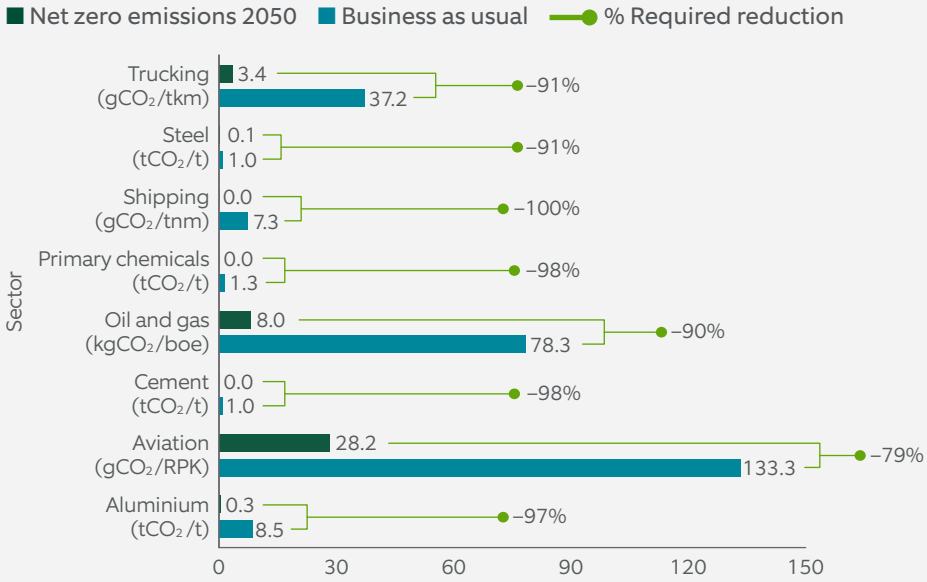
As NDCs ramp up, industries are looking to technology and evolving energy efficiency practices to enable transition, which will require outsized capital expenditures (capex) relative to history. As seen in **Exhibit 1**, additional capex required for the decarbonization of carbon intensive products is projected to reach US$463 billion annually between 2025 and 2050.[7] Fortunately, numerous pilot programs show emissions reductions are possible; but, industry leaders must fund additional research, identify best practices, and adapt production processes, all coming at a cost. However, we expect companies to continue tapping into the green, social, and sustainability bonds (GSSB) market, where investors can see actual progress through reporting and hold the companies responsible for their commitments.

Focusing in on 2025, countries and industries are at different stages of mandating and navigating the complexities of climate transition, and will continue to face varying challenges discussed in **Regulatory Tensions.**

EXHIBIT 1

Reduction Required

Emissions Reductions Required for Net Zero 2050, by Sector*



Sources: Bocca, R., Ashraf, M., et. al. 2024. Net-Zero Industry Tracker 2024. World Economic Forum. Based on data from: International Air Transportation Association (IATA); International Maritime Organization (IMO), International Aluminum Institute (IAI) and International Energy Agency (IEA). As of December 2024. * Note: Emission intensity figures are not comparable between sectors due to different units for production volumes.

We expect physical risks to continue to pose challenges to issuers in the near term while the global regulatory environment is likely to continue sending mixed signals, catalyzing investment opportunities and innovations. Regulatory mis-signals are likely to result in a delayed and fragmented transition, creating headwinds to climate action in markets like the U.S. and tailwinds internationally.

[6] Source: Index return of 20% from January 1, 2024–November 30, 2024. Global listed infrastructure performance based on S&P Global Infrastructure Index, which tracks the performance of 75 energy, transportation and utilities companies. Index performance returns do not reflect any management fees, transaction costs or expenses. It is not possible to invest directly in any index. **Past performance is not indicative of future results.** [7] Source: Bocca, R., Ashraf, M., et. al. 2024. Net-Zero Industry Tracker 2024. World Economic Forum.

THEME TWO

Twin Crises

The interrelated risks between climate change and nature loss — referred to as the "Twin Crises"— presents a negative feedback loop, whereby global warming degrades nature, which in turn worsens climate change. The World Bank estimates biodiversity loss is costing US$2.7 trillion annually to natural ecosystem services.[8] As seen in **Exhibit 2,** the Food, Beverage and Tobacco; Materials; and Energy sectors account for just over half of global impacts.[9] While most impacts are localized in EM, they also appear as supply chain and raw material sourcing risks in DM issuers.

The largest driver of nature loss is deforestation, with land clearing for agriculture accounting for nearly 90%.[10] Using Brazil as an example, the growing global population is driving the demand for meat producers, which is in turn fueling deforestation. In addition to exacerbating climate change — global forests offset approximately 25% of anthropogenic GHG emissions over the past few decades — deforestation also impairs energy, food, and water security.[11] These risks pose the potential for price volatility, supply chain disruptions, and reputational risks if not well managed.

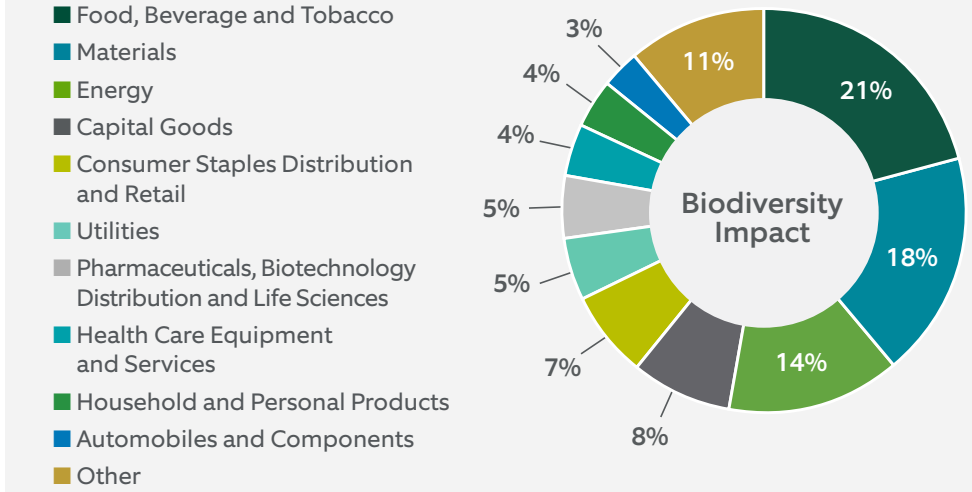
Coming out of COP29, Brazil announced an updated NDC goal inclusive of plans to reduce illegal deforestation, while the UK government announced a commitment to allocate US$299 million in deforestation funds. Maybe more significant, anti-deforestation regulations are on the horizon, most notably the European Commission's Regulation on Deforestation Free Products Regulation (EUDR), which will be live in 2025.

Investor attention is focused on driving increased disclosure of nature related risks. Between 2023–2024, the volume of nature-related shareholder proposals doubled globally.[12] Nature-related investor action in 2025 is likely to focus on enhancing harmonized frameworks, including the Taskforce for Nature Related Disclosures (TNFD) and the inclusion of natural capital in the global materiality baseline of the International Sustainability Standards Board (ISSB) Sustainability Standards. Going forward, we think we'll see a greater focus on improving disclosures to natural capital risks and expanding upon pilot activities certain issuers are exploring to map out nature footprinting.

EXHIBIT 2

Sectors Driving Biodiversity Loss

Biodiversity Impact Percentage* of MSCI World Index Top 250 Companies, by GICS Industry Groups



Source: Finance for Biodiversity Foundation. 2023. Top 10 biodiversity-impact ranking of company industries. Briefing Paper. April 2023. * Note: Calculated as the sum of normalized average impact scores .

As investors step up their considerations of the economic impacts of natural capital risks, 2025 is poised to drive more attention.

[8] Source: World Bank. "Protecting Nature Could Avert Global Economic Losses of $2.7 Trillion Per Year," Press Release. July 1, 2021. [9] Source: Finance for Biodiversity Foundation. 2023. Top 10 biodiversity-impact ranking of company industries. Briefing Paper. April 2023. [10] Source: FAO. "COP26: Agricultural expansion drives almost 90 percent of global deforestation," Press Release. June 11, 2021.

[11] Source: Hogan, J. A., Domke, G. M., Zhu, K., Johnson, D. J., and Lichstein, J. W. (2024). Climate change determines the sign of productivity trends in us forests. Proceedings of the National Academy of Sciences, 121(4). [12] Source: Principles for Responsible Investing. Proxy season 2024: Voting trends and insights for 2025. Webinar. September 19, 2024.

THEME THREE

Innovations in Computing Technologies

Artificial Intelligence (AI) is evolving at breakneck speed, driven by advances in computing power and data collection. Big tech capital expenditures are forecast to hit US $200 billion in 2025, and US$1 trillion over the next three years to meet generative AI demand outlays on data centers and new products.[13] Despite AI's potential to support sustainability goals and unlock efficiencies in green technologies, it also poses risks that could hinder environmental and social progress, such as increasing energy demand and access to the rare earth elements (REE) that AI chips require.

Companies, and investors, will face a conundrum to reconcile net-zero ambitions with AI growth potential. Generative AI requires nearly 33x more energy to complete a task than task-specific software, with estimated computational power needed for sustaining AI's growth doubling every 100 days.[14] As a result, data centers are driving unprecedented electricity demand, with forecast requirements of 460 terawatt hours (TWh)[15] of new electricity from 2023–2030.[16]

China's recent ban on REE exports to the U.S. is likely to create challenges as demand is expected to increase six-fold by 2040.[17] Trade impacts extend beyond AI's market potential. As companies work to overcome trade hurdles, which may include new export partners with lax environmental regulations, investors should be aware of the downstream environmental and social impacts.

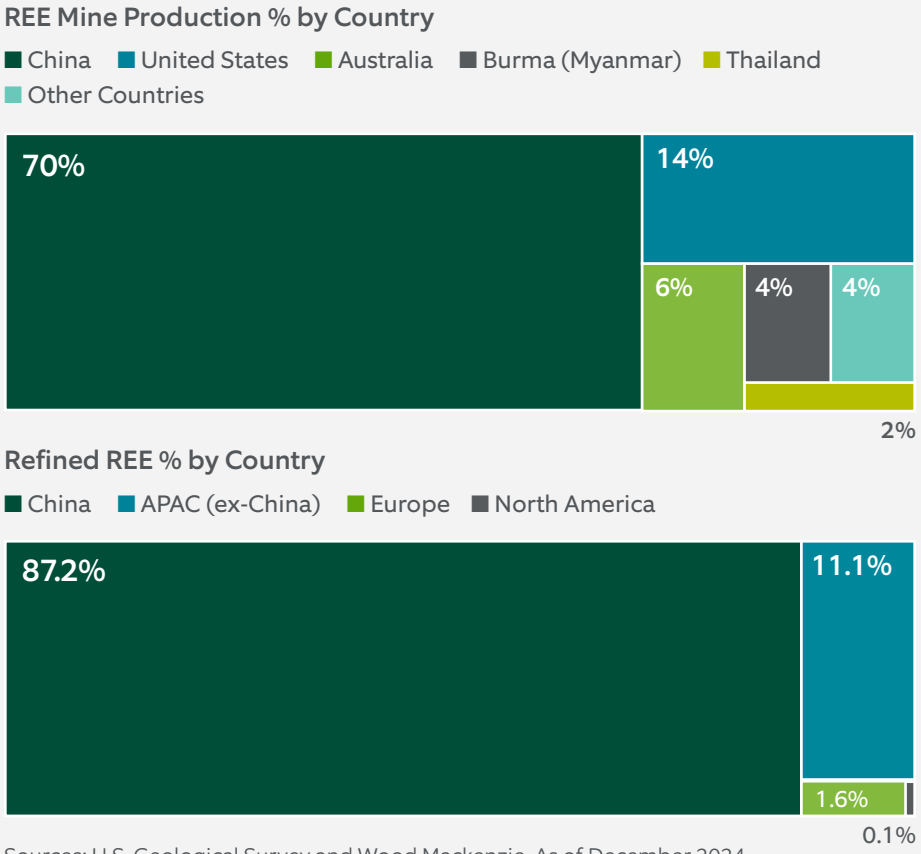
Top concerns are the serious environmental impacts of long-term, large-scale REE mining. This is further compounded at the end of the value chain by the lack of efficient recycling methods for electronics with REE, contributing to electronic waste accumulation. Also, REE extraction is rife with human rights issues — the Business & Human Rights Resource Centre (BHRRC) identified 102 alleged abuses in 2021 and 2022 associated with REE extraction. The abuses include Indigenous rights violations, attacks against grassroots leaders, water pollution, ecosystem destruction and unsafe working conditions.

Increasing energy and REE demands of AI systems exacerbate climate challenges, emphasizing the need for sustainable practices. Balancing innovation with prioritizing equitable policies, transparency, and green technologies is critical to supporting sustainable AI development.

[13] Sources: Rana, A. and A. Girard. "Big tech 2025 capex may hit $200 billion as gen-AI demand booms," Bloomberg Intelligence. October 2, 2024; Spatacco, A. "Dan Ives Expect $1Trillion in Artificial Intelligence (AI) Infrastructure Spending in the Next 3 Years. Here's My Top Pick to Benefit," Yahoo! Finance. October 18, 2024. [14] Sources: Shiqiang Zhu, Ting Yu, Tao Xu, Hongyang Chen, Schahram Dustdar, Sylvain Gigan, Deniz Gunduz, Ekram Hossain, Yao chu Jin, Feng Lin, et al. Intelligent Computing: The Latest Advances, Challenges, and Future. Intell Comput. 2023; 2:0006.DOI:10.34133/icomputing.0006.

EXHIBIT 3

Where in the World Are REE?



Sources: U.S. Geological Survey and Wood Mackenzie. As of December 2024.

As companies seek to diversify their supply chain sourcing, considerations for the environmental and social risks associated with raw materials should be top of mind for investors.

[15] One TWh could power the entire state of California for about 1.5 weeks. [16] Representing a CAGR of 22%. Source: Kemene, E., Valkhof, B. and T. Tladi. "AI and energy: Will AI help reduce emissions or increase demand? Here's what to know," World Economic Forum. July 22, 2024.
[17] Source: Nayar, J. "Not So 'Green' Technology: The Complicated Legacy of Rare Earth Mining," Harvard International Review. August 21, 2021.

THEME FOUR

Changing Dynamics in Emerging Markets (EM)

As a large contributor to the overall carbon output, EM is a space investors are turning to decarbonize portfolios. However, a common misconception is that decarbonization is inherently more difficult in EM, often due to perceived data gaps and concerns about the impact on economic development. However, this narrative oversimplifies the reality. While data transparency and reporting historically lagged DM, recent improvements in environmental, social and governance (ESG) reporting are significantly improving the availability and quality of EM carbon data. Many EM countries are rapidly enhancing their data infrastructure, making decarbonization progress more measurable and comparable to DM.

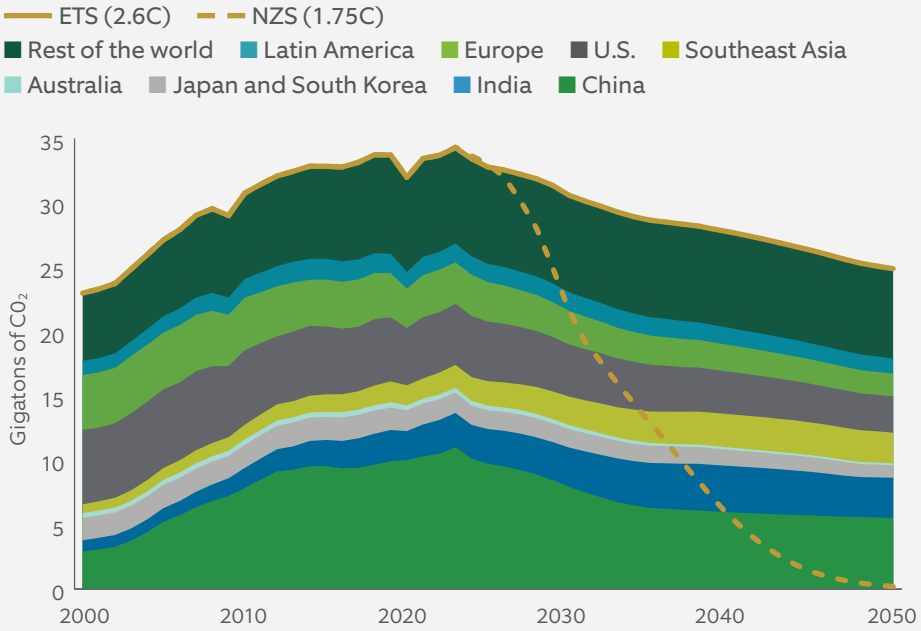
Additionally, the notion that decarbonization efforts in EMs will disproportionately harm economic growth, undermining a "just transition," ignores the economic opportunities of clean energy. Emerging markets can leapfrog (i.e., bypass) outdated technologies, moving directly to renewables and leveraging international climate finance for development. By investing in green industries, EMs can simultaneously reduce emissions and support job creation, ensuring that decarbonization aligns with a fair, equitable transition.

One trend in EM allocation we are seeing is aligning investments to a climate glidepath. From the overall emissions perspective, a large proportion of emissions are situated in EM countries — especially India and China, as seen in **Exhibit 4.** However, the glidepath can differ from the usual Net Zero 2050, allowing for more time for EM countries to decarbonize. In order to still remain within the 2°C budget, we need to thoughtfully construct portfolios within the EM space. This must include understanding EM vs. DM emissions data on a sector level; and, educating investors on Scope 3 emissions, as well as how absolute emission vs. carbon intensity data tell differing stories. We'll be exploring these topics in 2025 via a series of short papers, as well as closely watching regulatory developments in China and India.

EXHIBIT 4

Differing Glidepaths

Projected Regional CO_2 Emissions Global Temperature Increase Versus Pre-Industrial Levels, Economic Transition Scenario (ETS) vs. Net Zero Scenario (NZS)



Source: BloombergNEF. As of October 2024. Note: Economic Transition Scenario (ETS) reflects a world where policymakers pursue an energy transition relying only on historical efficiency trends and economically competitive, commercially at-scale clean energy technologies. Net Zero Scenario (NZS) based on Net Zero 2050.

Well-designed climate solutions based on high-quality data and systematic portfolio construction techniques have the potential of delivering sustainable portfolios that meet return, risk and sustainability objectives.

THEME FIVE

Regulatory Tensions

Some regulatory bodies globally shifted focus to sustainable investing and corporate climate activities in 2024. Notably, the ISSB made gains by establishing S1 and S2 as baselines for sustainability disclosure standards in several markets. However, by 2025, fractured political and regulatory priorities lead us to anticipate increased misalignments in definitions, language, and perspectives on sustainable investing, which in turn may represent increased regulatory risks and costs.

In 2025, we anticipate multiple jurisdictions to combat greenwashing, including the UK, EU, Canada and Australia. Large issuers in the EU will begin to include reporting on sustainability data in annual reports under the EU's Corporate Sustainability Reporting Directive (CSRD). This will include a requirement for companies to report financial and impact materiality via a double materiality assessment. Concurrently, these same markets are actively developing anti-greenwashing regulation to help address misleading claims. As international regulators deepen scrutiny on sustainability risks, opportunities and positioning, companies operating in these markets will face additional audit, legal and compliance costs along with potential regulatory risks.

As for the U.S., we anticipate mixed signals to companies on environmental and social regulations. With an administration change in early-2025, the U.S. government has pulled back on climate and sustainable investment commitments, such as the SEC climate disclosure rule and the Paris climate agreement. Legal challenges to sustainable investing activities, including involvement in entities like Climate Action 100+, have begun to arise in some state and federal courts. At the same time, other states are likely to maintain, or even increase focus on passing material climate risk rules and regulations. This misaligned framework will likely increase challenges and uncertainty for companies, especially multi-national entities, and investors. While challenges abound, markets continue to support innovation and progress toward what many see as a more sustainable, less carbon-intensive future.

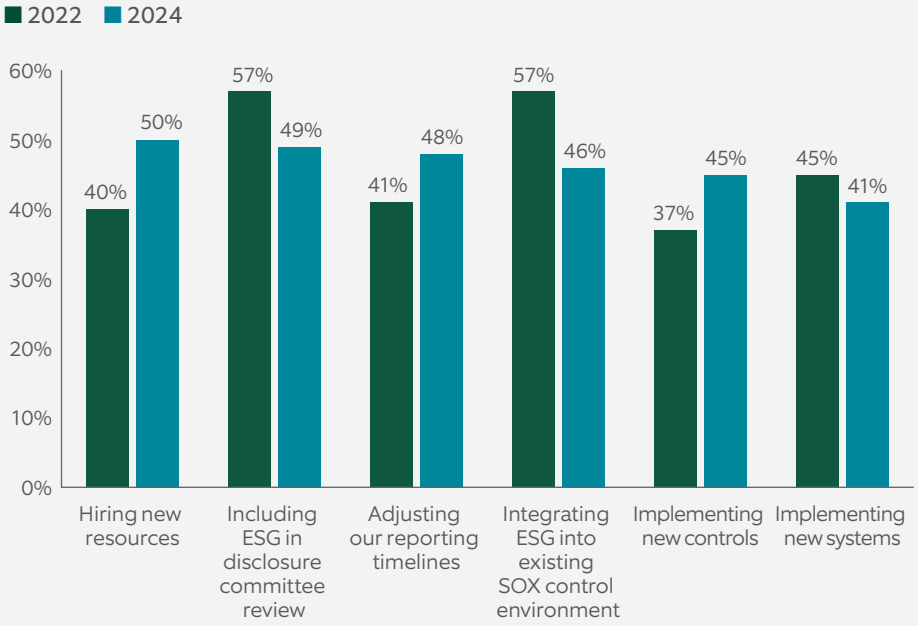
For companies, 2024 was a year of capacity building for many, as seen in **Exhibit 5.** That said, companies continue to face challenges of poor data quality and inconsistent data availability, major hurdles in preparing Scope 3 emissions disclosures. Building the appropriate infrastructure to facilitate clear sustainability disclosures, improved access to data, robust data governance, and upskilling staff will be critical in 2025 for companies to satisfy requirements and get ahead of regulatory and public scrutiny.

Finally, investors should welcome access to greater insights into how issuers manage ESG risks. Laggards who delay investing in necessary infrastructure to support increased disclosure rules may be positioning themselves for greater regulatory and reputational risk.

EXHIBIT 5

Enhancing Capabilities

Steps Companies Took in 2022 vs. 2024 to Enhance Financial Reporting and Controls for GHG Emissions Measurement*



Source: Deloitte. 2024 Sustainability Action Report Survey findings on ESG disclosure and preparedness. July 2024. Data as of January 2024. * Note: Data based on survey of 300 executives at publicly owned companies with a minimum annual revenue requirement of US$500MM+.

Issuers will be well served by addressing their sustainability resourcing and skills needs.

Conclusion

As investors navigate an increasingly complex sustainable investing landscape, we anticipate a growing demand for bespoke solutions and comprehensive analysis of incorporating sustainable investing considerations in portfolios.

At Northern Trust Asset Management, we believe material ESG factors are pre-financial indicators that can affect a company's future financial viability and clients' long-term risk-adjusted investment returns. When managed well, ESG factors can position a company for success, and, when mismanaged, can result in significant risks.

Consistent with our view that investors should be compensated for the risks they take, we believe evaluating companies' performance using certain ESG criteria can enhance our forward-looking view of risks and opportunities. The year to come will be marked by regime changes in several jurisdictions, with potentially significant policy shifts on the horizon. As these themes take shape over 2025, we will be monitoring how the risks associated with them play out.

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