

Vanguard's Report on Climate-related Impacts 2022

Vanguard Asset Management, Limited
Vanguard Investments UK, Limited

In alignment with the Task Force on Climate-related Financial
Disclosures (TCFD) and in accordance with the Financial Conduct
Authority's *Environmental, Social and Governance sourcebook*

Vanguard[®]

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VANGUARD'S CORE PURPOSE

To take a stand for all investors, to treat them fairly, and to give them the best chance for investment success.

This report has been prepared by The Vanguard Group, Inc., in alignment with the guidelines of the Task Force on Climate-related Financial Disclosures. Disclosures in relation to Vanguard UK subsidiaries, Vanguard Asset Management, Limited, and Vanguard Investments UK, Limited, are in accordance with the requirements set out in the Financial Conduct Authority's *Environmental, Social and Governance sourcebook*. The data used for this report are as of December 31, 2022, unless otherwise specified.

The TCFD recommends disclosures in four areas: governance, strategy, risk management, and metrics and targets. See "2022 TCFD disclosure status" on page 47 for a summary of our plans and progress in each area.

CEO letter



Tim Buckley
Vanguard Chairman and
Chief Executive Officer

I'm pleased to present Vanguard's second annual report in line with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). This report highlights our global efforts—as investment manager, investment steward, and corporate actor—in response to climate-related risks and opportunities.

We approach climate matters with an unwavering focus on our clients. These individuals have entrusted us with their hard-earned savings and asked us to help them achieve the long-term returns that enable their financial goals. Climate change, and the ongoing global response, will have far-reaching economic consequences for companies and financial markets, and presents a material financial risk to investors' long-term returns.

On behalf of our clients, we engage with companies held by the Vanguard funds to understand how

they identify, monitor, and address material risks, including climate risks. We are strong proponents of disclosure by companies on material climate risks to their businesses, which we believe is central to the accurate pricing of securities and the fair and efficient functioning of our capital markets. And we provide investors with the information and products they need to make sound investment choices considering climate-related risks and opportunities.

Our TCFD reporting, including on our efforts as a corporate actor, is one important way we demonstrate our own commitment to disclosure. We hope you find this report informative. Our reporting will always be grounded in our deep commitment to investors and their financial well-being.

Introduction

Introduction

About Vanguard

Vanguard was founded in 1975 on the basis of a simple but revolutionary idea: An investment company should manage its funds in the best interests of its clients. Today we are one of the world's leading asset management companies, offering investment products, advice, and retirement services to individuals, financial professionals, and institutions.

What sets Vanguard apart in the industry is our unique mutual ownership structure. Vanguard is owned by our U.S.-domiciled funds, which in turn are owned by their investors. Our owners are at the heart of every decision we make, which is reflected in our core purpose: **To take a stand for all investors, to treat them fairly, and to give them the best chance for investment success.**

As a steward of our clients' assets, we engage with portfolio companies to better understand how material risks, including material climate risks that could affect the value of our clients' investments over the long term, are evaluated by their boards and reflected in their disclosures to the market. We view such stewardship activities as a natural extension of Vanguard's core purpose.

A focus on the individual investor

Vanguard serves tens of millions of individual investors who have chosen to entrust us with their hard-earned savings to invest for important goals, such as education, the purchase of a home, or retirement.

We manage our funds in the best interests of our clients to help them meet these financial objectives.

Our investors expect the mutual funds and exchange-traded funds (ETFs) we offer to meet the specific objectives set forth for those vehicles. Each portfolio is managed to meet a specific objective, follows well-defined strategies, and adheres to clear policies.

On behalf of our clients, we have an important role to play in understanding and advocating for appropriate disclosures of material financial risks such as climate change. Our firm's leadership, as well as the teams that develop, manage, steward, and oversee our investment products, are committed to doing so.

Vanguard's approach to climate risk

Climate change, and the ongoing global response, will have far-reaching economic consequences for companies, financial markets, and investors. Vanguard is committed to understanding and attending to material risks that can erode our investors' long-term returns, including climate-related risks. Our approach spans several key areas of focus.

Research on the market and economic implications of climate change

Vanguard has been conducting research to understand how climate change could affect the global economy and financial markets. In a 2022 paper, [The Economics of Climate Change](#), Vanguard economists used

consensus scientific data to assess the impact of climate change on economic activity under four scenarios for greenhouse gas emissions and resulting temperature increases. They found that the net impact on global GDP is negative in all scenarios.

Product choices for our investors

Our global investment product lineup includes more than 280 index mutual funds and ETFs and more than 120 actively managed funds and ETFs. For clients who seek them, we offer more than 30 investment products globally that have specific environmental, social, and governance (ESG) objectives. For investors who specifically want to limit exposure to carbon-

intensive industries, we offer ESG index funds that avoid or reduce exposure to such industries while seeking to achieve a broad market-like return.

Vanguard also offers actively managed ESG funds that seek to generate excess return by allocating capital toward companies that the fund managers deem as demonstrating leading ESG practices consistent with each fund's mandate. Although the investment methodology may vary by product and manager, assessing ESG-related risks and opportunities is central to the investment strategy of each of these actively managed ESG portfolios.

Introduction

Investment stewardship

Vanguard's Investment Stewardship program is responsible for voting proxies and engaging with company boards and management teams on behalf of Vanguard-advised funds.¹ As part of its work, the Investment Stewardship team seeks to understand how boards of directors oversee material risks, including material climate-related risks, to safeguard long-term investor returns. For portfolio companies where climate risk is a material risk, the Investment Stewardship team engages with them to understand how they disclose, oversee, and mitigate these risks.

Companies' disclosure of material financial risks is central to the accurate pricing of securities and the fair and efficient functioning of the capital markets. Efficient market functioning is particularly important for the index funds favored by many

Vanguard investors since these funds buy and hold the many securities included in the benchmark index.

Proxy voting and related portfolio company engagement for funds that are managed externally by third-party investment advisors, including Vanguard's actively managed equity funds, are handled by these external investment advisors.

Engagement with policymakers

Vanguard works with global policymakers to support the interests of long-term investors. Government leaders are specifically empowered and charged with considering the competing interests inherent in issues such as climate change and crafting public policy responses that will address the complex societal impacts and trade-offs. Given the potential impact of climate change on the global economy and investor returns,

it is important that policymakers provide clarity to individuals, companies, and the financial markets about government plans and targets to address climate risks.

Corporate goals and initiatives

Vanguard has a set of corporate goals and initiatives to make progress toward reducing carbon emissions in our global operations and reaching carbon neutrality as a company by 2025.

¹ Vanguard's Investment Stewardship program is responsible for proxy voting and portfolio company engagement on behalf of the quantitative and index equity portfolios advised by Vanguard (together, "Vanguard-advised funds"). Vanguard's externally managed portfolios are managed by unaffiliated third-party investment advisors, and proxy voting and engagement for those portfolios are conducted by their respective advisors.

Governance

In this section, we discuss Vanguard's approach to governance of climate-related risks and opportunities.

Governance

Vanguard addresses climate-related impacts and clients' best interests through an integrated structure of boards, committees, and functions.

Board oversight of climate-related risks and opportunities

The Vanguard Group, Inc. (VGI), is owned by our U.S.-domiciled funds, which in turn are owned by their investors. As of December 31, 2022, the VGI Board of Directors (VGI board) comprised 11 directors, 10 of whom were independent. Members of the board also serve as the U.S.-domiciled funds' Boards of Trustees (fund boards). The directors bring to each of these boards a wealth of executive leadership experience derived from their service as senior executives, board members, and leaders of diverse public operating companies, academic institutions, government agencies, and other organizations. The VGI and fund boards meet regularly throughout the year to fulfill

their functions and obligations. Management arranges periodic training for these boards on ESG matters.

The VGI board is responsible for, among other matters, setting broad policies for the company as well as overseeing risk management relating to Vanguard's corporate operations. Where applicable, these policies include consideration of material climate-related risks and opportunities.

The VGI board also oversees Vanguard's corporate goals and initiatives aimed at reducing our carbon emissions throughout our global operations and achieving carbon neutrality as a company by 2025.

In addition, the board's audit committee is made aware of relevant ESG risks as they materialize.

The fund boards engage on issues affecting the Vanguard funds' evaluation of ESG and sustainability matters and communicate with management to help inform an effective course of action. The fund boards also oversee the funds' risk management, including consideration of material climate-related risks, where appropriate. The level of ESG risk evaluation varies by investment style and fund objective.

The VGI board and fund boards oversee the various Vanguard functions that conduct day-to-day risk

Governance

management as applicable, including compliance, fund services and oversight, enterprise investment services, investment management, investment stewardship, legal, portfolio review, and risk management. In addition, the VGI board and fund boards have regular interactions with internal and external auditors.

Outside the U.S., the boards of our international businesses and fund entities exercise similar oversight responsibilities in their respective regions. Management matters considered and decided in the international regions are reported to the VGI board through global management committees. For a regional example, see "In focus: European ESG governance framework" on page 15.

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Board engagement on climate matters affecting our global product lineup

The fund boards oversee the proxy voting for Vanguard-advised funds and receive regular updates on investment stewardship activities, including voting and portfolio company engagement, from the Investment Stewardship team. The fund boards discuss key themes and emerging areas of risk identified through stewardship activities (for example, risks related to climate change) and provide guidance to the stewardship team on how to address those risks consistent with the funds' proxy voting policies and guidelines. The fund boards consider updates to those policies and guidelines as necessary to address new or evolving issues.

We believe that company boards are responsible for determining risk-mitigation approaches to maximize shareholder value and plan for an uncertain future. To the extent that legally binding or government-specified limits related to the [Paris Agreement](#)² have been established, we believe that companies should disclose how their targets and strategies are appropriate in the context of those factors. For example, many companies have set targets

aligned with the goals of the Paris Agreement. As shareholders, the Vanguard-advised funds seek to understand the implications of those commitments.

As part of the oversight process for our global investment product lineup, the boards meet directly with the managers of our actively managed funds as appropriate and receive reporting on their consideration of material climate-related issues as part of their ESG integration practices.

The fund boards also receive an annual update on the external advisors' proxy voting and approve their proxy voting policies and procedures. In addition to providing information regarding the external advisors' proxy voting policies and practices, the 2022 proxy voting report for the externally managed funds included a discussion of key focus areas in 2022 proxy voting, including significant shareholder proposals regarding climate change, and highlighted certain external advisors' proxy voting on those proposals.

² The Paris Agreement sets a goal of holding the increase in global average temperature to well below 2 degrees Celsius above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 degrees Celsius above pre-industrial levels.

Governance

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Vanguard's ESG governance structure

This diagram highlights elements of our current global ESG governance structure that have a specific connection to climate-related risks and opportunities.

Board of Directors

ESG CEO Council

Investment Products and Services

Stewardship of Portfolio Securities

Vanguard as a Corporate Actor

Global Investment Committee*

ESG Risk and Strategy Oversight Committee

Investment Stewardship Oversight Committee*

Environmental Sustainability Steering Group

ESG and Product Committee

Manager Oversight Committee

* Board-appointed.

Management's role regarding climate-related risks and opportunities

ESG CEO Council

Vanguard's ESG CEO Council oversees and coordinates our global strategy on ESG-related matters, including climate-related risks and opportunities, at both the corporate and product levels. Vanguard's chief executive officer serves as council chair, and its members include a subset of Vanguard's executive leadership team. The council meets regularly and reports to the VGI board and the fund boards as appropriate.

The council provides guidance, oversight, and coordination on ESG matters in service of client interests. It reviews and assesses long-term goals and key initiatives and holds teams accountable for progress throughout the company. The framework underlying the council is organized around three pillars: Investment Products and Services, Stewardship of Portfolio Securities, and Vanguard as a Corporate Actor.

Functions across Vanguard's global operations align to the pillars and provide reports to members of the council.

Risk and strategy oversight

The ESG Risk and Strategy Oversight Committee, composed of senior leaders across our product, communications, risk, and legal functions, is a new subcommittee of the ESG CEO Council that facilitates the council's oversight of global ESG matters through:

- Shared awareness of global ESG risks, strategic opportunities, and investment perspectives.
- Recommendations for responding to risks and opportunities.

The committee supports two of the three ESG CEO Council pillars: Investment Products and Services and

Stewardship of Portfolio Securities. By bridging both pillars, the committee aims to facilitate enterprise strategic alignment and clarify accountability.

Investment products and services

Vanguard takes a disciplined, long-term approach to product development and strategy, and our product governance structure is intended to cover material ESG risks and opportunities, including those that are climate-related. As an integral part of this process, Vanguard's Portfolio Review Department develops our global product strategy, monitors the performance of each Vanguard fund, and oversees the funds and their investment advisors to ensure that they follow defined investment objectives and collectively offer diverse investment exposures consistent with our investment philosophy.

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The Portfolio Review Department has regional teams that conduct product research and product management to evaluate local market conditions and assess local client preferences. The department typically convenes Vanguard's Global Investment Committee 11 times a year to engage on key issues relevant to product oversight. The committee's work includes making recommendations to the respective fund boards regarding such matters as new products, risk guidelines, and manager selection. Vanguard's chief executive officer serves as the committee chair, and members include senior leaders from Vanguard's investment, product, business, legal, and risk functions.

In addition, the Portfolio Review Department regularly meets with the ESG and Product Committee and the Manager Oversight Committee, both of which have significant overlap in membership with the Global Investment Committee. The ESG and Product Committee provides input and guidance on ESG and non-ESG product topics that are in the early stages of strategic evaluation, while the Manager Oversight Committee meets with current and prospective managers as part of the oversight and selection process. The work of these committees supports the product-related recommendations made to the Global Investment Committee and, ultimately, to the VGI board and the fund boards for review and approval as appropriate.

Stewardship of portfolio securities

On behalf of Vanguard-advised funds, including both ESG and non-ESG index funds, Vanguard's Investment Stewardship team is responsible for engagement with portfolio companies about material risks, including material ESG risks. This dedicated team of experienced professionals operates globally while employing a regionally focused model. The team engages directly with company executives and boards, votes proxies, and advocates for marketwide adoption of governance best practices.

Our Investment Stewardship Oversight Committee, at the direction of the fund boards, oversees the proxy voting and stewardship activity with respect

Governance

to the equity securities held in portfolios advised by Vanguard. The committee typically meets at least quarterly and regularly reviews stewardship practices and proxy voting policies, including those concerning material climate risks. Those reviews encompass topics such as changes to proxy voting policies, proxy season engagement and voting activities, and risk control processes. Any changes to proxy voting policies that the committee believes are appropriate are recommended to the fund boards, which review and assess those changes. The committee includes fund officers and senior executives from relevant functions. Regular reports are provided by the Investment Stewardship team to the VGI board, fund boards, and boards of our international entities, as appropriate.

Since 2019, the proxy voting responsibilities for externally managed Vanguard funds have been delegated to

the investment advisors for those funds—creating greater alignment of investment management and investment stewardship. A Proxy Oversight Team, which includes members of Vanguard's legal and portfolio review teams, conducts ongoing oversight to ensure that external advisors are consistently exercising their obligation to vote proxies. The Proxy Oversight Team also provides annual updates to the fund boards. The fund boards are required to review and approve each external advisor's proxy voting policies and procedures at least annually.

Vanguard as a corporate actor

Vanguard has established targets for operational sustainability to help responsibly manage and reduce our own environmental footprint. Execution of these efforts resides with several departments reporting to Vanguard's chief financial officer, including Global

Workplace Experience (GWx), the department responsible for buildings, transportation, energy and waste management, and other operational functions. GWx's Environmental Sustainability Steering Group sets both short- and long-term goals and priorities, incorporates sustainability activities into business planning, and monitors and tracks progress toward targets. Oversight of Vanguard's own sustainability goals and of progress on the corporate level resides with the VGI board. See "Vanguard as a company" on page 40 for more information.

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European ESG governance framework

In addition to our global governance structure, we have regional structures in place to navigate the market and regulatory environments within each of the jurisdictions in which we operate. The Vanguard companies in Europe include our U.K. entities, Vanguard Asset Management, Limited (VAM), and Vanguard Investments UK, Limited (VIUK), as well as other affiliates including Vanguard Group (Ireland), Limited, and Vanguard Group Europe GmbH (collectively, Vanguard Europe).

The Vanguard Europe boards play an active role in overseeing risk management, including ESG-related risks, within Vanguard Europe's overall business strategy, governance framework, and risk appetite. The Vanguard Europe boards oversee risk management of various functions, including compliance, fund accounting, financial reporting, fund administration, investment management, investment stewardship, legal, portfolio review, and regional risk management. The boards typically meet at least five times per year. They consider issues affecting Vanguard Europe's evaluation of ESG risk and strategy matters and engage with Vanguard's management to help determine an effective course of action. Management arranges for periodic relevant training to the boards on ESG matters.

The following climate and other ESG-related subjects have been considered by the VAM board or the VIUK board, or both, during 2022, with additional focus on the evolving regulatory landscape in Europe:

- Strategy for communicating Vanguard Europe's approach to addressing climate issues.
- Vanguard Europe's approach to engagement with portfolio companies, including on material climate risk oversight and disclosures and on assessment of shareholder proposals related to environmental and social matters.
- Training on ESG regulatory developments, including Vanguard Europe's approach to addressing and implementing regulation.
- Updates on Vanguard Europe's Sustainability Risk Policy and ESG governance framework.

European ESG Management Oversight Council

Vanguard Europe's recently established European ESG Management Oversight Council (ESG MOC) provides oversight of ESG risks and strategy in relation to Vanguard Europe that may impact the broader Vanguard enterprise and its investment products and services. The ESG MOC was formed

by, and reports into, Vanguard's European Leadership Team and the managing director of Europe.

The European head of our Portfolio Review Department chairs the ESG MOC, and the council's voting members include our European heads of investment management, risk management, finance, and legal. Its remaining members are ESG subject matter experts from across the European business. The council meets at least monthly and reports periodically to the European Leadership Team, managing director of Europe, Vanguard Europe boards, and other Vanguard European councils and forums, as appropriate.

The ESG MOC has the following responsibilities:

- Acting as the designated forum for oversight, harmonization, and direction-setting on ESG risk and strategy matters related to Vanguard's European business.
- Overseeing the integration of ESG considerations into Vanguard Europe functions and processes within the context of Vanguard's global approach to ESG investing and risk appetite.
- Reviewing U.K. and European Union sustainability regulations and the implementation of applicable requirements by Vanguard's European business.

Strategy

In this section, we discuss how Vanguard considers climate-related risks and opportunities across our business.

Strategy

We manage our business with a singular goal of creating long-term value for our clients.

Our client-centric strategy

Vanguard's strategy as a corporate actor and asset manager is grounded in our investor-owned structure. That means that everything we do is in the interest of giving our investors the best chance for investment success.

In support of our strategy, we have an important role to play in understanding and responding to risks and opportunities that impact our ability to serve clients and help them meet their financial goals.

At Vanguard, climate risk is not considered a discrete risk. Instead, climate change, and the resulting global response, is viewed as a potential root cause or driver of investment management, legal and regulatory, operational, strategic, and financial risks facing the organization, both near-term and long-term.

While the understanding of climate-related risks and opportunities continues to advance, much remains uncertain. As such, Vanguard approaches the topic with humility and always through the lens of the impact on the long-term investment returns of our clients.

Climate-related risks and opportunities

Consensus market expectations—as well as Vanguard's own economic analysis—indicate that changes to the climate and the resulting global response will have far-reaching economic consequences for companies and financial markets, and therefore for investors.

In general, organizations face both physical and transition risks from climate change. Physical risk involves the tangible impacts of climate change, including extreme weather events such as flooding, wildfires, and droughts. Transition risk involves

Strategy

the move to a low-carbon economy through policy, preferences, technology, and market changes.

Vanguard seeks to understand and monitor physical and transition risk drivers that may present material risks to our ability to serve our investors. Vanguard conducts ongoing investment, expense management, and operational oversight to modernize and maintain the resiliency of core infrastructure (such as computer systems and buildings) and to implement evolving regulatory and reporting requirements.

Figure 1 highlights examples of climate-related risks that Vanguard could face. We actively monitor these potential risks, and we remain confident in our time-tested approach for effectively managing risks such as these that could affect our clients' long-term investments.

FIGURE 1
Summary of climate-related risks

	Risk category	Risk description	Illustrative risk impacts	Driver type
Investment product and management	Investment management risk	Market, credit, and liquidity risks that impact returns or impede our ability to manage assets on behalf of clients	Mass market movements and decreased liquidity driven either by transitioning too suddenly and rapidly or too slowly.	Transition and physical
			Market repricing for climate risks as well as volatility may be seen in certain companies, sectors, and geographies.	Transition and physical
			Investors overallocate capital to climate-focused companies too quickly, leading to valuation anomalies that could increase volatility and impact long-term returns.	Transition
	Legal and regulatory risk	The risk of noncompliance with new or existing laws and regulations	Regulatory breach and legal costs associated with inaccurate disclosures related to climate objectives	Transition
	Operational risk	The risk to operations from inadequate or failed processes, people, systems, and service providers	Reputational damage related to holding non-ESG securities in ESG products because of data errors	Transition
			Business interruptions to Vanguard and third parties stemming from climate-related physical impacts	Physical
	Strategic risk	Risks related to management's ability to make appropriate business decisions to prepare for and react to the broader economic or regulatory environment	Investment product range fails to align with changing investor sentiment	Transition
			Government and political views on climate change and sustainable investing impact Vanguard's ability to attract investors and the success of products	Transition

(Continued on next page)

Strategy

While such risks are possible, efforts to adapt to climate change and encourage innovation may also present Vanguard with opportunities, such as those outlined in **Figure 2**.

Transition-related corporate and investment risks

In the near term, Vanguard considers transition risks to be a greater driver of enterprise risk than physical risks, as climate-related regulations and reporting requirements are evolving at different paces—and with varying degrees of complexity—in markets around the world.

We also consider transition risks to be a more pressing driver of risk for companies held in our products, with physical risks generally acting as a driver of longer-term risk. As governments and sectors diverge in climate policy approaches, and global markets approach key dates outlined in the Central Banks and Supervisors Network for Greening the Financial System ([NGFS](#)) scenarios, there is greater potential for transition risks driven by the emergence of disorderly transition scenarios.

Summary of climate-related risks (continued)

	Risk category	Risk description	Illustrative risk impacts	Driver type
Business operations and financial health	Legal and regulatory risk	The risk of noncompliance with new or existing laws and regulations	Increased financial costs because of complex global regulatory requirements	Transition
	Financial risk	Risks related to the organization's ability to manage its financial resources efficiently and responsibly	Loss of revenue from fund drawdowns as clients shift away from investment approaches lacking clear climate risk-mitigation strategies	Transition and physical
	Strategic risk	Risks related to management's ability to make appropriate business decisions to prepare for and react to the broader economic or regulatory environment	Staff skill sets prove inadequate to address climate-related challenges (e.g., failing to meet requirements or misinterpreting data and client needs)	Transition
			Regulations on climate change and sustainable investing interfere with Vanguard's ability to conduct business	Transition

FIGURE 2

Summary of climate-related opportunities

	Opportunity	Opportunity description	Illustrative opportunity impacts	Driver type
Investment product and management	Strategic	Investor demand for investment products and advice focused on climate change, ESG, or both	Meet client needs through a selection of ESG products that we believe have enduring investment merit and are consistent with our time-tested product design principles	Transition and physical
	Operational	Innovations stemming from addressing climate change foster increased efficiency	Operational efficiencies resulting in reduced operating costs	Transition
Business operations and financial health	Financial	Greater understanding of operational resiliency	Greater capital efficiencies and cost savings from right-sized risk management and risk transfer (e.g., insurance) activities	Transition and physical

Meeting investment needs of clients

Vanguard has an opportunity to meet the evolving investment needs of our clients, including through products that consider climate-related risks and opportunities.

Our product lineup includes both index and actively managed funds. Our index funds enable investors to construct broadly diversified portfolios and frequently serve as the core building blocks underlying our extensive array of multi-asset products. Our non-ESG equity index funds seek to track the performance of indexes that don't screen out ESG risks. However, ESG risks, including material climate-related risks, are considered when our Investment Stewardship team evaluates proxy proposals and engages with portfolio company boards and management. This team takes a case-by-case approach that evaluates each proposal in the context of the company, the materiality of the issue that is the subject of the proposal, the expected impact of the proposal

on the issue, and whether the proposal safeguards the long-term interests of investors in that company.

Some of our investment products are designed to pursue specific ESG goals and objectives for investors who prefer such an approach. Our exclusion-based ESG index products, for example, avoid or reduce exposure to specific industries, including many that are carbon-intensive, while still seeking to achieve market-like returns.

Our actively managed funds include several ESG-focused funds that aim to generate excess return by allocating capital to companies with leading or improving ESG practices. In each instance, these actively managed ESG funds account for climate considerations through their inclusion of specific net zero objectives.

As client interest in ESG investing has grown, we have taken steps to provide a greater selection of both

index and active ESG products that we believe have enduring investment merit and are consistent with our time-tested product design principles. In 2022, we launched 10 new ESG products globally, including three actively managed funds: a U.S.-domiciled fund investing in companies that contribute positively to environmental change and decarbonization and two others, one in the U.S. and one in Australia, both of which invest in companies that seek to contribute positively to solving social and environmental challenges.

We also offer many actively managed products that do not have ESG-specific mandates. The managers of these products have their own approaches to integrating material ESG risks, including material climate risks, into their investment processes.

Resilience of our strategy

Our strategy has always followed our unique U.S. mutual ownership structure—one that enables us to manage our funds and business in the best interests of our clients. We continually invest in people and technology to ensure we can serve our clients and remain operationally resilient at all times.

We remain confident in our approach to effectively managing risks that could affect our clients' long-term investments, including material risks resulting from climate change. Our engagement with portfolio companies as part of our Investment Stewardship program, our rigorous processes for selection and oversight of the managers of our actively managed funds, and our thoughtful approach to product development have served our investors well.

Vanguard's focus on long-term returns, rather than quarterly results, keeps our business resilient, even during challenging macroeconomic environments. We have captured positive net cash flows into our funds for 44 consecutive years, and our asset base is diversified across product type, asset class, and management style. We maintain a strong balance sheet and liquidity position, which are regularly monitored through stress testing to ensure we can withstand the financial implications of significant, unexpected events, including those resulting from climate change.

For a regional example of how our business evaluates the resilience of our strategy, see "In focus: Vanguard U.K. stress and scenario testing" on page 22.

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Vanguard U.K. stress and scenario testing

A key component of Vanguard U.K. (VAM and VIUK) risk processes is a material risk assessment of harms.

The assessment's objectives are to:

- Identify all material harms that could result from:
 - The ongoing operation of Vanguard U.K. business.
 - The winding down of Vanguard U.K. business.
- Identify the material risks facing Vanguard's U.K. business, clients, and financial markets.
- Assess the probability and potential impact of identified risks, including stress testing where appropriate.
- Assess and identify mitigating management actions and internal controls.

- Provide assurance to stakeholders as to the effectiveness of management actions relating to the level and nature of risks faced.

The material risk assessment of harms supports Vanguard U.K.'s overall risk life cycle and provides assurance that:

- Vanguard U.K. is able to remain financially viable throughout the economic cycle, with the ability to address any material potential harm that may result from its ongoing activities.
- Vanguard U.K.'s business could be wound down in an orderly manner, minimizing harm to customers and other market participants.

Vanguard U.K. has identified a series of severe but plausible risk scenarios, including ESG risk exposures, with which to stress-test our business. Stress testing

involves adjusting specific parameters that affect the financial position of Vanguard U.K., including but not limited to capital and liquid resources, income, and profit.

Our ESG stress test considers U.K. client demand for ESG products and how resilient Vanguard U.K.'s strategies are in terms of climate-related risks and opportunities, taking into consideration different climate-related scenarios, including a temperature rise of 2 degrees Celsius above pre-industrial levels (consistent with a transition to a low-carbon economy). These stress tests are maturing every year along with scenario analysis best practices and Vanguard's ability to assess associated ESG risks.

Risk management

In this section, we discuss how Vanguard identifies, evaluates, and manages climate-related risks and opportunities on behalf of our investors.

Risk management

Vanguard has a long history of thoughtfully managing risk to safeguard our clients' assets and best interests.

Identifying and assessing climate-related risks

As a matter of course, we seek to identify, assess, and mitigate risks from both a corporate and investment product management perspective, taking impact, probability, and urgency into account. In our experience, it is critical to continually evolve and refine the way each risk is considered.

Vanguard's risk-management life cycle has four key components: identification of risk, assessment of risk, management of risk, and monitoring and reporting of the risk environment. We see risk

management as an ongoing process and mindset moving continuously through each stage.

Vanguard embeds relevant ESG considerations into existing functions to ensure that ESG factors are considered alongside, not separately from, other matters important to serving our clients. Within our investment processes, we integrate material climate and broader ESG considerations where appropriate, as described further in this section.

Risk management

Our overall risk-mitigation approach is founded on three core lines of defense:

- **Vanguard's business units**, which include areas ranging from client-facing teams to shared service functions such as technology and finance, are responsible for the assessment of risks within their respective purviews and for the development of processes and control frameworks to mitigate potential impacts on Vanguard clients.
- **Vanguard's corporate risk functions**, including Global Risk and Security and the Office of the General Counsel, incorporate risk prevention across all areas of our operations and businesses.
- **Vanguard Internal Audit**, an independent and objective team directly accountable to the VGI board, assesses the adequacy of internal controls to enhance the governance and oversight of enterprise risks and risk management.

Business continuity

As a company dedicated to helping clients build and preserve wealth, Vanguard plans carefully and methodically to ensure a quick and smooth recovery in the event of an emergency or disruptive event, including climate-related events.

Vanguard's Enterprise Resiliency and Business Continuity Management group, within Global Risk and Security, oversees enterprise resilience and partners with business continuity teams in every division at all Vanguard sites globally. The group independently assesses and monitors business continuity to ensure that we can continue operations and serve our clients during natural disasters, weather-related events, and other potential disruptions.

Our integrated business continuity program

oversees enterprise resilience and provides crisis management, governance, and oversight to ensure employee, supplier, technology, and workspace resilience. The process has three major components:

- Identifying and mitigating risks.
- Documenting detailed business contingency plans.
- Executing comprehensive contingency tests.

In addition to regular planning, maintenance, and testing, we use several routine business strategies to ensure flexibility and resilience in our operations. For example, Vanguard runs key business functions from multiple geographic locations, which in turn reduces the risk of

Risk management

regional climate-related events and other disruptions. In another example, our Investment Management Group is global in nature. Our portfolio managers and investment analysts in different geographies work as one team. This approach enables us to leverage multiple time zones to extend the number of hours in a trading day and ensure business continuity. We have trading desks in two of our U.S. locations (Malvern, Pennsylvania, and Scottsdale, Arizona), as well as in the U.K. and Melbourne, Australia.

Managing climate-related risks within our investments

Relevant teams monitor material climate-related risks across our funds through our investment stewardship activities, ESG integration within the Vanguard-advised active strategies, and oversight of our external managers' ESG integration and engagement practices.

Investment stewardship

Vanguard's Investment Stewardship team carries out engagements with portfolio companies and votes proxies on behalf of Vanguard-advised funds, including Vanguard equity index funds and ETFs. Engagement and proxy voting for Vanguard's externally managed active funds are conducted by those funds' external advisors.

Vanguard-advised equity funds provide broadly diversified access to the global markets at a very low cost. Broad market diversification can include exposure to material risks, including climate risk. On behalf of the Vanguard-advised equity funds, and their investors, Vanguard's Investment Stewardship team monitors and promotes disclosure of material risks, including material climate-related risks.

This team engages directly with executives and board members of portfolio companies to better understand how the companies are addressing such risks. In 2022, the global Investment Stewardship

team engaged with 1,304 companies representing \$3.1 trillion in equity assets under management.

Rather than applying a sweeping, one-size-fits-all framework, the Investment Stewardship team takes a case-by-case approach to evaluating portfolio companies' governance practices and voting proxies. Decisions on how to vote all proxy ballot items, including climate-related proposals, are grounded in the funds' proxy-voting policies and our clients' long-term financial interests.

On behalf of the Vanguard-advised equity funds, the Investment Stewardship team looks for portfolio company boards to effectively oversee material climate-related risks and disclose those risks using widely recognized investor-oriented reporting frameworks. The Investment Stewardship team supports the framework created by TCFD for disclosing governance, strategy, risk management, and metrics and targets. Where climate change is a material risk for a company, the team

looks for a company's board to disclose the specific risks and to have strategies in place to oversee and mitigate those risks. Vanguard views such disclosure as central to the healthy and efficient functioning of capital markets. The team also evaluates the company's progress on any climate-related goals they have set.

While we look for company management and boards to mitigate material risks, the Vanguard funds do not dictate company strategy or operations. A company's board should be fully engaged, monitor progress toward company goals and targets, and ensure appropriate action. When risk-management gaps surface, the Investment Stewardship team seeks to engage with company directors and executives to understand the issues and advocate for enhanced governance practices. The funds may vote against directors if directors have failed to effectively identify, monitor, and manage material risks, inclusive of material climate risks.

CASE STUDY

Engaging with South African coal mining companies

In 2022, we engaged separately with two South African coal mining companies—Exxaro Resources (Exxaro) and Thungela Resources (Thungela). Our purpose was threefold: We established an open line of communication with company leaders to continue a constructive dialogue, developed a better understanding of each board's oversight of material climate risks and long-term strategy, and shared our perspective on effective disclosures.

At companies with significant exposure to thermal coal, we seek to understand the actions that boards take to identify and mitigate material risks related to the expected transition away from thermal coal in order to support the long-term value of Vanguard-advised funds' investments in these companies.

Exxaro leaders provided context regarding the company's approach to board refreshment and changes in board committees overseeing material business

risks. They explained that the areas of oversight of different committees create synergies and how different skills from each committee contributed to effective board dynamics. They noted a shifting organizational mindset from focusing on risks and compliance to assessing business resilience and opportunities.

Thungela's chair spoke about the experience, diversity of thought, and commitment of the company's relatively new board. We encouraged the company to consider potential improvements in public disclosures regarding the governance oversight processes of material climate risks to provide shareholders with increased transparency into these matters. We also encouraged measures to ensure that the board has access to relevant skills and expertise.

While recognizing the long-term implications of climate risk on their businesses in the coming decades, both

companies expressed confidence in the strong fundamentals of coal demand over the next 10 to 15 years as well as a determination to generate value from the favorable commodity price cycle to create value for shareholders. Leaders from both companies noted the importance of ensuring a transition from coal that balances social, economic, and environmental considerations, particularly in South Africa, which remains reliant on coal for its energy needs.

Both Exxaro and Thungela conveyed that they are focused on reducing their operational emissions according to published targets and that they recognize the critical roles that innovations, new technologies, and value chain partnerships will play in the energy transition. At the same time, the companies articulated that they were pursuing different strategic approaches and value propositions for investors. Exxaro stated it was developing a phased decarbonization plan and aimed to be, over time, a diversified company

providing energy and mineral resources for a low-carbon economy. Thungela said that its strategy was based on a view that coal supply would persist and that the company was not looking to diversify its portfolio but rather was focused on being a responsible owner and operator of coal mines.

We acknowledged the disclosures that the companies were providing to the market to help investors understand their approaches to governing and managing material climate risks. We asked how each company was considering updating its scenario analysis to account for evolving policies and regulation. We also encouraged closer alignment of climate-related disclosures with the TCFD recommendations to enhance consistency and comparability of both companies' reporting. Exxaro stated it would review its climate reporting during 2023. Thungela had previously committed to issuing a fully compliant TCFD report in 2023.

IN FOCUS

"Say on Climate" proposals

Say on Climate management proposals seek an advisory vote from shareholders on a company's approach to climate strategy.

A core principle of our Investment Stewardship program is that it does not seek to dictate company strategy or operations, including a company's climate strategy or execution thereof. Instead, the team looks to public company boards to articulate how a company's strategy is expected to generate shareholder value. The team is therefore concerned when a board puts forward a resolution that is framed as a vote on the company's strategy, as it could indicate an abdication of board responsibilities and diminish the board's accountability.

At the same time, Investment Stewardship recognizes that by enabling shareholders to vote on climate disclosures, companies can gather important feedback on how their

climate strategies are considered or perceived and shareholder expectations.

When companies put forward a Say on Climate vote, Investment Stewardship asks that they clearly articulate what shareholders are being asked to vote on; the team encourages boards to frame Say on Climate votes as an advisory vote on disclosures. Vanguard Investment Stewardship intends the votes of Vanguard-advised equity funds as a signal on the coherence and comprehensiveness of the reporting rather than as an endorsement of strategy or a lack of confidence in the plan itself.

In proxy year 2022, we observed an increase in the number of companies that presented and recommended support of Say on Climate resolutions at shareholder meetings. The majority of these resolutions were put forward by companies in Europe, South Africa, and

Australia that were operating in sectors exposed to material climate-related risks.

After thorough analysis of each proposal on a case-by-case basis, Vanguard-advised funds supported the Say on Climate proposals submitted by management at companies in the European, Middle Eastern, and African regions, which generally drew high levels of support from shareholders. We engaged with companies to better understand their boards' approaches to oversight of climate-related risks and attendant climate strategies. We also encouraged more robust disclosure of board oversight of material climate-related risks as well as disclosures in line with TCFD.

Conversely, the funds did not support Say on Climate management resolutions at two Australian energy companies, Santos Ltd. and Woodside Energy Group Ltd. In each case, we

reviewed the company's published climate transition plan and engaged with its board. While we recognized helpful context in each company's climate reporting, we questioned whether the disclosed risk-mitigation approach in each case was adequate to underpin a request for shareholder support of the climate reports at this time. We determined it was not in the best interest of funds' shareholders to support proposals that failed to comprehensively address the most significant area of material climate risk for either company in a meaningful way.

Risk management

CASE STUDY

Oversight of climate-related risks at Goldman Sachs

We engaged with leaders at Goldman Sachs, a U.S.-based financial services company, in advance of the company's 2022 annual meeting to discuss several matters on the ballot, including a shareholder proposal to adopt a policy that would ensure that Goldman Sachs' underwriting and lending activities did not contribute to new fossil fuel development. Through our engagement, we found that Goldman Sachs' directors spoke credibly and evidenced appropriate oversight of the company's climate-related risks and opportunities.

In our research, we reviewed Goldman Sachs' public disclosures and commitments related to climate risks. The company had committed to increasing disclosure on certain financed emissions, outlined a prioritized set of targets for 2030, and shared a detailed explanation

of its governance framework that provides oversight of climate-related risks. These disclosures offered further evidence of the board's sufficient oversight of potential financially material climate-related risks.

In reviewing the shareholder proposal, we had concerns that it was overly prescriptive. The suggested policy would have directed Goldman Sachs to not participate in certain underwriting and lending activities. In our view, creation and implementation of such a policy would fall within the purview of management; we viewed the proposed policy as giving the board insufficient latitude to determine how to implement the proposal. The Vanguard-advised funds do not seek to dictate company strategy or operations and believe such matters appropriately belong to the

company's management team under the oversight of its board. As a result of our assessment of the prescriptiveness, the funds did not support the proposal, which failed after receiving 11% support.

Risk management

2022 at a glance: Investment Stewardship activities on behalf of Vanguard-advised funds

1,304

Number of companies engaged

13,490

Companies where a
proposal was voted on

1,802

Total company engagements

184,521

Proposals voted on

Additional resources on investment stewardship at Vanguard

- [Investment Stewardship 2022 Annual Report](#)
- [Vanguard's approach to climate risk governance](#)
- [Proxy voting disclosures for Vanguard funds](#)

Piloting proxy voting choice for individual investors

In late 2022, Vanguard announced a pilot program to provide investors in a select number of its U.S.-domiciled equity funds with the opportunity to participate more directly in the proxy voting process. The program, which launched in February 2023, was made available to eligible investors in three U.S.-based equity index funds. Pilot participants were able to select from four proxy voting policy options. The program will help Vanguard identify the most efficient and effective mechanisms for enabling investors to express their views in the proxy voting process. As we test this approach, we will gather client and stakeholder feedback and explore the full range of options for individual investor involvement in proxy voting.

Investment management

Integration of climate risks and opportunities by our external advisors

The majority of Vanguard's active equity funds and active multi-asset funds are managed by external firms. In fact, 24 external asset management firms serve as investment managers and investment stewards for Vanguard's actively managed funds. Vanguard recognizes that each firm brings a different perspective to the way it assesses and oversees climate risk, including in funds that do not pursue explicit ESG objectives.

We work closely with each of our active managers to understand how they integrate ESG considerations into their investment process, and we have observed refinement as ESG data reliability has improved and the ESG landscape has continued to evolve. Ultimately, we are responsible for assessing how each manager's approach aligns with its investment process, which is designed to deliver strong investment outcomes for

our clients. Our approach to fund manager selection centers on what we believe to be the key drivers of investment success—firm, people, philosophy, and process. This approach provides our investors with diversity of thought and broader access to top investment talent. It also provides us with a unique perspective on the ways in which different active managers approach the investment process.

Vanguard's Portfolio Review Department regularly engages with current and prospective external fund managers. As part of these engagements, the team examines how managers incorporate financially material considerations, including climate change, into their security selection processes. The team considers how managers gather information, how their research efforts are structured to account for climate considerations, the extent to which they

consider both quantitative and qualitative factors in their analysis, and how they engage with portfolio companies. The team regularly reports on its findings and discussions to a subcommittee of Vanguard's Global Investment Committee and the fund boards.

The Portfolio Review Department holds these external investment managers to the highest standards to ensure that they remain focused on maximizing investment performance for our investors. Included in our ongoing assessment is the appropriate consideration and management of material financial risks, such as those posed by climate change.

Risk management

CASE STUDY

Wellington Management: Climate science integration in active management

Driver type: Physical risk

Wellington Management Company LLP oversees the largest amount of Vanguard assets among our external investment advisors, managing more than \$390 billion globally on behalf of Vanguard clients as of December 31, 2022.

Wellington's climate research team conducted a risk-based portfolio review as of October 2021, focused on physical climate risks. One holding identified as having potential risk exposure was HCA Healthcare because of the materiality of its physical assets and the geographic distribution of those assets. With support from the investment team, Wellington's ESG and climate analysts engaged with HCA's management team to discuss the company's preparedness for physical climate risks and its progress on emissions disclosure, both of which are financially material risks that have the potential to affect shareholder value.

Almost half of HCA's revenue comes from its hospitals in Florida and Texas, which face increasing hurricane and flooding risks. Wellington had previously encouraged the company to provide clearer disclosure of resiliency measures for potential business disruption from these physical risks. Wellington engaged with HCA again after the company's 2021 TCFD report was published in spring 2022.

In the report, HCA disclosed its initial climate-related risk assessment process. The company noted that it had learned from such events as Hurricane Harvey, which hit its hospitals in Houston in 2017, and that it had increased property-level resilience measures, such as bringing in backup energy capacity and building up water barriers. During this engagement, HCA discussed enterprise-level tactics, policies, and procedures to strengthen

future responses to extreme weather events and mentioned increasing integration of resilience considerations when building out new infrastructure. Wellington saw this enhanced preparation in action soon after; during Hurricane Ian in September 2022, HCA announced proactive patient transfers, closures, and service deferrals. Wellington views these as positive, proactive steps for patient safety that also shorten the time business is disrupted.

Wellington found that because results from climate models are often not easily digestible, many companies rely on historical data to inform their climate outlook. This makes it challenging to plan for potential increases in capital expenditures related to increasing frequency and severity of climate events. Following the dialogue with HCA,

Wellington's climate analysts followed up with [Woodwell climate maps](#) for future hurricane and flood risks to assist HCA with climate modeling across different time horizons and scenarios. Wellington also provided its Physical Risks of Climate Change (P-ROCC) framework, which seeks to provide guidance to companies to disclose their physical vulnerabilities and resilience measures, and thereby help investors better evaluate the ability of companies to adapt.

In total, Wellington's ESG and climate team gained conviction in the company's environmental risk-mitigation practices and trajectory toward better disclosure of emissions and transition risk. Wellington plans to continue to review HCA's progress on disclosure of physical risk resilience and emissions reduction plans.

Risk management

CASE STUDY

Baillie Gifford: Managing transition risk in context

Driver type: Transition risk

Baillie Gifford Overseas Ltd. is an Edinburgh, Scotland-based investment advisor, managing more than \$39 billion globally on behalf of Vanguard investors as of December 31, 2022.

Wayfair Inc. is a U.S.-based company that connects global suppliers of home furnishings with consumers. In addition to being an advanced e-commerce platform that enables buyers to find and visualize the products they want, it provides a series of "supplier services" covering transportation, warehousing, marketing, and product presentation. Suppliers can opt into these services, yielding a margin to Wayfair in exchange.

Baillie Gifford identified Wayfair as a climate and environment engagement priority beginning in 2020. As a platform that aggregates the (primarily) furniture

products of over 23,000 suppliers, many from Asia, and matches them with millions of customers, mostly in the U.S. and Europe, the company has sustainability-related opportunities across customers, suppliers, and its own operations. On the customer side, there are potential benefits to long-term demand if the company can help customers identify goods with sustainable credentials and understand the footprint and sourcing of the goods for which they are shopping. On the supplier side, emissions and sourcing tools could become additional, potentially high-margin services and add efficiency in areas such as inventory management and logistics. In relation to Wayfair's own operations, increases in carbon prices could give a competitive edge to companies with

efficient warehousing and distribution and access to low-carbon logistics.

From 2020 through 2022, Baillie Gifford engaged with Wayfair's CEO, head of sustainability, and chief operating officer on these topics. Their discussions ranged from the basics of data collation and reporting to the more strategic issues of supplier and customer needs and opportunities in freight and logistics.

Baillie Gifford was pleased to see Wayfair's inaugural corporate responsibility report, released in June 2022. It explores Wayfair's identified areas of sustainability focus: communities, employees, environmental impact, and supply chain. The company now discloses its direct (Scopes 1 and 2) greenhouse gas emissions and has begun estimating its indirect upstream

(Scope 3) footprint. It has set a target to reduce Scopes 1 and 2 emissions by 63% (absolute) from a 2020 base by 2035 and indicates that further disclosures and goals will be forthcoming.

In late summer 2022, Baillie Gifford again met with the company's head of corporate sustainability. This meeting was a working exchange of ideas covering emissions estimation, the evolution of the market for low-emissions freight, supplier engagement, and customer influence. Baillie Gifford was encouraged that Wayfair recognizes the potential business opportunities in these areas. Meanwhile, Wayfair continues to work on its supplier education programs and recently relaunched its Shop Sustainably platform for consumers. These conversations are ongoing.

Integration of climate risks in fixed income

All of Vanguard's fixed income index funds and the majority of its actively managed fixed income funds are managed by Vanguard Fixed Income Group (FIG). FIG has a formal integration process to incorporate climate-related and ESG risk factors into investment decisions for both internally managed active funds and index funds. These factors may range from macroeconomic considerations to issuer-specific challenges. FIG systematically assesses the financial materiality of ESG risks to complement standard credit assessment. FIG's credit research analysts regularly meet with issuers to discuss key credit risk topics and, where applicable, raise climate and ESG concerns. When appropriate, our fixed income team shares input with the Investment Stewardship team and holds joint engagements with portfolio companies. During these engagements, the team takes key measures to ensure proper handling of material nonpublic information.

CASE STUDY

Company: Volkswagen AG (Volkswagen)

In 2021, Vanguard FIG credit research analysts, alongside Vanguard's Investment Stewardship team members, met with the chairman of Volkswagen's supervisory board to discuss a range of matters. The teams focused on the board's risk-management efforts to help inform FIG's analysis of the company, taking into account the company's 2015 diesel emissions scandal, criminal proceedings, and special audit. The information gained during the meeting provided the credit research analysts with a comfort level regarding key risk information being reported to the board, and the analysts had an improved outlook for Volkswagen's governance and compliance regarding greenhouse gas emissions targets.

FIG's credit research analysts also engaged with several Volkswagen company representatives at the Credit Agricole CIB (Corporate and Investment Bank) Auto Credit Day 2022 conference in Paris. Analysts discussed a range of topics including gas shortages, supply chains, interest rates trajectory, and union negotiations around pay and financials, as well as fleet- and company-level carbon dioxide (CO₂) emissions. The analysts had determined that the fleet CO₂ emissions posed a material financial risk to Volkswagen in light of applicable legislation and targets from the European

Union (E.U.) related to these emission types (where noncompliance can lead to material fines). This year's engagement confirmed the FIG analysts' views that Volkswagen is well positioned to avoid future E.U.-imposed penalties on its fleet CO₂ emissions (which would impact its credit profile), partly because of a successful rollout of electric vehicle models. The E.U. has established CO₂ emissions targets for the entire E.U. fleet of each automaker, and each year those targets become more challenging to meet. Company representatives shared that Volkswagen continues to reduce the average CO₂ emissions in its passenger cars to remain compliant with E.U. targets, and management expects an increase in electric-vehicle orders that will meet E.U. fleet emission targets going forward.

These engagements enabled our credit team to understand the limited downside risk related to significant fines from the E.U., helping to affirm our positive view of the firm's credit standing. FIG's credit research analysts will continue to engage with company management regarding progress on stated targets and compliance with E.U. requirements.

Metrics and targets

In this section, we discuss the metrics and targets we use to assess climate-related risks and opportunities.

Metrics and targets

One of our most important responsibilities to our clients is clear, accurate, and useful disclosure about risks in Vanguard funds.

Measuring climate-related risks and opportunities

Climate data and metrics remain a rapidly evolving area. We are exploring the benefits and limitations of various climate metrics for our investors. We also acknowledge the growing global scrutiny and regulation of climate-related disclosures as well as the increasing demand for ESG data among a subset of our clients. Vanguard continues to build out its data capabilities to meet regulatory reporting obligations and client preferences.

In terms of our investment processes and stewardship activities, we focus on material climate-related risks as they relate to the overall risk exposure of our underlying portfolio companies. Vanguard views corporate disclosures—including disclosures pertaining to climate matters—through the lens of materiality to the firm's long-term value, and we focus on the risks that are most relevant to specific companies while acknowledging

that those risks might evolve over time. Disclosure and assessment of material risks, including climate-related risks, are important for price discovery and returns. As disclosure of material climate-related risks improves, we believe that security prices will more accurately reflect these risks and that all investors will benefit.

For our equity index products, our Investment Stewardship team uses climate metrics disclosed at the company level to inform its engagements and proxy votes on material climate risk matters. We undertake these activities with a long-term perspective and with the objective of safeguarding and enhancing investor returns over time. The Investment Stewardship team in some instances supplements disclosed company metrics with climate metrics provided by third parties.

For our actively managed funds, corporate disclosures about climate risks and opportunities can inform the investment decisions of portfolio managers. The managers incorporate such disclosures into their investment processes and engagement strategies. Each manager's approach to the use of climate metrics is part of our Portfolio Review Department's ongoing oversight of our investment advisors.

Metrics and targets

IN FOCUS

In Europe, in response to the evolving regulatory environment, we continue to consider how to integrate sustainability risk data into our enterprise and investment risk-management frameworks. In our 2021 TCFD report, we described our first climate change scenario analysis exercise, which was designed to help us obtain a deeper understanding of climate impact in different sectors of the capital markets. Since then, we've employed scenario analysis in our climate-related research and in U.K. ESG stress testing required by regulation, highlighted on page 22 of this report. These use cases are sharpening our understanding of the various tools and methodologies and will inform our future approach to scenario analysis. Additionally, climate metrics are disclosed in our 2022 U.K. TCFD entity and fund-level reports.

Figure 3 illustrates climate-related metrics that are used in our U.K. TCFD disclosures or are being considered for integration into sustainability risk disclosures in Europe.

FIGURE 3

Summary of climate-related metrics within U.K. TCFD disclosures or under consideration for European sustainability risk integration

Metric	Helps to answer the question	Definition
Total carbon emissions	How many metric tons of carbon dioxide equivalent (tCO ₂ e) emissions is the portfolio responsible for?	Greenhouse gas (GHG) emissions (Scopes 1 and 2) multiplied by the current value of investment divided by the issuer's enterprise value including cash (EVIC). It is based on the absolute GHG emissions associated with a portfolio, expressed in tCO ₂ e.
Total carbon footprint	How much tCO ₂ e in emissions is the portfolio responsible for per million dollars invested?	Total carbon emissions for a portfolio normalized by the market value of the portfolio, expressed in tCO ₂ e per \$1 million invested.
Weighted average carbon intensity (WACI)	What is the portfolio's exposure to carbon-intensive companies?	A portfolio's exposure to carbon-intensive companies, expressed in tCO ₂ e per \$1 million in revenue; reflects the carbon intensity of a portfolio across asset classes.
Climate Value-at-Risk (Climate VaR)	How is the portfolio impacted in different climate scenarios?	A forward-looking climate risk metric that assesses how a company's valuation could be impacted by climate policy risks and physical climate risks and could benefit from a low-carbon technology transition.
Implied Temperature Rise (ITR)	How well do public companies align with global temperature goals?	The ITR estimates the global implied temperature rise (in the year 2100 or later) if the entire economy had the same carbon budget overshoot or undershoot as the portfolio in question. The portfolio-level ITR compares the sum of "owned" projected GHG emissions, including Scope 3, against the sum of "owned" carbon budgets for the underlying fund holdings.

Note: For U.K. product-level disclosures, as mandated by the Financial Conduct Authority effective in 2022, we adopted the Climate VaR and ITR metrics given their wide adoption within the financial sector. At the same time, we acknowledge the limitations of both metrics, including the static nature of the assessment and the heavy reliance on multiple assumptions.

Metrics and targets

ESG products and net zero objectives

Vanguard has been thoughtful and deliberate in building out our ESG product lineup by ensuring that each new fund addresses investors' enduring needs. Our product development approach relies on a rigorous set of design principles. These principles require assessment of each product proposal based on investment merit, client needs, any competitive advantage, and any legal, regulatory, or operational constraints. Only after a multitier approval process, as outlined in "Management's role regarding climate-related risks and opportunities" on pages 12 and 13, do we proceed with a launch.

The ESG funds we have launched in recent years include a number of actively managed equity products that are aligned with a temperature rise of less than 2 degrees Celsius above preindustrial levels, meaning that, as part of the fund design, they are constructed to meet net zero objectives. The external managers of these active funds each determine their own interim targets and methodology for alignment, consistent with the fund's strategy. Their approach is disclosed in the fund's prospectus, and the targets are monitored by both the manager and Vanguard.

Vanguard as a company

In this section, we discuss our goals and progress regarding environmental sustainability in our business operations.

With more than 20,000 crew members around the world, Vanguard is committed to reducing our global carbon footprint and managing climate-related risks to our operations.

Measuring progress on operational climate risks

Vanguard's corporate climate strategy seeks to reduce our firm's own climate impact, invest in sustainable solutions, and engage our crew (our name for employees). Our sustainability goals and operational targets are outlined in this section.

In 2022, we continued to use 100% renewable energy globally in owned properties, a goal we first achieved in 2021, and we also achieved that goal in leased properties where Vanguard has operational control. Where possible, our buildings are powered by on-site

renewable energy and direct renewable energy from the utility supplier. Where direct renewable energy from the utility supplier is unavailable, our approach includes purchasing renewable energy certificates.

Our 2022 emissions increased as our crew began returning to the office after working remotely during the COVID-19 pandemic. However, emissions and our other climate-related metrics improved relative to the 2019 baseline levels, as shown on page 42.

Climate-related goals for our global operations

Goal	Date established	Target completion	Status
Achieve 100% renewable energy in our global operations.	January 2020	2021	Achieved 100% renewable energy in 2021 and 2022. Goal shifts to maintaining 100% use of renewable energy moving forward.
Reach carbon neutrality throughout our global operations.	January 2020	2025	71% carbon neutral by year-end 2022.

Vanguard as a company

Update on 2025 reduction targets

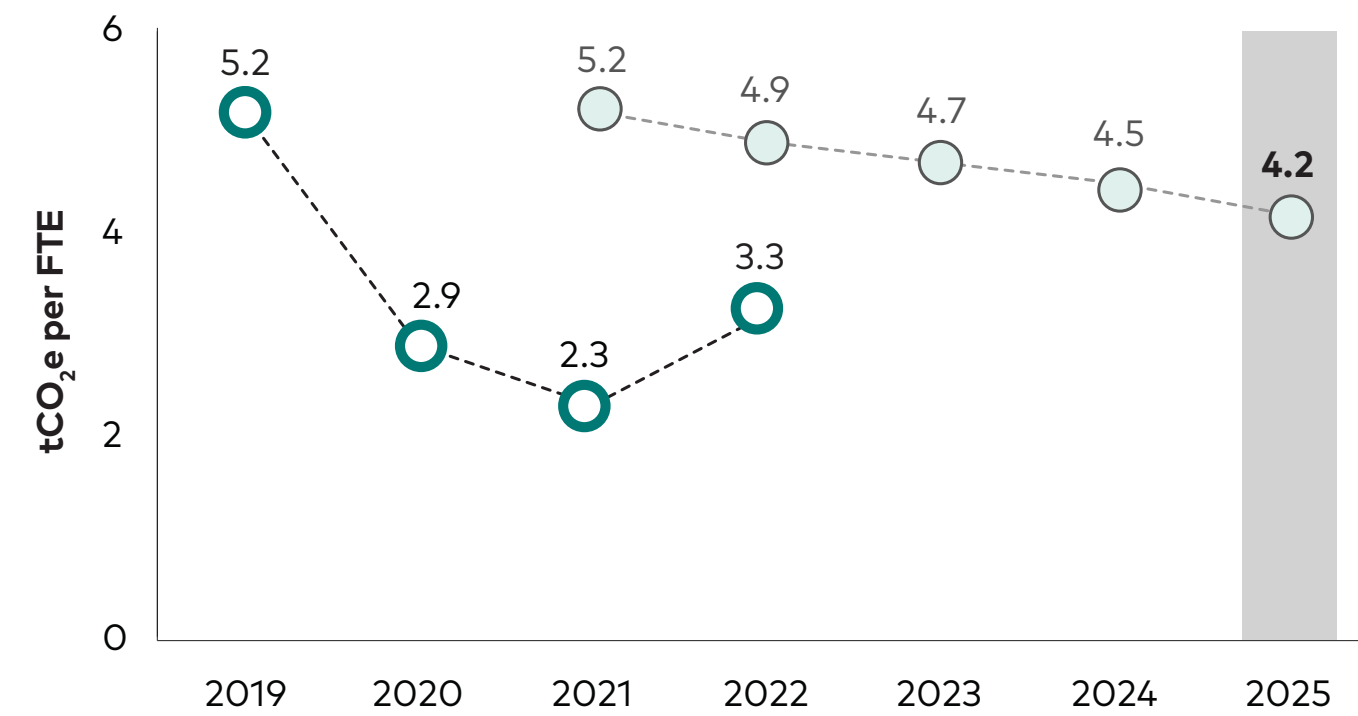
Vanguard understands the importance of reducing our own climate impact. As a result, we have adopted four reduction targets for 2025, based on 2019 baseline levels:

- Reduce carbon emissions by 20%, measured in metric tons of carbon dioxide equivalent (tCO₂e) per full-time equivalent (FTE).
- Reduce electricity usage by 5%, measured in kilowatt-hours per square foot of space under operational control.
- Reduce water usage by 20%, measured in gallons per square foot of space under operational control.
- Divert 80% of waste from landfills.

The adjacent charts show actual results through 2022 and targets through 2025.

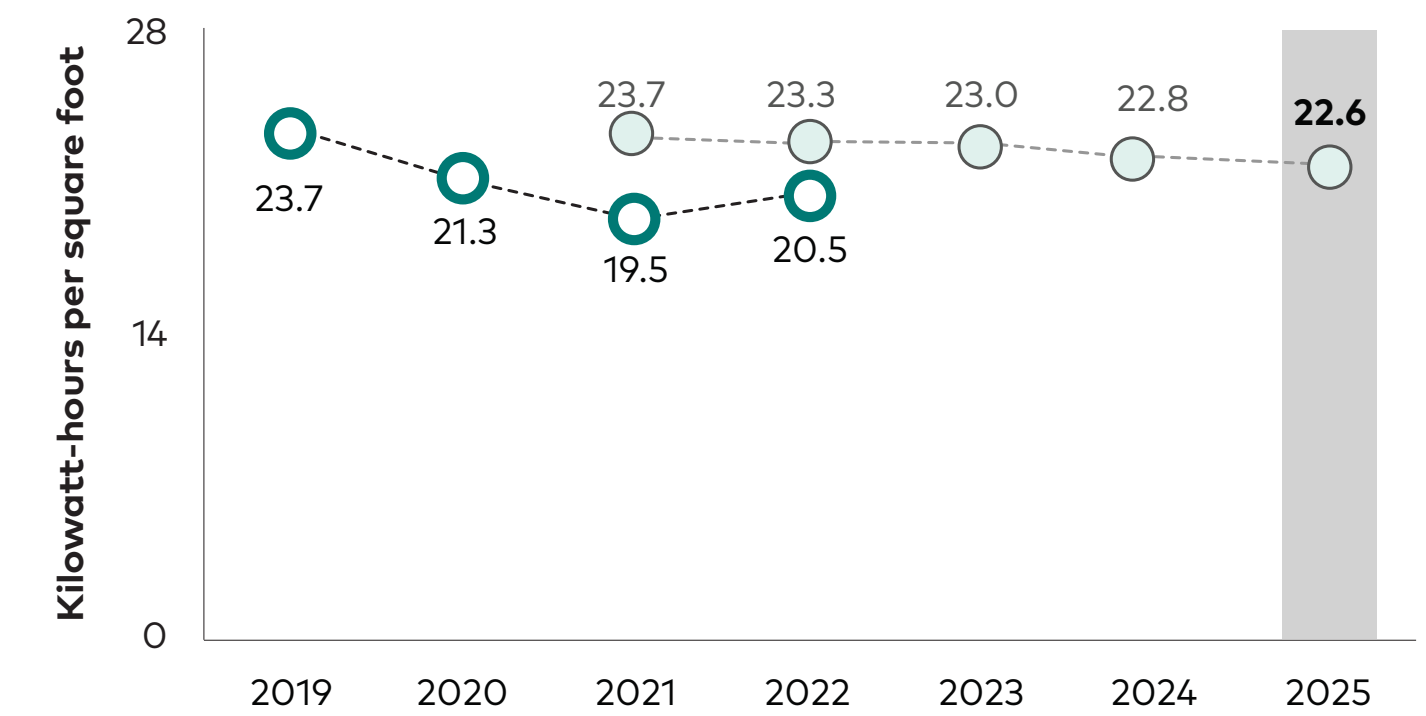
Emissions reduction

 **20%** reduction



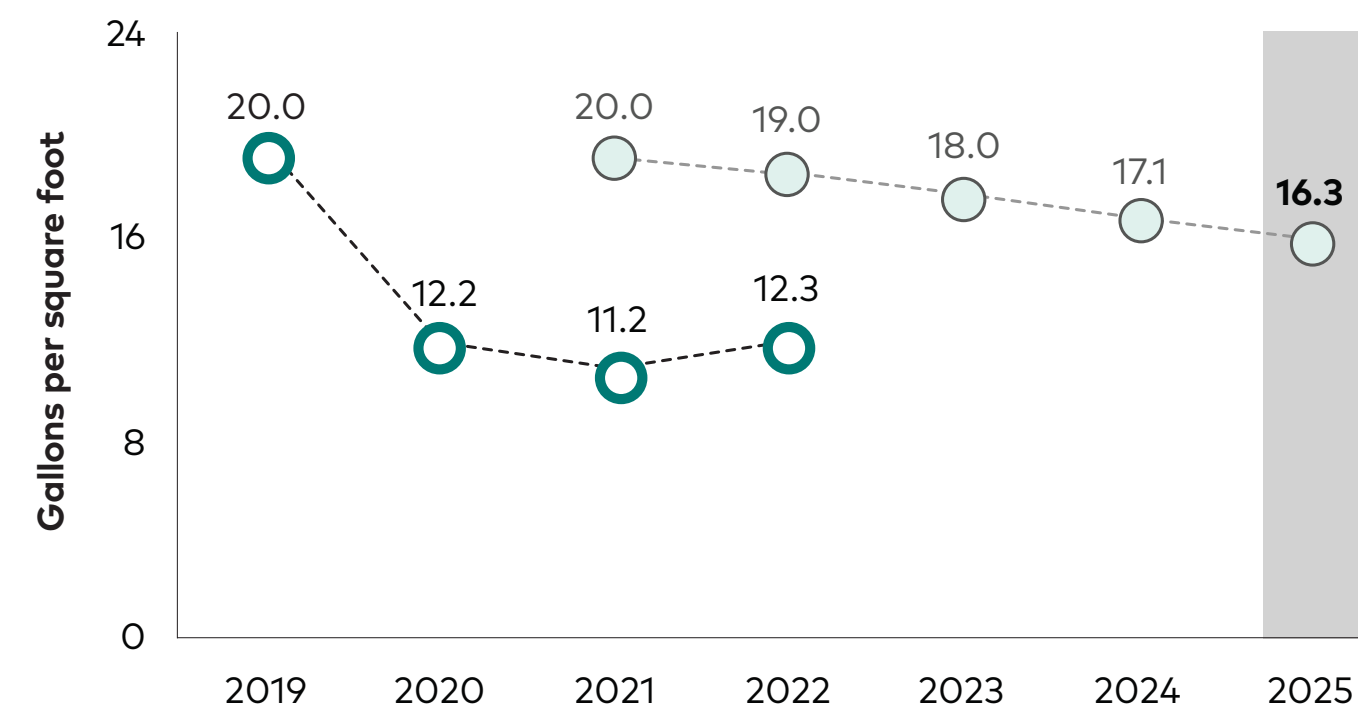
Electricity reduction

 **5%** reduction



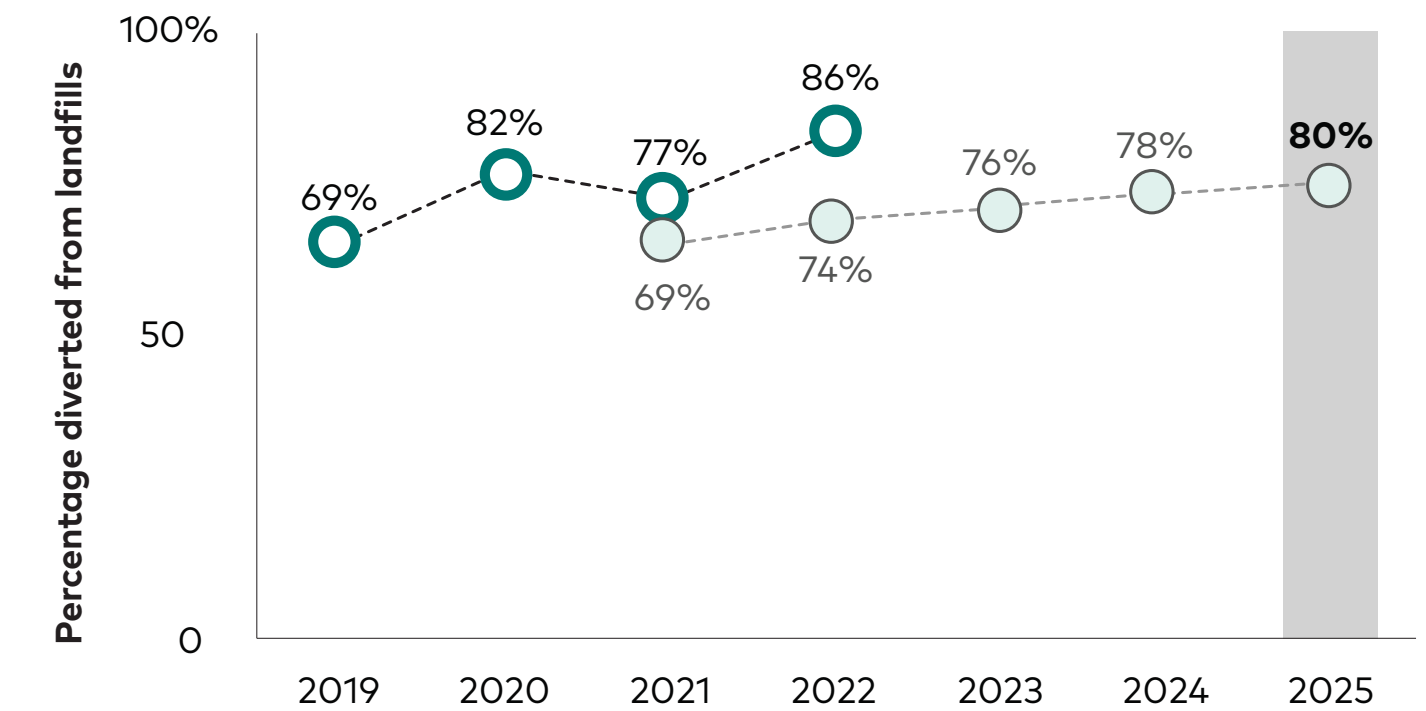
Water reduction

 **20%** reduction



Waste diversion

 **80%** diversion



● Actual result ○ Target

Source: Vanguard

Vanguard as a company

How we reduce our climate impact and engage our crew

Green building criteria and certifications are integral to our corporate building design standards. As of December 31, 2022, 18 buildings—or nearly 30% of the buildings across our global locations—were either LEED- or BREEAM-certified.³ Of the 18 buildings, eight were new certifications for Vanguard in 2022.

We continued to upgrade exterior lighting, adding 749 more LED lamps that are expected to save 725 megawatt-hours (MWh) of electricity annually on top of the 726 MWh of savings from upgrades the prior year. Additionally, we are a member of the U.S. Environmental Protection Agency's Green Power Partnership, which seeks to increase voluntary use of electricity produced from renewable energy resources.

We offer programs to encourage the use of low-carbon transportation, including about 70 free electric

vehicle charging ports adjacent to our buildings, shuttles between campuses and to and from public transit, and pretax deductions for public transit costs. Our electric vehicle chargers are powered by 100% renewable energy, resulting in reduced commuting emissions of 227 tCO₂e and saving over 37,000 gallons of gasoline. Additionally, we have begun to add electric vehicles to our maintenance fleet.

In 2022, we introduced a program offering U.S. crew an incentive toward the lease or purchase of a hybrid or electric vehicle. As of December 31, 2022, nearly 470 crew had taken advantage of this incentive. Our crew also participate in various educational events such as our speaker series, Earth Day activities, and our employee-led Green Teams throughout the year.

IN FOCUS

A LEED project

The Theseus building on our Malvern, Pennsylvania, campus is the first Vanguard-owned building to achieve LEED Interior Design and Construction Silver certification. Its sustainable features include water-efficient faucets, toilets, and showers, which reduce water usage by approximately 46% compared with the previous systems. Adding more energy-efficient lighting reduced electrical usage by 25%, saving approximately 113 MWh annually. Indoor air quality was enhanced with the installation of an updated ventilation system that is highly effective at capturing contaminants.

³ LEED (Leadership in Energy and Environmental Design) is administered by the U.S. Green Building Council; BREEAM (Building Research Establishment Environmental Assessment Methodology) is administered by BRE Global, a subsidiary of the U.K.-based BRE Group.

Renewable energy and carbon offsets

In 2022, Vanguard purchased over 110,000 MWh of renewable energy, which resulted in a reduction of more than 34,000 tCO₂e.

As a company, we supported three cost-efficient and diversified carbon-offset projects in 2022 that offset 24,500 tCO₂e. These projects were selected to align with the interests of our clients, crew, and communities and represent both U.S. and global efforts with multiple benefits, including and in addition to carbon avoidance and removal:

United States: Clinton Landfill Gas Collection and Combustion Project

Registry: *Verra Verified Carbon Standard*
Project type: *Landfill gas*

The project supports a landfill gas collection and utilization project at the Clinton Landfill in DeWitt County, Illinois. The project includes methane capture and destruction with Caterpillar generators to convert the methane to biofuel. As a direct result, the surrounding community benefits from improved air quality and reduced odor.

United States: Davidson County Landfill Gas Destruction Project

Registry: *Verra Verified Carbon Standard*
Project type: *Landfill gas*

The project supports a landfill gas collection and utilization project at the Davidson County Landfill in Lexington, North Carolina. The project includes methane capture and destruction with an electricity generator set, and a single open flare as a backup. As a direct result, the surrounding community benefits from improved air quality and reduced odor.

Kenya: Paradigm Clean Cookstove Project

Registry: *Verra Verified Carbon Standard*
Project type: *Improved cookstoves*

The project distributes fuel-efficient cookstoves to replace wood and charcoal stoves, which will cut toxic pollution emissions by up to 70%, reduce fuel use by 50%, and generate electricity for mobile phone charging and home lighting. Other benefits include protecting forests, reducing indoor air pollutants, and improving home safety.

Disclosure of Scopes 1, 2, and 3 greenhouse gas emissions

Greenhouse gas emissions (tCO ₂ e)		2020	2021	2022
Scope 1	Emissions	3,240	3,683	4,375
Scope 2	Electricity emissions—location-based*	39,707	37,271	34,361
	Total electricity emissions—market-based**	20,431	0	0
Scope 3	Emissions	21,894	16,251	44,699
Total carbon emissions	Scopes 1, 2, and 3 (location-based)[†]	64,841	57,205	83,435
	Total reported emissions[‡]	45,565	13,934	24,573

Notes: Vanguard's operational carbon emissions have been assured by ERM CVS, a third-party sustainability analysis provider. Assurance is based on the International Standard on Assurance Engagements (ISAE 3000).

* Emissions from electricity before we purchased renewable energy certificates.

** Emissions from electricity after we purchased renewable energy certificates.

[†] Total emissions before any purchased renewable energy certificates and carbon offsets.

[‡] Total reported emissions = (Scope 1 + Scope 2 market-based + Scope 3) – purchased carbon offsets.

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Emissions went up in 2022 as many of our crew returned to offices but remained below 2019 baseline levels, as shown on page 42.

By 2025, we intend to avoid, reduce, or offset all Scopes 1 and 2 emissions, as well as emissions from a number of Scope 3 categories,⁴ including purchased goods and services,⁵ fuel- and energy-related activities, waste generated in operations, business travel, employee commuting, and upstream leased assets.⁶

⁴ Scopes 1, 2, and 3 are as defined by the [Greenhouse Gas Protocol](#). Scope 1 refers to all direct greenhouse gas (GHG) emissions. Scope 2 refers to indirect GHG emissions from consumption of purchased electricity, heat, or steam. Scope 3 refers to other indirect emissions not covered in Scope 2 that occur in a company's value chain, including both upstream and downstream emissions.

⁵ Includes only shuttle, security, and other service vehicles.

⁶ Scope 3 data do not include Vanguard fund investments.

2022 TCFD disclosure status

2022 TCFD disclosure status

The TCFD recommends disclosure in four primary areas—governance, strategy, risk management, and metrics and targets. This table contains a summary of our plans and progress in each of the relevant areas.

	Pillar/recommendation	Summary
Governance: Disclose the organization's governance around climate-related risks and opportunities.	(a) Describe the board's oversight of climate-related risks and opportunities.	The Vanguard Group, Inc., board of directors is responsible for broad company policies, including consideration of material climate-related risks and opportunities. The boards of trustees of our U.S.-domiciled funds oversee fund-related matters, including environmental, social, and governance (ESG) considerations and material climate-related risks. Outside the U.S., the boards of our international businesses and fund entities provide similar oversight and have decision-making authority in their respective regions. See "Board oversight of climate-related risks and opportunities" on page 9. Our global ESG governance structure includes an integrated network of committees and functions with a specific connection to climate-related risks and opportunities. See "Vanguard's ESG governance structure" on page 11.
	(b) Describe management's role in assessing and managing the climate-related risks and opportunities.	Our ESG CEO Council, chaired by the chief executive officer, has global oversight of climate-related risks and opportunities. The council is structured around three pillars—Investment Products and Services, Stewardship of Portfolio Securities, and Vanguard as a Corporate Actor. The ESG Risk and Strategy Oversight Committee, a subcommittee of the council, facilitates its oversight. See "Management's role regarding climate-related risks and opportunities" on page 12. In Europe, Vanguard's recently formed European ESG Management Oversight Council oversees ESG risks and strategy for the company's European businesses. See "European ESG governance framework" on page 15.
Strategy: Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material.	(a) Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.	In the near term, Vanguard expects transition risks to outweigh physical risks as a driver of risk both for our organization and the companies held in our product portfolios. With climate-related regulations and reporting requirements evolving at varying paces around the world, there is greater potential for impacts from transition risks driven by the emergence of disorderly transition scenarios. We anticipate that physical risks will act as a driver of longer-term risks. See "Climate-related risks and opportunities" on page 17.
	(b) Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning.	The potential impacts of climate-related risks include higher operational costs related to complying with complex global regulatory requirements. Potential opportunities include meeting increased client demand for ESG products that we believe have enduring investment merit and are consistent with our time-tested product design principles. See "Summary of climate-related risks" on page 18 and "Summary of climate-related opportunities" on page 19.
	* For asset managers: Describe how climate-related risks and opportunities are factored into relevant products or investment strategies.	Climate-related impacts are considered in the management of our funds through engagement with portfolio companies and integration of ESG risks as appropriate and in some instances specifically as part of the product design. See "Meeting investment needs of clients" on page 20.
	* For asset managers: Describe how each product or investment strategy might be affected by the transition to a low-carbon economy.	We consider transition risks to be a greater driver of enterprise risk than physical risks in the near term, as climate-related regulations and reporting requirements are evolving at different paces—and with varying degrees of complexity—in markets around the world. We also consider transition risks to be a more pressing driver of risk for companies held in our product portfolios, with physical risks acting as a driver of longer-term risk. See "Transition-related corporate and investment risks" on page 19.
	(c) Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	Our strategy has always followed our unique U.S. mutual ownership structure—one that enables us to manage our funds and business in the interests of our clients and with a long-term perspective. Our structure reinforces the resilience of our strategy, ensuring that we remain aligned to our clients' interests. See "Resilience of our strategy" on page 21. In the U.K., we have conducted ESG stress testing to assess our ability to remain financially viable throughout the economic cycle. See "Vanguard U.K. stress and scenario testing" on page 22.

2022 TCFD disclosure status

	Pillar/recommendation	Summary
<p>Risk management:</p> <p>Disclose how the organization identifies, assesses, and manages climate-related risks.</p>	<p>(a) Describe the organization's processes for identifying and assessing climate-related risks.</p>	<p>As a matter of course, we seek to identify, assess, and mitigate risks from both a corporate and investment product management perspective, taking impact, probability, and urgency into account. Vanguard's risk-management life cycle has four key components: identification of risk, assessment of risk, management of risk, and monitoring and reporting of the risk environment. We see risk management as an ongoing process and mindset moving continuously through each stage. See "Identifying and assessing climate-related risks" on page 24.</p>
	<p>* For asset managers: Describe, where appropriate, engagement activity with investee companies to encourage better disclosure and practices related to climate-related risks in order to improve data availability and asset managers' ability to assess climate-related risks.</p>	<p>On behalf of the Vanguard-advised equity funds, the Investment Stewardship program believes portfolio company boards should effectively oversee material climate-related risks and disclose those risks using widely recognized investor-oriented reporting frameworks. For Vanguard's externally managed funds, investment stewardship activities are carried out by the funds' respective managers. We support the disclosure framework created by the TCFD. See "Investment stewardship" on page 27.</p>
	<p>* For asset managers: Describe how material climate-related risks are identified and assessed for each product or investment strategy. This might include a description of the resources and tools used in the process.</p>	<p>Vanguard's Investment Stewardship team carries out engagements with portfolio companies and votes proxies on behalf of Vanguard-advised funds, including Vanguard equity index funds and ETFs. See "Investment stewardship" on page 27.</p> <p>Our external advisors serve as investment managers and investment stewards for the majority of our actively managed equity funds, each bringing a different perspective to assessing and overseeing climate risk, including in funds that do not pursue explicit ESG objectives. See "Integration of climate risks and opportunities by our external advisors" on page 32.</p> <p>Vanguard Fixed Income Group (FIG), which manages most of our fixed income funds, has a formal integration process to incorporate climate-related and ESG risk factors into investment decisions for both internally managed active funds and index funds. FIG systematically assesses the financial materiality of ESG risks to complement standard credit assessment. See "Integration of climate risks in fixed income" on page 35.</p>
	<p>(b) Describe the organization's processes for managing climate-related risks.</p>	<p>Relevant teams monitor material climate-related risks across our funds through our investment stewardship activities, ESG integration within the Vanguard-advised active strategies, and oversight of our external managers' ESG integration and engagement practices. See "Managing climate-related risks within our investments" on page 26.</p>
	<p>* For asset managers: Describe how the organization manages climate-related risks for each product or investment strategy.</p>	<p>The majority of Vanguard's active equity funds and active multi-asset funds are managed by 24 external asset management firms. We hold these managers to the highest standards to ensure that they remain singularly focused on maximizing investment performance for our investors. The appropriate consideration and management of material financial risks, such as those posed by climate change, is part of our ongoing assessment of these firms. See "Identifying and assessing climate-related risks" on page 24.</p>
	<p>(c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.</p>	<p>Vanguard's overall risk-mitigation approach is founded on three core lines of defense: our business units, our corporate risk functions, and our independent Internal Audit team. See "Identifying and assessing climate-related risks" on page 24.</p>

2022 TCFD disclosure status

	Pillar/recommendation	Summary
<p>Metrics and targets:</p> <p>Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.</p>	<p>(a) Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk-management process.</p>	<p>For our equity index products, our Investment Stewardship team uses climate metrics disclosed at the company level to assess potential material risks to long-term investments and to inform its engagements and proxy votes. The team undertakes these activities with the objective of safeguarding and enhancing long-term investor returns. In some instances, the team supplements disclosed company metrics with climate metrics provided by third parties. For the Vanguard-advised active funds, corporate disclosures about climate risks and opportunities inform the investment decisions of portfolio managers. The managers incorporate such disclosures into their investment processes and engagement strategies, including their use of scenario analysis. See "Measuring climate-related risks and opportunities" on page 37.</p>
	<p>* For asset managers: Describe metrics used to assess climate-related risks and opportunities in each product or investment strategy. Where relevant, also describe how these metrics have changed over time. Where appropriate, provide metrics considered in investment decisions and monitoring.</p>	<p>In Europe, we've employed scenario analysis in our climate-related research and in U.K. ESG stress testing as required by regulation. These use cases are sharpening our understanding of the various tools and methodologies and will inform our future approach to scenario analysis. Additionally, climate metrics are disclosed in our 2022 U.K. TCFD entity-level and product reports. See "Summary of climate-related metrics within U.K. TCFD disclosures or under consideration for European sustainability risk integration" on page 38.</p>
	<p>* For asset managers: Where appropriate, provide metrics considered in investment decisions and monitoring.</p>	<p>Climate data and metrics remain a rapidly evolving area. We are exploring the benefits and limitations of various climate metrics for our investors. We also acknowledge the growing global scrutiny and regulation of climate-related disclosures as well as the increasing demand for ESG data among a subset of our clients. Vanguard continues to build out its data capabilities to meet client preferences and regulatory reporting obligations. See "Measuring climate-related risks and opportunities" on page 37.</p>
	<p>* For asset managers: Describe the extent to which the organization's assets under management and products and investment strategies, where relevant, are aligned with a well-below 2°C scenario. Also indicate which asset classes are included.</p>	<p>Vanguard has been thoughtful and deliberate in building out our ESG product lineup by ensuring that each new fund addresses investors' enduring needs. This includes actively managed equity ESG products that are aligned with a temperature rise of less than 2 degrees Celsius above preindustrial levels, meaning that as part of the fund design, they are intended to meet net zero objectives. The external managers of these active funds each determine their own targets and methodology for alignment, consistent with the fund's strategy. Their approach is disclosed in the fund's prospectus, and the targets are monitored by both the manager and Vanguard. See "ESG products and net zero objectives" on page 39.</p>
	<p>(b) Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.</p>	<p>As a company, we disclose Scopes 1 and 2 GHG emissions and several Scope 3 emissions. Our operational carbon footprint in 2022 was 83,435 metric tons of carbon dioxide equivalent (tCO₂e), which was reduced to 24,573 tCO₂e through the purchase of carbon offsets. See "Disclosure of Scopes 1, 2, and 3 greenhouse gas emissions" on page 45.</p>
	<p>* For asset managers: Disclose GHG emissions for assets under management and the weighted average carbon intensity (WACI) for each product or investment strategy, where data and methodologies allow. Also consider providing other carbon footprinting metrics the organization believes are useful for decision-making.</p>	<p>Vanguard continues to build out its data capabilities to meet client preferences and regulatory reporting obligations. In the U.K., as mandated by the Financial Conduct Authority this year, we are disclosing GHG emissions and WACI for funds meeting specified data coverage thresholds. See "Measuring climate-related risks and opportunities" on page 37.</p>
	<p>(c) Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.</p>	<p>Vanguard seeks to reach carbon neutrality in our global operations by 2025. We also have four reduction targets for 2025, based on 2019 baseline levels. We have made progress on each of those targets:</p> <ul style="list-style-type: none"> • Reduce carbon emissions by 20% per full-time equivalent. • Reduce electricity usage by 5% per square foot of space under operational control. • Reduce water usage by 20% per square foot of space under operational control. • Divert 80% of waste from landfills. <p>See "Update on 2025 reduction targets" on page 42.</p> <p>We also have a number of actively managed ESG funds constructed to meet net zero targets. See "ESG products and net zero objectives" on page 39.</p>

* Supplemental guidance for asset managers, from [Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures](#), published October 2021.

Vanguard UK supplementary entity-level and product disclosures

Approach to UK supplementary disclosures

Introduction

This Appendix contains Vanguard UK's supplementary entity-level and product disclosures in accordance with the *Environmental, Social and Governance sourcebook* published by the Financial Conduct Authority (FCA).

It is intended as a supplement to *Vanguard's Report on Climate-related Impacts 2022*, The Vanguard Group, Inc., report in alignment with the Task Force on Climate-related Financial Disclosures (TCFD).

Unless otherwise stated, all climate-related disclosures relevant to Vanguard UK in-scope entities are contained in this Appendix or within *Vanguard's Report on Climate-related Impacts 2022*. The carbon-related data disclosures contained in this Appendix have been prepared using third-party data provided by MSCI ESG Research LLC (MSCI).

We continue to enhance our capabilities for integrating financially material sustainability risk considerations and data into our investment and stewardship processes. For example, Vanguard incorporates a range of financially

material security-level environmental, social and governance (ESG) metrics and data into these processes. It should be noted, however, that the specific, aggregate fund-level and entity-level metrics cited in this Appendix are not utilised in internal investment decision processes. For information on metrics and data used by our internal and external investment managers, refer to "Measuring climate-related risks and opportunities" on page 37 of *Vanguard's Report on Climate-related Impacts 2022*.

Note to Vanguard investors: Climate data reporting remains a fluid and evolving area. Considering the nascency of the data set and corresponding data limitations, including challenges in interpreting the data, we caution investors who seek to use this information as a basis for investment decision making. Investing requires the consideration of many factors, including investment goals, risk tolerance and time horizon. The availability of climate data does not change the importance of these foundational considerations for long-term investors.

Approach to UK supplementary disclosures

Methodology

Our reporting is aligned to the [TCFD's 2021 implementation guidance](#) and the methodology of the [Partnership for Carbon Accounting Financials \(PCAF\)](#).

Coverage

For the purpose of this report, we define "coverage" as the percentage of eligible securities within our funds for which we have obtained carbon data. The availability of carbon data remains a challenge. We have established a reporting threshold to prevent incomplete data sets from being presented that may not accurately reflect the carbon credentials of a fund.

Funds that have total carbon footprint data for less than 60% of eligible securities have not been included in product reports for UK-domiciled funds. However, they are included in the aggregated carbon metrics in the UK entity-level report. As data become more available, we

may reassess our threshold. For more information, please refer to "Data and metrics limitations" starting on page 58.

One element that impacts coverage is the exclusion of some asset classes from carbon reporting. This is either because of a lack of standards set out by PCAF or because, as of the time this report was being prepared, MSCI had limited data availability for some asset classes. As a result of these asset-type exclusions, 3.15% of assets for VIUK and 2.00% of assets for VAM are excluded from entity-level metrics.

Specifically, the following asset types are in scope for the report:

- Corporate equity
- Corporate bonds
- Sovereigns

The following asset types have been excluded from the report:

- Derivatives
- Equity-linked notes
- Warrants
- Municipal bonds
- Securitised products (asset-backed securities, mortgage-backed securities, collateralised loan obligations, commercial mortgage-backed securities)
- Cash

Approach to UK supplementary disclosures

Carbon metric definitions

Core metrics

- **Scopes 1 and 2 greenhouse gas (GHG) emissions:**

Scope 1 emissions are emissions that occur from sources owned or controlled by the reporting company, such as emissions associated with fuel combustion in boilers, furnaces and vehicles. Scope 2 emissions are indirect emissions from the generation of purchased or acquired electricity, steam, heating or cooling consumed by the reporting company. Scope 2 emissions physically occur at the facility where the electricity, steam, heating or cooling is generated.

- **Total carbon emissions:** Emissions (Scopes 1 and 2) multiplied by the current value of investment divided by the issuer's enterprise value including cash (EVIC).

The calculation is based on the emissions associated with a portfolio, expressed in metric tons of carbon dioxide equivalent (tCO₂e).

- **Total carbon footprint:** Total emissions for a portfolio normalised by the market value of the portfolio, expressed in tCO₂e per \$1 million invested.
- **Weighted average carbon intensity (WACI):** A portfolio's exposure to carbon-intensive companies, expressed in tCO₂e per \$1 million in revenue; reflects the carbon intensity of a portfolio across asset classes.

For corporate constituents, WACI measures a portfolio's exposures to carbon-intensive companies, defined as the portfolio-weighted average of companies' carbon intensity (emissions divided by sales).

For sovereign constituents, WACI measures a portfolio's exposures to carbon-intensive economies, defined as the portfolio-weighted average of sovereigns' GHG intensity (emissions divided by gross domestic product [GDP]).

Approach to UK supplementary disclosures

Additional metrics

We use MSCI's proprietary methodology to report on Climate Value-at-Risk and Implied Temperature Rise.⁷

- **MSCI Climate Value-at-Risk (Climate VaR):** Climate VaR is a forward-looking climate risk metric that assesses how a company's valuation could be impacted by climate policy risks and physical climate risks (from extreme weather events) and could benefit from a low-carbon technology transition. The metric is expressed as a positive or negative percentage to reflect change from a company's or portfolio's current valuation. The aggregated Climate VaR is the sum of the aggregated policy risk Climate VaR,⁸ the technology opportunity Climate VaR⁹ and the physical risk Climate VaR¹⁰ associated with the selected transition and physical risk scenarios.

- **MSCI Implied Temperature Rise (ITR):** The ITR metric provides an indication of how well public companies align with global temperature goals. The ITR estimates the global implied temperature rise (in the year 2100 or later) if the entire economy had the same carbon budget overshoot or undershoot as the company or portfolio in question. The portfolio-level ITR compares the sum of "owned" projected emissions, including Scopes 1, 2 and 3,¹¹ against the sum of "owned" carbon budgets for the underlying fund holdings. The portfolio's total estimated carbon budget overshoot/undershoot is then converted to a degree (Celsius) of temperature rise using the transient climate response to cumulative emissions.¹² The allocation base used to define ownership is EVIC, to enable the analysis of equity and corporate bond portfolios.

⁷ Source: MSCI ESG Research methodologies published October 2021 (Climate Value-at-Risk) and September 2021 (Implied Temperature Rise).

⁸ Aggregated policy risk Climate VAR is a company's downside or neutral exposure expressed as a percentage of the company's market value that may arise because of climate change policies that countries enact to enable transitioning to a low-carbon economy.

⁹ Technology opportunity Climate VAR is a company's upside exposure, expressed as a percentage of the company's market value because of technology opportunities born out of changes required to meet the transition to a low-carbon economy. For example, technology advances are considered through patent analysis and green revenue exposure.

¹⁰ Physical risk Climate VaR is a company's downside or neutral exposure expressed as a percentage of the company's market value that may arise because of asset damage and business interruption as a direct consequence of the physical hazards or perils of climate change.

¹¹ Scope 3 emissions are all indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company.

¹² Transient climate response to cumulative emissions (TCRE) represents the ratio of the global average surface temperature change per unit of carbon dioxide (CO₂) emitted. It helps to model the carbon budget for given temperature targets.

Approach to UK supplementary disclosures

Approach to scenario analysis

For scenario analysis, we rely on the MSCI Climate VaR model results to analyse the exposure of funds to climate risks and opportunities.

These risks and opportunities are applied to six scenarios produced by the Central Banks and Supervisors Network for Greening the Financial System (NGFS), which are divided into three categories: orderly transition, disorderly transition and hot house world, as described further in the adjacent table.

For this report, we chose to analyse the exposure of each fund to climate risks and opportunities out to 2100 under three of the NGFS scenarios: net zero 2050 for orderly, delayed transition for disorderly and nationally determined contributions for hot house world.

The results indicate the potential impact of future climate shocks on the market value of each fund, based on aggregated policy risks, technology opportunities and physical risks.

- **Policy risks:** Using a hybrid top-down and bottom-up methodology, MSCI calculates the potential risks that may arise because of extensive regulatory and policy changes taking place to transition to a low-carbon economy across the globe.
- **Technology opportunities:** MSCI developed a low-carbon technology opportunity model based on a company's current low-carbon revenue streams and company-specific patent data. Recently published patent databases allow an evidence-based view into the strategic research and development investments of companies.
- **Physical risks:** Physical risk scenarios model how the physical aspects of the climate system change, including variables such as temperature rise, sea-level rise and the frequency and severity of specific extreme weather events.

NGFS scenarios matrix

Category	Scenarios	Description
Orderly transition	<ul style="list-style-type: none"> • Net zero 2050 • Below 2°C 	Orderly scenarios assume climate policies are introduced early and become gradually more stringent. Both physical and transition risks are relatively subdued.
Disorderly transition	<ul style="list-style-type: none"> • Divergent net zero • Delayed transition 	Disorderly scenarios explore higher transition risk because of policies being delayed or divergent across countries and sectors. For example, carbon prices would have to increase abruptly after a period of delay.
Hot house world	<ul style="list-style-type: none"> • Nationally determined contributions • Current policies 	Hot house world scenarios assume that some climate policies are implemented in some jurisdictions, but efforts are insufficient to halt significant global warming. The scenarios result in severe physical risk including irreversible impacts like sea-level rise.

Source: [Climate Financial Risk Forum Guide 2021](#). Scenario analysis, October 2021.

Approach to UK supplementary disclosures

Approach to identifying products with high exposures to carbon-intensive sectors

The FCA's *Environmental, Social and Governance sourcebook* requires the disclosure of quantitative climate scenario analysis for funds with "concentrated exposures or high exposures to carbon intensive sectors".

Most of Vanguard investors' assets are held in index funds, the majority of which, by mandate, track broad stock and bond market indexes. Therefore, most of our funds are broadly diversified and are not concentrated in any one sector. In the absence of an industry standard threshold for defining "high exposures to carbon intensive sectors", we elected to apply a threshold based on WACI.

WACI can be used as a proxy for a portfolio's potential exposure to transition risks. When comparing two portfolios, the portfolio with higher WACI may be more susceptible to transition risk in the event of increased regulation targeting emissions.

To define a threshold for funds with the highest WACI, we first calculated each fund's historical average WACI using 2020, 2021 and 2022 data. We then calculated the average WACI across our UK funds and identified those with a WACI of one standard deviation above the mean. Having identified the funds with the highest WACIs, we subsequently isolated the underlying Climate VaR for policy risk, technology opportunity and physical risk.

While this methodology does not directly describe exposure to high-carbon sectors within our funds, it can be applied across our fund line-up, both index and active, to provide insight into the funds with the highest exposure to carbon-intensive companies. We will refine our approach over time as industry standards and regulatory guidance continue to develop.

Approach for externally managed funds

Data for externally managed funds within this report have been produced by MSCI. This data may differ from the information that respective managers produce as

part of their own TCFD disclosures given variation in data providers and methodologies. The usage of climate data within investment processes and stewardship activities may also vary among our external managers. For more information, please refer to "Integration of climate risks and opportunities by our external advisors" on page 32 of *Vanguard's Report on Climate-related Impacts 2022*.

The following funds are externally managed:

- Vanguard Active U.K. Equity Fund
- Vanguard Global Emerging Markets Fund
- Vanguard Global Equity Fund
- Vanguard Global Equity Income Fund
- Vanguard Global Sustainable Equity Fund
- Vanguard SustainableLife 40-50% Equity Fund
- Vanguard SustainableLife 60-70% Equity Fund
- Vanguard SustainableLife 80-90% Equity Fund

Data and metrics limitations

Data and metrics limitations

We recognise that climate risk metrics are evolving, with standards and methodologies being constantly developed and refined. Climate metrics are also an area of increased scrutiny as companies disclose new data sets for which assurance standards have been developed. In this section, we discuss some of the key challenges and limitations that we have encountered when preparing this report.

Data availability and quality

Carbon data availability and quality remain a focus area, and efforts are being made by companies and data providers to improve their respective coverage.

Reported versus estimated data

Reported emissions are the preferred type of data; however, we recognise that for some companies, particularly small- and mid-cap companies, reporting remains a challenge because of resourcing constraints. Further, emissions disclosures are not mandated in all

jurisdictions. Where reported emissions are unavailable, estimated data are used, as per PCAF guidance.

This report discloses third-party data provided by MSCI. MSCI collects emissions data for the companies in the coverage universe. Emissions data are updated on a dynamic cycle throughout the year from the most recent corporate sources available, including annual reports, corporate social responsibility reports or websites. In addition, MSCI uses emissions data reported through CDP (formerly the Carbon Disclosure Project) or government databases when data are not available through direct corporate disclosure.

When companies do not disclose data, or data disclosures do not follow the [Greenhouse Gas Protocol](#) standards and guidance, MSCI uses proprietary methodologies to estimate Scopes 1, 2 and 3 emissions, using company-specific data or industry averages, or both.

Scope 3 emissions

For this reporting year, Vanguard has not explicitly incorporated Scope 3 emissions within the TCFD report because of a lack of reported and consistent data. The exception to this is the usage of Scope 3 emissions by MSCI to calculate the policy risk Climate VaR and ITR. The FCA requires eligible industry participants to report Scope 3 emissions by 30 June 2024.

Sovereign constituents

Our disclosures do not reflect recent changes to MSCI's Climate VaR and ITR methodologies for sovereign constituents. Therefore, for two of our funds that invest in government securities—Vanguard U.K. Inflation-Linked Gilt Index Fund and Vanguard U.K. Long Duration Gilt Index Fund—only the WACI is reported.

Use of historical data

For the disclosures in this UK report, Vanguard has not reported historical climate data. We plan to include it in future reports, using 2022 data as our baseline.

Data and metrics limitations

Carbon metrics

Climate change is a complex issue, and no single climate-related metric can fully represent the position of a product or portfolio. We have disclosed several carbon metrics in line with TCFD recommendations, each of which has their respective strengths and weaknesses.

All backward-looking metrics rely on historical data and do not recognise future plans to reduce emissions, and hence could lead to greater focus on short-term reduction of emissions rather than long-term considerations.

Backward-looking metrics such as total carbon emissions, carbon footprint and WACI are normalised using financial metrics (EVIC or revenue) and hence are prone to market volatility. Therefore, the carbon credentials of a fund might reflect the sensitivity to market valuation of the issuer rather than changes to its underlying emissions.

Carbon metrics and limitations

Metric	Formula	Limitations
Total carbon emissions	$\sum_i^n \frac{\text{Current value of investment}}{\text{Investee company's enterprise value}} \times \text{Investee company's Scopes 1 \& 2 emissions}$	Total carbon emissions is not useful for benchmarking and portfolio comparison as it is an absolute metric.
Total carbon footprint	$\frac{\sum_i^n \frac{\text{Current value of investment}}{\text{Investee company's enterprise value}} \times \text{Investee company's Scopes 1 \& 2 emissions}}{\text{Current value of all investments}}$	Carbon footprint is only calculated for corporate constituents and is not relevant for sovereign constituents.
WACI	<p>For corporate constituents, WACI measures a portfolio's exposures to carbon-intensive companies, defined as the portfolio-weighted average of companies' carbon intensity (emissions divided by sales). GHG intensity of corporate constituents is calculated as follows, with revenue acting as a proxy for sales:</p> $\sum_i^n \frac{\text{Current value of investment}}{\text{Current value of all investments}} \times \frac{\text{Investee company's Scopes 1 \& 2 emissions}}{\text{Investee company's revenue}}$ <p>For sovereign constituents, WACI measures a portfolio's exposures to carbon-intensive economies, defined as the portfolio-weighted average of sovereigns' GHG intensity (emissions divided by gross domestic product). GHG intensity of sovereign constituents is calculated as follows:</p> $\sum_i^n \frac{\text{Current value of investment}}{\text{Current value of all investments}} \times \frac{\text{Country's Scopes 1 \& 2 emissions}}{\text{Gross domestic product}}$	<p>WACI does not take into account the difference in carbon characteristics among sectors.</p> <p>WACI is also sensitive to outliers.</p> <p>Using revenue (instead of physical or other metrics) to normalise the data tends to favour companies with higher pricing levels relative to their peers.</p>

Data and metrics limitations

Forward-looking climate metrics provide an estimate of the company's impact on, and exposure to, climate change. These metrics are also subject to certain limitations.

Climate Value-at-Risk

Climate VaR is reliant on assumptions made under the various scenarios. Climate VaR models assume no change or adaptation from companies over time, which can limit any analysis around investment opportunities. Climate VaR results can also be overestimated when costs are already priced into the market and can be underestimated when opportunities are already priced in.

While our in-house investment strategists continue to research this topic, Vanguard takes no view on which climate scenario, if any, is currently priced in by financial markets. Similarly, Vanguard makes no assumption on the likelihood of each climate scenario eventually becoming a reality and acknowledges that these scenarios are not an exhaustive set of all possible outcomes.

One of the key limitations of modelling high emissions scenarios like the hot house world scenarios is the need to consider complex interactions within the Earth's climate system. Such modelling is still in its nascency and does not capture the full potential magnitude of those impacts. Because such impacts are most likely to manifest in hot house world scenarios, the models

skew toward transition risks present under orderly and disorderly scenarios. This limitation helps explain why the hot house world scenario contained in our product reports represents the lowest total Climate VaR across all three scenarios.

In 2022, Vanguard published a paper, [The Economics of Climate Change](#), which indicated that the net cost to the economy increases meaningfully as temperatures rise to more than 3 degrees Celsius above preindustrial levels. This research is in line with the latest Intergovernmental Panel on Climate Change (IPCC) report, which states that the "global economic benefit of limiting global warming to 2°C is reported to exceed the cost of mitigation in most of the assessed literature".¹³

¹³ IPCC, 2022. *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. (P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, and J. Malley, eds.).

Data and metrics limitations

Implied Temperature Rise (ITR)

ITR is a forward-looking metric that relies on projected emissions and estimated data. The stated company-level reduction targets that inform this metric might not reflect companies' real-world transition.

Next steps

We anticipate that, over time, the data limitations outlined in this section will be reduced as data availability continues to improve in response to increasing regulatory disclosure requirements, such as the anticipated introduction of ISSB (International Sustainability Standards Board) and CSRD (The Corporate Sustainability Reporting Directive) standards. In addition, the methodologies for estimating and calculating emissions are in their early stages of adoption, in comparison to financial metrics, and are likely to be further refined and improved over time because of the increasing application of regulatory requirements.

Entity-level report

Entity-level report

This report contains entity-level disclosures for two entities:

- Vanguard Asset Management, Limited (VAM), in its capacity as an asset manager in relation to portfolio management services it provides and as an asset owner in relation to its operation of the Vanguard Personal Pension.¹⁴
- Vanguard Investments UK, Limited (VIUK), in its capacity as an asset manager for Vanguard's UK UCITS funds.

The carbon metrics in the adjacent table are set out in accordance with the methodology in the "Approach to identifying products with high exposures to carbon-intensive sectors" section on page 56.

Carbon metrics

Reporting period: 1 January 2022 to 31 December 2022

	VAM	VIUK
Assets under management (\$ billions)	\$319.35	\$74.20
Scopes 1 and 2 GHG emissions (tCO₂e)	24,554,638,158	23,636,202,782
Coverage (%)	67%	69%
Total carbon emissions (tCO₂e)	19,602,904.73	4,580,395.37
Coverage (%)	61%	66%
Total carbon footprint (tCO₂e per \$1 million invested)	62.40	63.74
Coverage (%)	61%	66%
Weighted average carbon intensity for corporate constituents (tCO₂e per \$1 million revenue)	151.72	146.92
Coverage (%)	67%	69%
Weighted average carbon intensity for sovereign constituents (tCO₂e per \$1 million GDP nominal)	248.66	199.30
Coverage (%)	29%	12%

Source: MSCI.

Notes: Asset figures are in US dollars as at 31 December 2022. GHG = greenhouse gas. tCO₂e = metric tons of carbon dioxide equivalent. Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

¹⁴ As at 31 December 2022, total assets under administration within the Vanguard Personal Pension were \$3.147 billion in US dollars. Vanguard Personal Pension is the UK self-invested pension scheme operated and administrated by VAM.

Entity-level report

Compliance statement

The disclosures contained within the TCFD entity-level report for Vanguard Asset Management, Limited, and Vanguard Investments UK, Limited, including any third-party or group disclosures cross-referenced therein, are in compliance with the applicable requirements for the disclosure of climate-related financial information set out in Chapter 2 of the FCA's *Environmental, Social and Governance sourcebook*.

Date: 29 June 2023

Signed: 

Sean Hagerty
Managing Director of Vanguard Europe

Product reports

Product reports

This report contains product disclosures in relation to VAM and VIUK.

Vanguard's 35 UK UCITS funds are in scope for the product reports. Because eight funds fall short of the 60% coverage threshold described on page 52, we have included product reports for 27 funds. All 35 funds are included in the entity-level report for both VAM, in its capacity as an asset owner in relation to its operation of the Vanguard Personal Pension, and VIUK, in its capacity as an asset manager for UK UCITS funds.

The eight funds excluded from product reports because they were identified as having coverage below 60% as at 31 December 2022 are:

- Vanguard LifeStrategy 20% Equity Fund
- Vanguard LifeStrategy 40% Equity Fund
- Vanguard LifeStrategy 60% Equity Fund
- Vanguard Sterling Short-Term Money Market Fund
- Vanguard Target Retirement 2015 Fund
- Vanguard Target Retirement 2020 Fund
- Vanguard Target Retirement 2025 Fund
- Vanguard Target Retirement 2030 Fund

Product reports

Vanguard Active U.K. Equity Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund is an active fund investing primarily in shares of UK companies, being those which are incorporated, domiciled or conduct a significant portion of their business in the UK.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard Active U.K. Equity Fund	238,191,348	1,937.30	47.86	77.32
Coverage	89%	88%	88%	89%
Reported emissions	76.80%	—	—	—
Estimated emissions	12.50%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-15.08%	-29.95%	-13.52%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.7°C

Source: MSCI.

Product reports

Vanguard ESG Developed World All Cap Equity Index Fund (UK)

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to track the performance of the FTSE Developed All Cap Choice Index, a market-capitalisation weighted index representing the performance of large, mid and small-size shares covering developed markets around the world.

Scenario analysis

Under the orderly transition scenario, policy and physical risk are on par as the biggest drivers of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard ESG Developed World All Cap Equity Index Fund (UK)	2,048,076,674	14,267.42	20.24	59.88
Coverage	98%	98%	98%	98%
Reported emissions	79.80%	—	—	—
Estimated emissions	18.60%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-6.87%	-14.38%	-6.55%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.1°C

Source: MSCI.

Product reports

Vanguard FTSE 100 Index Unit Trust

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Trust seeks to track the performance of the FTSE 100 Index, a market-capitalisation weighted index representing the performance of the 100 largest companies traded on the London Stock Exchange that pass screening for size and liquidity.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard FTSE 100 Index Unit Trust	355,489,011	96,496.42	87.06	125.11
Coverage	99%	98%	98%	99%
Reported emissions	94.30%	—	—	—
Estimated emissions	4.60%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-20.19%	-38.58%	-13.06%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.6°C

Source: MSCI.

Product reports

Vanguard FTSE Developed Europe ex-U.K. Equity Index Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to track the performance of the FTSE Developed ex-U.K. Index. The Index comprises large and mid-size shares providing coverage of developed markets around the world, excluding the UK.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard FTSE Developed Europe ex-U.K. Equity	1,318,645,313	251,585.66	67.16	105.69
Coverage	98%	98%	98%	98%
Reported emissions	93.20%	—	—	—
Estimated emissions	4.70%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-11.59%	-21.02%	-12.14%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.0°C

Source: MSCI.

Product reports

Vanguard FTSE Developed World ex-U.K. Equity Index Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to track the performance of the FTSE Developed ex-U.K. Index. The Index is comprised of large and mid-size shares providing coverage of developed markets around the world, excluding the UK.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard FTSE Developed World ex-U.K. Equity Index Fund	5,174,043,008	678,253.82	49.85	143.20
Coverage	98%	98%	98%	98%
Reported emissions	84.10%	—	—	—
Estimated emissions	14.40%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-8.81%	-17.82%	-7.28%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.7°C

Source: MSCI.

Product reports

Vanguard FTSE Global All Cap Index Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to track the performance of the FTSE Global All Cap Index, a market-capitalisation weighted index representing the performance of large, mid and small-size shares covering developed and emerging markets around the world.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard FTSE Global All Cap Index Fund	12,252,172,313	150,216.98	64.12	169.00
Coverage	98%	98%	98%	98%
Reported emissions	78.70%	—	—	—
Estimated emissions	19.50%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-11.49%	-21.27%	-9.13%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.8°C

Source: MSCI.

Product reports

Vanguard FTSE U.K. All Share Index Unit Trust

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Trust seeks to track the performance of the FTSE All-Share Index, a free-float market-capitalisation weighted index representing the performance of all eligible companies listed on the London Stock Exchange's main market, which pass screening for size and liquidity.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard FTSE U.K. All Share Index Unit Trust	9,820,675,039	1,125,870.59	81.09	122.19
Coverage	96%	95%	95%	96%
Reported emissions	89.40%	—	—	—
Estimated emissions	5.60%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-19.77%	-37.96%	-13.24%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.6°C

Source: MSCI.

Product reports

Vanguard FTSE U.K. Equity Income Index Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to track the performance of the FTSE U.K. Equity Income Index. The Index consists of common shares of companies listed on the London Stock Exchange's main market that are expected to pay dividends that generally are higher than average.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard FTSE U.K. Equity Income Index Fund	307,777,393	141,875.46	92.28	140.06
Coverage	100%	100%	100%	100%
Reported emissions	96.30%	—	—	—
Estimated emissions	3.40%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-27.63%	-56.99%	-18.54%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.9°C

Source: MSCI.

Product reports

Vanguard Global Equity Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund is an active fund, and its multi-manager structure uses two independent sub-investment advisers, managing approximately equal portions of the Fund's investments. The Fund seeks to achieve its investment objective by investing primarily in shares of companies which may be located anywhere in the world.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard Global Equity Fund	405,602,832	17,478.55	44.79	132.79
Coverage	98%	97%	97%	98%
Reported emissions	75.40%	—	—	—
Estimated emissions	22.30%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-11.72%	-18.60%	-8.64%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.3°C

Source: MSCI.

Product reports

Vanguard Global Equity Income Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to provide an annual level of income (gross of fees) greater than that of the FTSE Developed Index together with an increase in the value of investments over the long term (more than five years).

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard Global Equity Income Fund	1,045,697,056	22,661.13	89.28	204.53
Coverage	100%	100%	100%	100%
Reported emissions	90.90%	—	—	—
Estimated emissions	9.10%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-15.95%	-28.52%	-11.94%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

3.0°C

Source: MSCI.

Product reports

Vanguard Global Emerging Markets Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund is an active fund investing primarily in shares of companies located in emerging market countries.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk. We have disclosed the disaggregated Climate VaR for this fund given its high WACI, in line with our approach outlined on page 56. The high WACI is driven by exposure to the energy and utilities sectors, as well as industrial sectors such as cement and steel.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard Global Emerging Markets Fund	975,581,584	69,253.30	219.91	395.59
Coverage	96%	96%	96%	96%
Reported emissions	84.10%	—	—	—
Estimated emissions	12.30%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly				2°C NGFS disorderly				3°C NGFS hot house world*			
	Total Climate VaR	Physical risk	Policy risk	Technology opportunity	Total Climate VaR	Physical risk	Policy risk	Technology opportunity	Total Climate VaR	Physical risk	Policy risk	Technology opportunity
Aggregated Climate VaR	-32.37%	-19.40%	-17.30%	4.33%	-43.59%	-21.22%	-29.77%	7.40%	-24.36%	-23.45%	-1.26%	0.35%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

3.3°C

Source: MSCI.

Product reports

Vanguard Global Sustainable Equity Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund is an active fund whereby the investment adviser uses their expertise to pick investments to achieve the Fund's objectives. The Fund seeks to achieve its investment objective by investing almost exclusively (at least 90% of the Fund's assets) in equity securities issued by large and mid-size companies located throughout the world, selected in accordance with the Fund's Sustainability Policy.

Scenario analysis

Under the orderly transition scenario, policy and physical risk are on par as the biggest drivers of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard Global Sustainable Equity Fund	56,546,900	747.69	11.04	46.43
Coverage	98%	98%	98%	98%
Reported emissions	94.70%	—	—	—
Estimated emissions	3.70%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-4.70%	-10.58%	-5.99%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

1.8°C

Source: MSCI.

Product reports

Vanguard LifeStrategy 80% Equity Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to hold investments that will pay out money and increase in value through a portfolio comprising approximately 80% shares and 20% bonds and other similar fixed income investments.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for corporate constituents (tCO ₂ e per \$1 million revenue)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard LifeStrategy 80% Equity Fund	20,806,012,825	623,793.38	65.48	155.59	220.62
Coverage	71%	68%	68%	71%	12%
Reported emissions	58.50%	—	—	—	—
Estimated emissions	11.90%	—	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-11.59%	-22.98%	-9.34%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.6°C

Source: MSCI.

Product reports

Vanguard LifeStrategy 100% Equity Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund's investment objective is to hold investments that will pay out money and increase in value through exposure to a diversified portfolio comprising approximately 100% by value of shares.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for corporate constituents (tCO ₂ e per \$1 million revenue)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard LifeStrategy 100% Equity Fund	12,737,844,897	368,902.25	65.59	155.97	220.23
Coverage	80%	80%	80%	80%	0.013%
Reported emissions	78.70%	—	—	—	—
Estimated emissions	19.50%	—	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-12.18%	-23.88%	-9.80%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.6°C

Source: MSCI.

Product reports

Vanguard SustainableLife 40-50% Equity Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund is an active fund whereby the investment adviser uses their expertise to pick investments to achieve the Fund's objectives. The Fund uses an independent sub-investment adviser which follows a distinct approach in managing the Fund's investments to maintain a balance between its investments in shares and bonds.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for corporate constituents (tCO ₂ e per \$1 million revenue)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard SustainableLife 40-50% Equity Fund	1,130,173,680	1,783.78	37.41	136.60	267.76
Coverage	80%	74%	74%	80%	16%
Reported emissions	65.50%	—	—	—	—
Estimated emissions	14.40%	—	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-7.68%	-14.67%	-6.42%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.4°C

Source: MSCI.

Product reports

Vanguard SustainableLife 60-70% Equity Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund is an active fund whereby the investment adviser uses their expertise to pick investments to achieve the Fund's objectives. The Fund uses an independent sub-investment adviser which follows a distinct approach in managing the Fund's investments to maintain a balance between its investments in shares and bonds.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for corporate constituents (tCO ₂ e per \$1 million revenue)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard SustainableLife 60-70% Equity Fund	1,578,015,123	18,508.23	37.76	132.17	255.57
Coverage	89%	85%	85%	89%	9%
Reported emissions	75.60%	—	—	—	—
Estimated emissions	13.50%	—	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-8.84%	-16.08%	-7.49%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.3°C

Source: MSCI.

Product reports

Vanguard SustainableLife 80-90% Equity Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund is an active fund whereby the investment adviser uses their expertise to pick investments to achieve the Fund's objectives. The Fund uses an independent sub-investment adviser which follows a distinct approach in managing the Fund's investments to maintain a balance between its investments in shares and bonds.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for corporate constituents (tCO ₂ e per \$1 million revenue)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard SustainableLife 80-90% Equity Fund	1,122,139,647	4,903.15	39.26	137.82	255.68
Coverage	96%	94%	94%	96%	3%
Reported emissions	84.00%	—	—	—	—
Estimated emissions	11.80%	—	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-9.74%	-17.35%	-8.35%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.3°C

Source: MSCI.

Product reports

Vanguard Target Retirement 2035 Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to achieve an increase in value and, consistent with a gradually changing investment allocation, hold investments that will pay out money for investors planning to retire in or within approximately five years after 2035.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for corporate constituents (tCO ₂ e per \$1 million revenue)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard Target Retirement 2035 Fund	21,300,656,062	16,140.06	65.54	155.30	222.40
Coverage	66%	62%	62%	66%	19%
Reported emissions	54.10%	—	—	—	—
Estimated emissions	11.80%	—	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-11.03%	-22.14%	-8.90%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.6°C

Source: MSCI.

Product reports

Vanguard Target Retirement 2040 Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to achieve an increase in value and, consistent with a gradually changing investment allocation, hold investments that will pay out money for investors planning to retire in or within approximately five years after 2040.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for corporate constituents (tCO ₂ e per \$1 million revenue)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard Target Retirement 2040 Fund	21,300,656,062	13,141.92	65.64	155.30	222.60
Coverage	68%	65%	65%	68%	16%
Reported emissions	56.10%	—	—	—	—
Estimated emissions	12.00%	—	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-11.27%	-22.96%	-9.30%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.6°C

Source: MSCI.

Product reports

Vanguard Target Retirement 2045 Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to achieve an increase in value and, consistent with a gradually changing investment allocation, hold investments that will pay out money for investors planning to retire in or within approximately five years after 2045.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for corporate constituents (tCO ₂ e per \$1 million revenue)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard Target Retirement 2045 Fund	20,806,012,825	11,781.55	65.66	155.40	222.78
Coverage	71%	68%	68%	71%	13%
Reported emissions	58.20%	—	—	—	—
Estimated emissions	12.20%	—	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-11.46%	-22.82%	-9.22%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.6°C

Source: MSCI.

Product reports

Vanguard Target Retirement 2050 Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to achieve an increase in value and, consistent with a gradually changing investment allocation, hold investments that will pay out money for investors planning to retire in or within approximately five years after 2050.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for corporate constituents (tCO ₂ e per \$1 million revenue)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard Target Retirement 2050 Fund	20,806,012,825	7,757.66	65.75	155.44	222.78
Coverage	71%	69%	69%	71%	11%
Reported emissions	59.10%	—	—	—	—
Estimated emissions	12.20%	—	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-11.55%	-22.98%	-9.28%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.6°C

Source: MSCI.

Product reports

Vanguard Target Retirement 2055 Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to achieve an increase in value and, consistent with a gradually changing investment allocation, hold investments that will pay out money for investors planning to retire in or within approximately five years after 2055.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for corporate constituents (tCO ₂ e per \$1 million revenue)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard Target Retirement 2055 Fund	20,806,012,825	4,848.58	65.73	155.56	222.77
Coverage	72%	69%	69%	72%	12%
Reported emissions	59.20%	—	—	—	—
Estimated emissions	12.20%	—	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-11.56%	-22.96%	-9.30%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.6°C

Source: MSCI.

Product reports

Vanguard Target Retirement 2060 Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to achieve an increase in value and, consistent with a gradually changing investment allocation, hold investments that will pay out money for investors planning to retire in or within approximately five years after 2060.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for corporate constituents (tCO ₂ e per \$1 million revenue)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard Target Retirement 2060 Fund	20,806,012,825	1,508.23	65.74	155.61	221.84
Coverage	71%	69%	69%	71%	12%
Reported emissions	59.10%	—	—	—	—
Estimated emissions	12.20%	—	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-11.56%	-22.96%	-9.31%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.6°C

Source: MSCI.

Product reports

Vanguard Target Retirement 2065 Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to achieve an increase in value and, consistent with a gradually changing investment allocation, hold investments that will pay out money for investors planning to retire in or within approximately five years after 2065.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for corporate constituents (tCO ₂ e per \$1 million revenue)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard Target Retirement 2065 Fund	20,806,012,825	1,328.15	65.61	155.53	221.31
Coverage	71%	69%	69%	71%	12%
Reported emissions	59.10%	—	—	—	—
Estimated emissions	12.20%	—	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-11.56%	-22.95%	-9.30%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.6°C

Source: MSCI.

Product reports

Vanguard U.K. Inflation-Linked Gilt Index Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to track the performance of the Bloomberg U.K. Government Inflation-Linked Float Adjusted Bond Index, a float-adjusted market-capitalisation weighted index representing the UK government inflation-linked securities market, offering exposure to inflation-linked gilts with maturities greater than one year.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard U.K. Inflation-Linked Gilt Index Fund	n/a	n/a	n/a	131.74
Coverage	n/a	n/a	n/a	72%
Reported emissions	n/a	—	—	—
Estimated emissions	n/a	—	—	—

Source: MSCI.

Note: The coverage percentage is rounded to the nearest whole number.

Product reports

Vanguard U.K. Long Duration Gilt Index Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to track the performance of the Bloomberg U.K. Government 15+ Years Float Adjusted Bond Index. The Index is a float-adjusted market-capitalisation weighted index representing a segment of the UK government bond market, offering exposure to gilts with maturities greater than 15 years.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity for sovereign constituents (tCO ₂ e per \$1 million GDP nominal)
Vanguard U.K. Long Duration Gilt Index Fund	n/a	n/a	n/a	131.74
Coverage	n/a	n/a	n/a	100%
Reported emissions	n/a	—	—	—
Estimated emissions	n/a	—	—	—

Source: MSCI.

Note: The coverage percentage is rounded to the nearest whole number.

Product reports

Vanguard U.S. Equity Index Fund

Reporting period: 1 January 2022 to 31 December 2022

Domicile: United Kingdom

The Fund seeks to track the performance of the S&P Total Market Index, a market-capitalisation weighted index representing the US stock market, offering broad exposure to large, mid, small, and micro-size companies regularly traded on the New York Stock Exchange and the Nasdaq over-the-counter market.

Scenario analysis

Under the orderly transition scenario, policy risk is the biggest driver of impact. This scenario assumes that policies are introduced early and become gradually more stringent. Likewise, under the disorderly transition scenario, the fund is most exposed to policy risk, which is exacerbated by the delayed introduction of high carbon prices. The hot house world scenario has the lowest policy risk, which is in line with scenario assumptions on limited policy action, and the highest physical risk.

Carbon metrics

	Scopes 1 and 2 GHG emissions (tCO ₂ e)	Total carbon emissions (tCO ₂ e)	Total carbon footprint (tCO ₂ e per \$1 million invested)	Weighted average carbon intensity (tCO ₂ e per \$1 million revenue)
Vanguard U.S. Equity Index Fund	2,476,061,532	617,548.98	43.12	147.99
Coverage	98%	98%	98%	98%
Reported emissions	76.70%	—	—	—
Estimated emissions	21.40%	—	—	—

Source: MSCI.

Notes: Scopes 1 and 2 GHG emissions are rounded to the nearest whole number. All coverage percentages are rounded to the nearest whole numbers.

MSCI Climate Value-at-Risk (Climate VaR)

	1.5°C NGFS orderly	2°C NGFS disorderly	3°C NGFS hot house world*
Aggregated Climate VaR	-7.77%	-16.68%	-4.50%

Source: MSCI.

*For more information on the limitations of using aggregated Climate VaR in modelling hot house world scenarios, refer to "Data and metrics limitations" starting on page 58.

MSCI Implied Temperature Rise

2.8°C

Source: MSCI.

Important information

This document is designed for use by and is directed only at persons resident in the UK.

For further information on the funds' investment policies and risks, please refer to the prospectus of the UCITS and to the KIID before making any final investment decisions. The KIIDs for these funds are available, alongside the prospectus via Vanguard's website <https://global.vanguard.com>.

All investing is subject to risk, including the possible loss of the money you invest. Diversification does not ensure a profit or protect against a loss.

Be aware that fluctuations in the financial markets and other factors may cause declines in the value of your account. There is no guarantee that any particular asset allocation or mix of funds will meet your investment objectives or provide you with a given level of income.

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