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The Scope of Net Zero: The Use of Carbon Emission Data to Achieve Portfolio Goals

THE SCOPE OF NET ZERO: THE USE OF CARBON EMISSION DATA TO ACHIEVE PORTFOLIO GOALS

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If we are going to meet the ambitious targets required to achieve net-zero emissions, we need to be able to measure the carbon emissions of the assets we hold. That may seem like a straightforward endeavor: Simply calculate the Scope 1, 2, and 3 emissions for your portfolio holdings. But doing so accurately is more complicated than it seems, especially if you hold a broad portfolio of global assets. Not all companies report carbon emissions, and data vendors that provide that information have different methodologies for handling and estimating missing data. In this chapter, we define the different scopes of carbon emissions and evaluate their coverage from different data vendors across various investment universes. We investigate how estimated data factor into portfolio-wide emission calculations. In particular, we focus on Scope 3 emissions, the largest component for most companies. Many believe addressing Scope 3 emissions is critical to achieving net zero, even though they are the least reliable emission metric. We delve into some of the challenges of Scope 3 emissions, such as relevance, estimating the components (upstream versus downstream), and double counting with other scopes. We explore ways to overcome some of these challenges. While measuring current Scope 1, 2, and 3 carbon emissions is an important exercise, the ultimate goal is to achieve net zero. The Science-Based Targets initiative (SBTi) established requirements for the net-zero standard. We define these data, examine coverage statistics, and discuss how to build SBTi Paris-aligned portfolios and how they differ from low-carbon portfolios.

Introduction

Climate change is one of society's greatest challenges. If we have any hope of combatting the earth's rising temperature, we must set aggressive targets to reduce greenhouse gas (GHG) emissions. To accurately set those targets and monitor our progress toward achieving them, we must first be able to accurately measure the emissions generated. Doing so may seem straightforward, but it is a complex task. It is essential that we understand the various components of corporate emissions and how they are measured, reported, and incorporated into net-zero or emission-reduction commitments.

In this chapter, we delve into the topic of corporate emission data. We define the different scopes of GHGs, examine their coverage, and compare the quantity of GHG emissions for various sectors and regions. The different components of emissions can vary according to sector and business model, and we examine those interactions. Scope 3 emissions, which result not from activities from assets owned or controlled by the company but from its value chain, are the most difficult to calculate but are often the largest component of a company's emissions. We investigate the relationship between Scope 3 emissions and the other components and detail some of the issues surrounding Scope 3. We then move from historical Scope 1-3 GHG emissions to forward-looking SBTi data and evaluate how a company's projected emissions align to the Paris Agreement at different time horizons and examine what methods can be used to determine this alignment and how SBTi targets compare with historic emission data.

Achieving net zero is about policies, technologies, business models, and consumer preferences, as well as data. Investors need to accurately measure each component of that chain to set goals, monitor progress, and ensure we are progressing along a path toward a cooler planet.

Scope 1, 2, and 3 Emissions: An Overview

GHG accounting standards emerged in the mid-1990s and were formalized as part of the 1997 Kyoto Protocol.[1] Carbon accounting classifies emissions into two broad groups: nonfluorinated gases, such as carbon dioxide (CO_2) and methane (CH4), and fluorinated gases, such as hydrofluorocarbons (HFCs). The Kyoto Protocol, the initial agreement to reduce global GHGs, created a system to convert these diverse emission types to a CO_2 equivalent to make it possible to compare them and to determine their individual and total contributions to global warming. In 2001, the World Resources Institute and the World Business Council for Sustainable Development published the Greenhouse Gas Protocol, which establishes a "comprehensive, global, standardized framework for measuring and managing emissions from private and public sector operations, value chains, products, cities, and policies."[2] This framework

[1]For more information, go to https://unfccc.int/kyoto_protocol.

[2]www.wri.org/initiatives/greenhouse-gas-protocol.

breaks down an organization's emissions into three categories or "scopes" based on the source. In this chapter, we focus on these three scopes of corporate emission data: their history, coverage, and data quality.

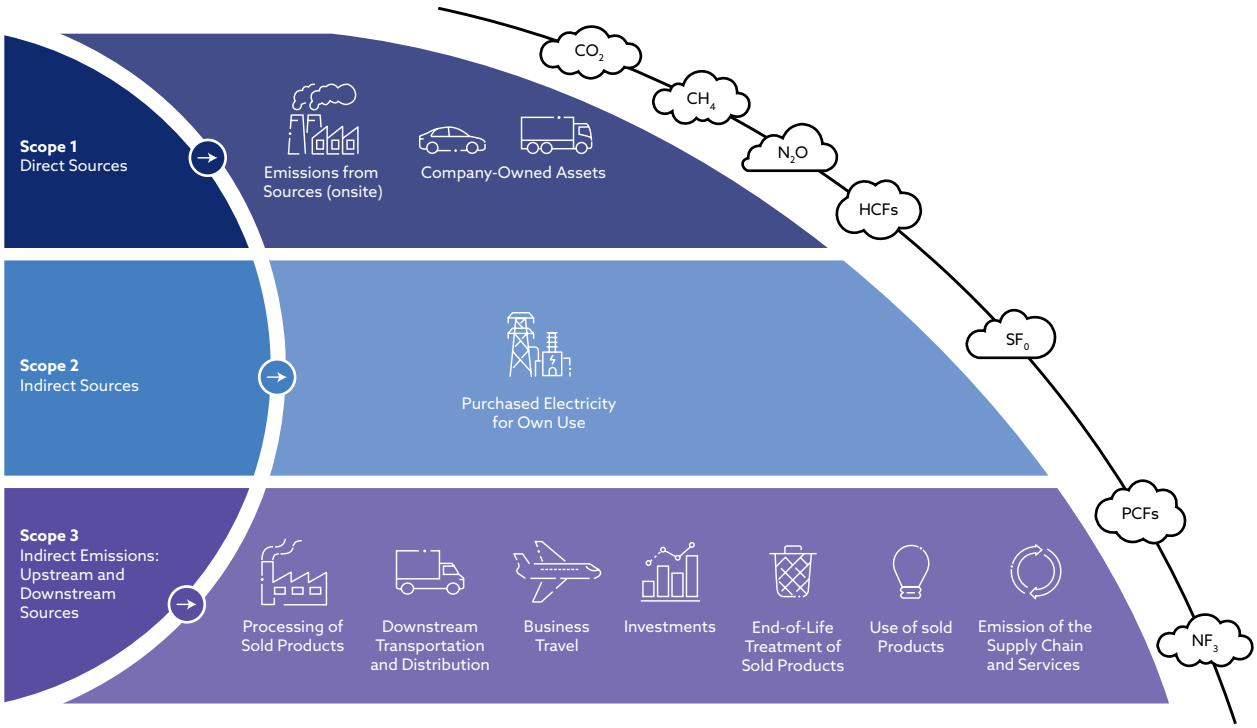
Definitions

Exhibit 1 illustrates the different components of corporate emissions.

Scope 1 emissions are direct GHG emissions from sources that are owned or controlled by the reporting company. They include emissions from combustion in owned or controlled boilers, furnaces, and vehicles and emissions from chemical production in owned or controlled process equipment. Examples include emissions from company vehicles, on-site fuel combustion, and manufacturing processes directly controlled by the company.

Scope 2 emissions are indirect GHG emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the reporting company. Although the emissions occur at the facility where the electricity or other forms of energy are generated, they are accounted for in the company's GHG inventory because they are a consequence of the company's energy consumption. Examples include emissions from the generation of electricity purchased for lighting, heating, and cooling company facilities.

Exhibit 1. Scope 1, 2, and 3 Emissions



Scope 3 emissions encompass all other indirect emissions that occur in the value chain of the reporting company, including both upstream and downstream activities. Scope 3 emissions are a result of activities from assets not owned or controlled by the reporting company but that the company indirectly impacts through its value chain. They include emissions from purchased goods and services, business travel, transportation and distribution, waste generation, and the use of sold products. Scope 3 emissions consist of two components:

- *Upstream emissions* are emissions from activities related to the production and supply of goods and services used by the reporting company, including raw material extraction, manufacturing, and transportation.
- *Downstream emissions* are emissions resulting from the distribution, processing, and use of the company's sold products, including emissions from product disposal or recycling.

Scope 4 emissions, introduced in 2013, are known as avoided emissions. Unlike the traditional scopes (Scope 1, 2, and 3), which focus on emissions directly or indirectly associated with a company's operations and value chain, Scope 4 emissions measure the reductions in emissions that occur as a result of the use of a product or service.[3] There is an increased focus on Scope 4 emissions, but they are difficult to calculate, not widely reported, and consequently outside the scope of this chapter.

Relevance for Investment Managers

Understanding and managing Scope 1, 2, and 3 emissions are critical for investors for several reasons:

- *Risk management:* Companies with significant GHG emissions may face regulatory risks, increased operational costs, and potential liabilities. Investors need to evaluate these risks to make informed investment decisions.
- *Reputation:* Companies that poorly manage emissions may suffer reputational damage, affecting customer loyalty and brand value. Increasingly, investors are considering environmental performance as part of their investment criteria.
- *Long-term sustainability:* Companies that proactively manage their emissions are often better positioned for long-term sustainability. This can lead to improved financial performance and create value for shareholders.

[3]For more information, go to https://plana.earth/glossary/scope-4-emissions.

Absolute emissions refer to the total quantity of GHG emissions released by a company, regardless of the company's size or output. They are measured in total units of emissions (e.g., metric tons of Scope 1, 2, and 3 emissions). Absolute emissions provide a clear picture of the total environmental impact of a company's activities.

Emission intensity is a metric that normalizes emission data to a specific business metric, such as revenue, production output, or employee count. It is typically expressed as emissions per unit of output (e.g., metric tons of CO_2e per unit of product, per dollar of revenue, or relative to the enterprise value of the company). Intensity emissions allow for comparisons among companies of different sizes and can indicate how efficiently a company is managing its GHG emissions relative to its business activities. However, it is subject to volatility of the denominator in that the variability of sales or the enterprise value of the company can cause changes to the intensity when the underlying emissions are relatively stable.

In conclusion, comprehensively understanding and managing Scope 1, 2, and 3 emissions not only help companies mitigate their environmental impact but also provide valuable insights for investors. By evaluating a company's emission profile and metrics, investors can better assess environmental risks, predict future performance, and align their portfolios with sustainable practices.

Using Multiple Vendors to Improve Emission Data Accuracy and Coverage

As previously discussed, carbon metrics are critical for assessing a company's environmental impact. Datasets from different providers are generally homogeneous, meaning they share common characteristics, such as the different emission scopes, among different vendors. While this situation makes these data relatively easy to compare and combine, it also presents a unique set of challenges.

Unlike financial statements, there are no official reporting standards for emission data and although there are generally accepted practices for reporting emissions, different vendors might use different methods to measure and report carbon emissions.

Additionally, each vendor may have different coverage universes and data update frequencies. We evaluated three of the primary vendors of carbon emission data. **Exhibit 2** shows the correlation of reported emissions between those three vendors.

In addition to validating data across providers, the coverage universe can be increased by combining data vendors. **Exhibit 3** shows the coverage of each of the three vendors over time. The chart illustrates the unique count of companies for which carbon intensity data are available, comparing individual vendors (Vendor 1, Vendor 2, and Vendor 3) and the combined dataset over time.

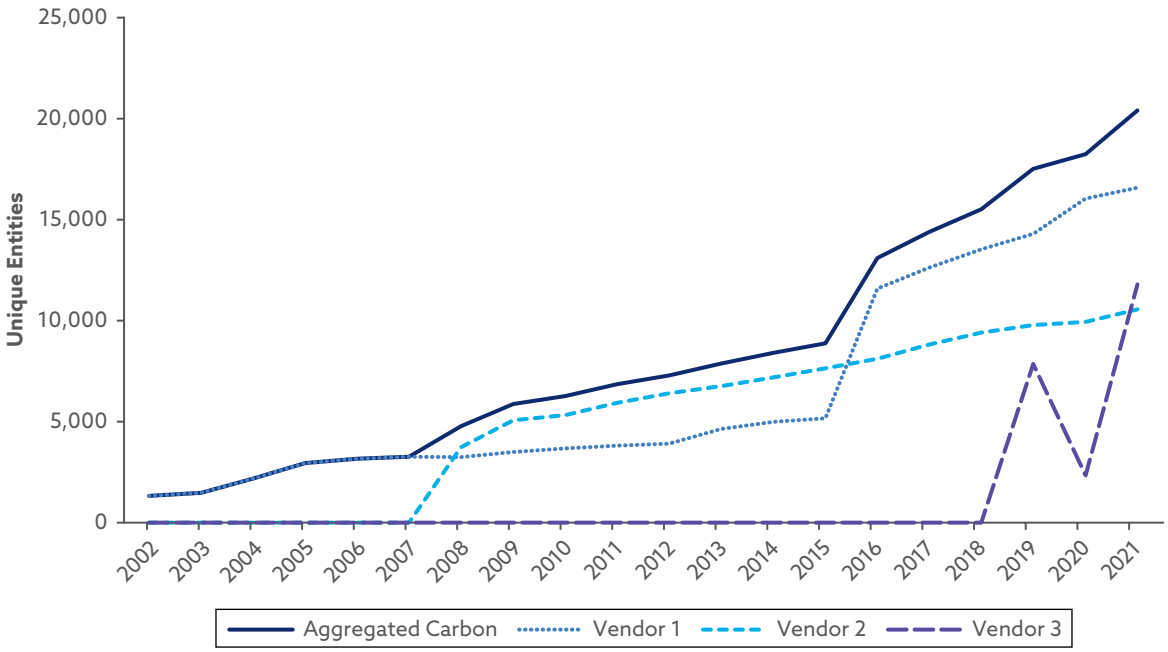
Exhibit 2. Average Correlation between Different Carbon Data Vendors during Overlapping Periods between 2012 and 2024

	Vendor 1	Vendor 2	Vendor 3
Vendor 1	1.00	0.12	0.43
Vendor 2	0.12	1.00	0.71
Vendor 3	0.43	0.71	1.00

Sources: Man Group and underlying vendor data.

The "Aggregated Carbon" line representing the combined carbon dataset shows a steady increase, reflecting the aggregation of data from all vendors. Vendor 1 consistently provides the largest number of company estimates, followed by Vendor 2 and Vendor 3. The noticeable spikes and drops in Vendor 3's data indicate variability in its reporting over the years. Overall, the combined dataset offers a more comprehensive coverage of companies, emphasizing the benefit of integrating multiple data sources to enhance the breadth and reliability of carbon intensity data for climate investment analysis. By validating and combining the data from different vendors, researchers and investors can reconcile the differences and inconsistencies in the data and gain a more accurate, timely, and comprehensive view of a company's carbon emissions.

Exhibit 3. Aggregated vs. Individual Vendors' Carbon Metrics, 2002–2021



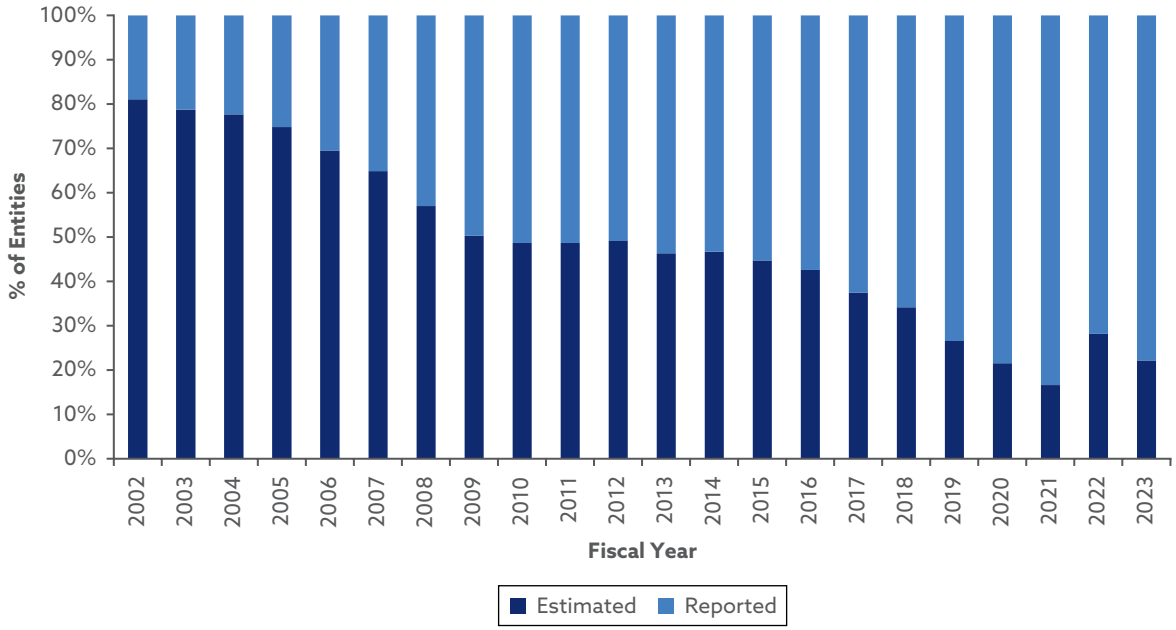
Source: Man Group.

The analysis in the rest of this section will rely on the data from this combined curated dataset, which cross-validates across vendors to maximize coverage, favoring more recent and reported data over older, estimated figures.[4]

Analysis of Carbon Data by Region and Sector

Corporations and investors have increased their focus on carbon emissions over the last 20 years, especially since the Paris Agreement was signed in 2016. Consequently, disclosures of corporate carbon emissions have increased over that time. **Exhibit 4** illustrates the percentage of reported versus estimated Scope 1 and 2 carbon emissions since 2002 for the MSCI All Country World Index (ACWI), a broad equity index of developed and emerging markets. Reported emissions are those that are directly reported by the company, whereas estimated emissions are included in vendor data but are estimated by the vendor, usually based on industry average emissions. It is evident that the proportion of reported emissions has increased dramatically—from roughly 20% in 2002 to roughly 80% today. (Note that as of the time of this analysis, not all fiscal-year 2023 emission data had been reported—hence the increased use of estimated data for the latest fiscal year). This trend indicates an improvement in transparency and accuracy of emission reporting, reflecting the growing emphasis on precise climate data for informed investment decisions.

Exhibit 4. Time Series of Reported vs. Estimated Scope 1 and 2 Emissions



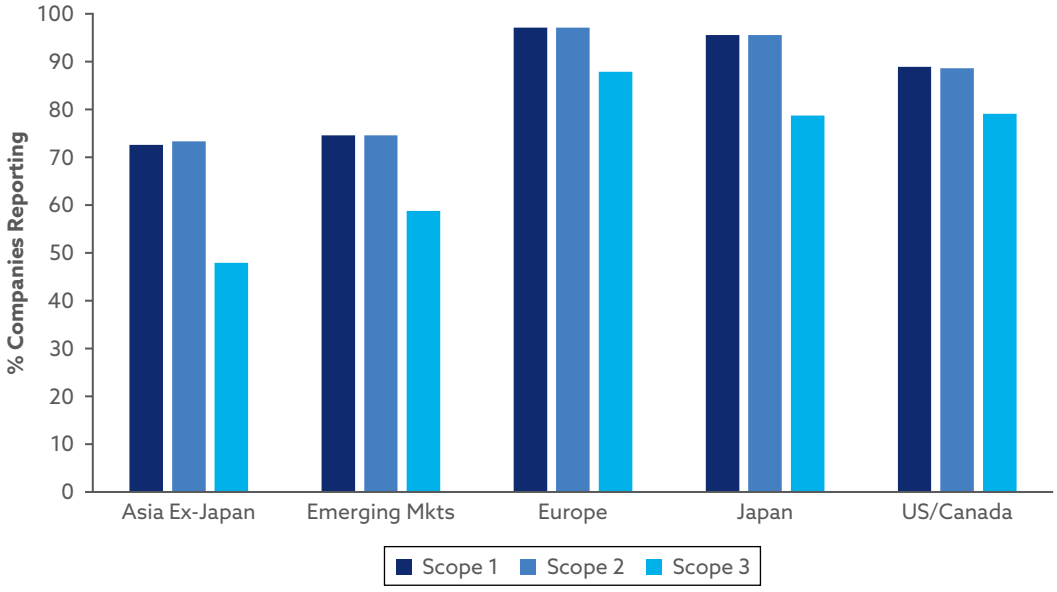
Sources: Man Group; MSCI ACWI universe.

[4]www.man.com/maninstitute/unlocking-the-hidden-potential-ESG-data.

Reported emissions differ by scope. Scopes 1 and 2 are from company-owned assets or electricity directly purchased, are typically easier to calculate, and have higher reporting statistics. In contrast, Scope 3 results from assets and usage not directly controlled by the company and are consequently more difficult to calculate and have lower reported levels. We will explore Scope 3 emissions in the next section of this chapter. **Exhibit 5** illustrates the reported scope disclosures by region for fiscal year 2021, categorized by scope. Note that Scope 3 emissions are counted as "reported" if any component is reported by the company. Typically, the Scope 3 metrics that are easier to calculate, such as corporate travel or emissions from investments, are reported and the upstream and downstream metrics (see the breakdown in Exhibit 1) that are more difficult to calculate are not reported. While this increases the percentage of companies reporting Scope 3, it greatly underestimates the actual emissions. The consolidated carbon dataset in this section tries to account for this by including estimates to fully represent Scope 3 emissions.

Europe leads the way in carbon emission reporting. Emission disclosures are mandated for FY 2024 by the Corporate Sustainability Reporting Directive (CSRD), which requires all large companies and all listed companies (except listed microenterprises) to disclose "risks and opportunities arising from social and environmental issues and . . . the impact of their activities on people and the environment."[5] In the developed markets, Japan and North America have the next highest disclosure rates, followed by Asia ex-Japan. Scope 1 and 2

Exhibit 5. Reported Regional Disclosure by Scope



Sources: Man Group; MSCI ACWI universe (FY 2021).

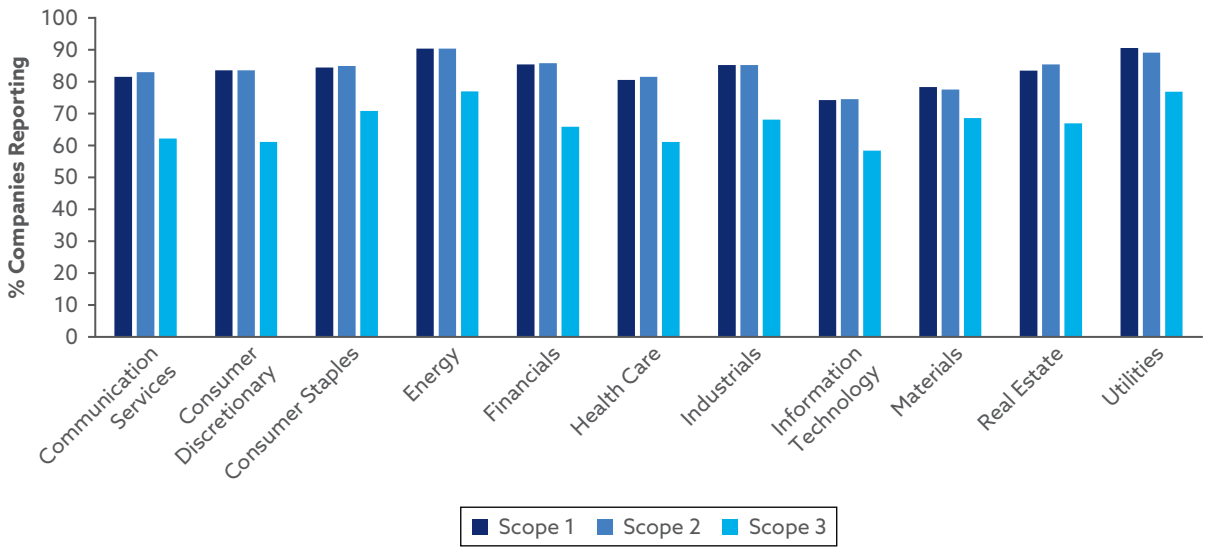
[5]https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en.

disclosures are very similar within regions, with Scope 3 having lower reporting levels. The emerging markets, which have a large Asian component, are similar to Asian developed markets but have about 10% higher Scope 3 reporting levels.

Carbon emissions also vary by sector, with the highest-emitting sectors typically having the highest disclosure rates. **Exhibit 6** breaks down the percentage of companies reporting emissions by scope across various Global Industry Classification Standard (GICS) sectors for the MSCI ACWI for fiscal year 2021. Energy, utilities, and materials, the three highest-emitting sectors (as shown in **Exhibit 7** and **Exhibit 8**), also have the highest reporting rates. Low-emitting sectors, such as technology, communication services, and financials, have the lowest reporting levels. As with the country-level exhibits, reporting rates for Scope 3 are much lower than they are for Scope 1 and 2.

Regarding the level of total carbon emissions, Exhibit 7 shows the distribution, by sector, of total Scope 1–3 emissions. Three things stand out. First, absolute emissions vary greatly by sector, with energy, utilities, and materials generally having the highest total emissions. Second, a sector's emissions vary by scope. Scope 1 represents the bulk of the emissions in the utilities and energy sectors, while Scope 3 dominates in the materials, consumer discretionary, and consumer staples sectors (we will delve deeper into this in the next section).[6] Third, the distributions are very skewed for all three scopes. There is a much wider distribution of high emitters outside the interquartile range (shaded box) than

Exhibit 6. Reported Sector Disclosure by Scope



Sources: Man Group; MSCI ACWI (FY 2021).

[6]There is some debate about the accurate calculation of downstream Scope 3 emissions for energy companies. See Department for Energy Security and Net Zero, "Scope 3 Emissions in the UK Reporting Landscape: Call for Evidence" (October 2023). https://assets.publishing.service.gov.uk/media/652ea4756972600000dccf9db/scope-3-emissions-in-the-uk-reporting-landscape.pdf.

Exhibit 7. Distribution of Scope 1, 2, and 3 Emissions by Sector

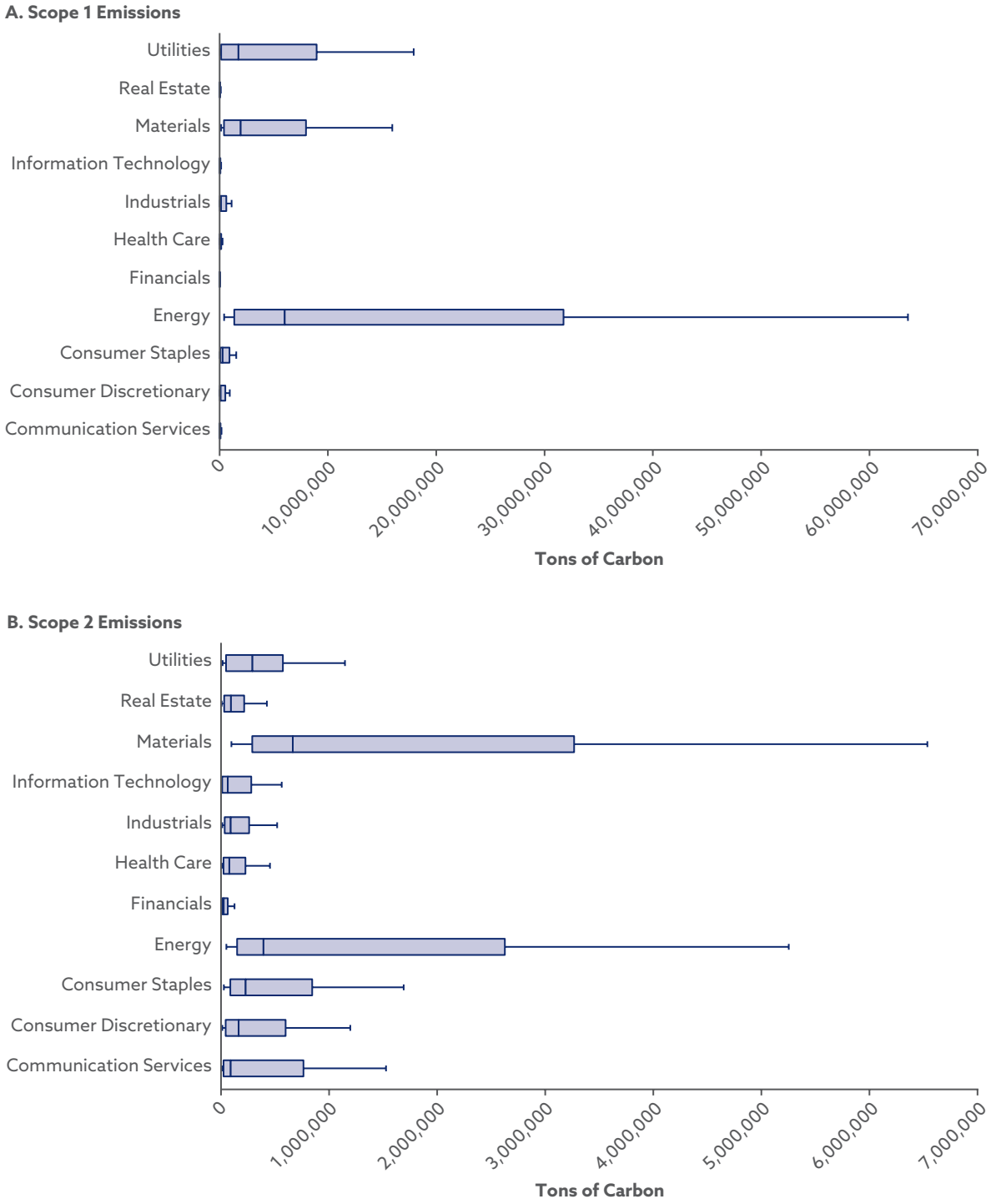
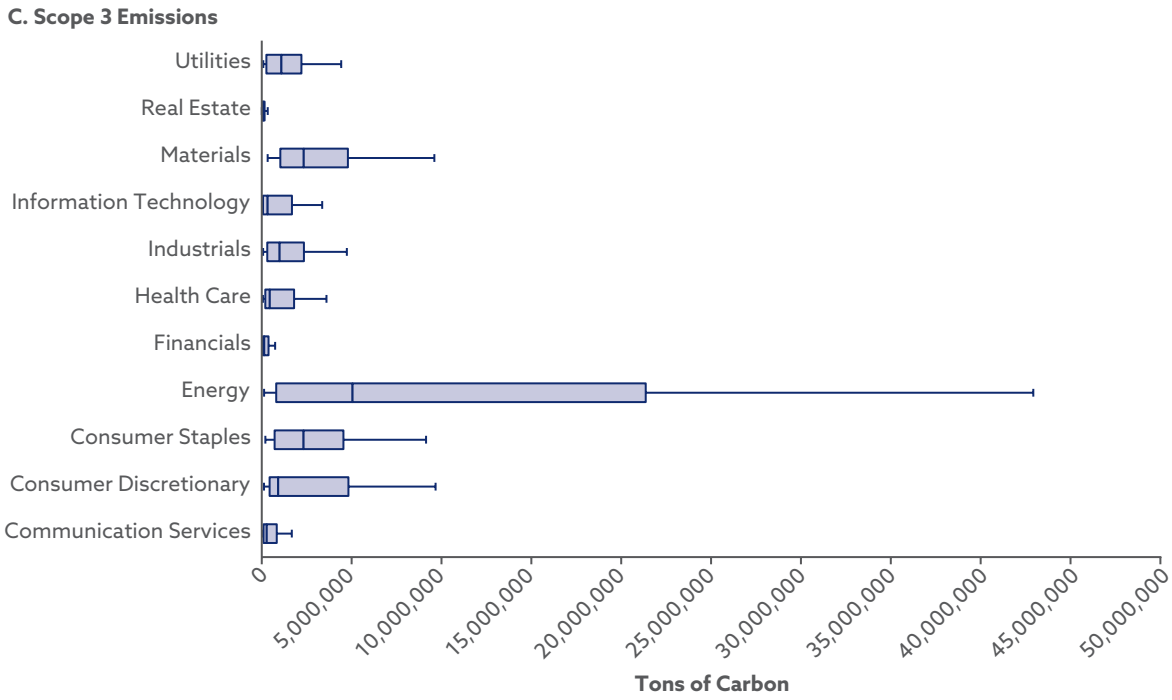
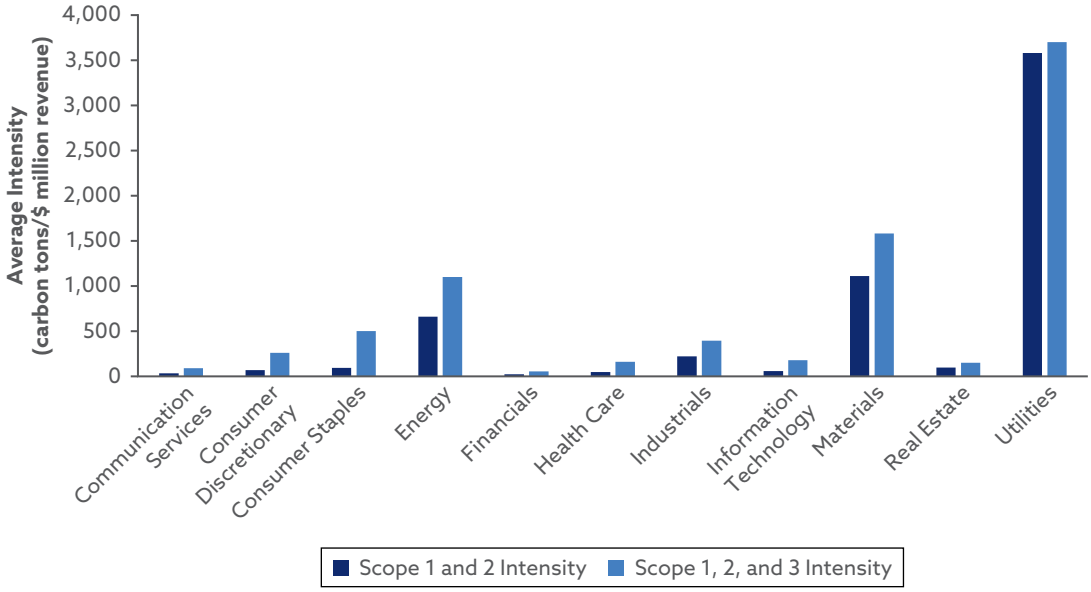


Exhibit 7. Distribution of Scope 1, 2, and 3 Emissions by Sector (*continued*)



Sources: Man Group; MSCI ACWI (FY 2023).

Exhibit 8. Average Carbon Intensity by GICS Sector (Scope 1 and 2 Combined and Scope 1, 2, and 3 Combined)



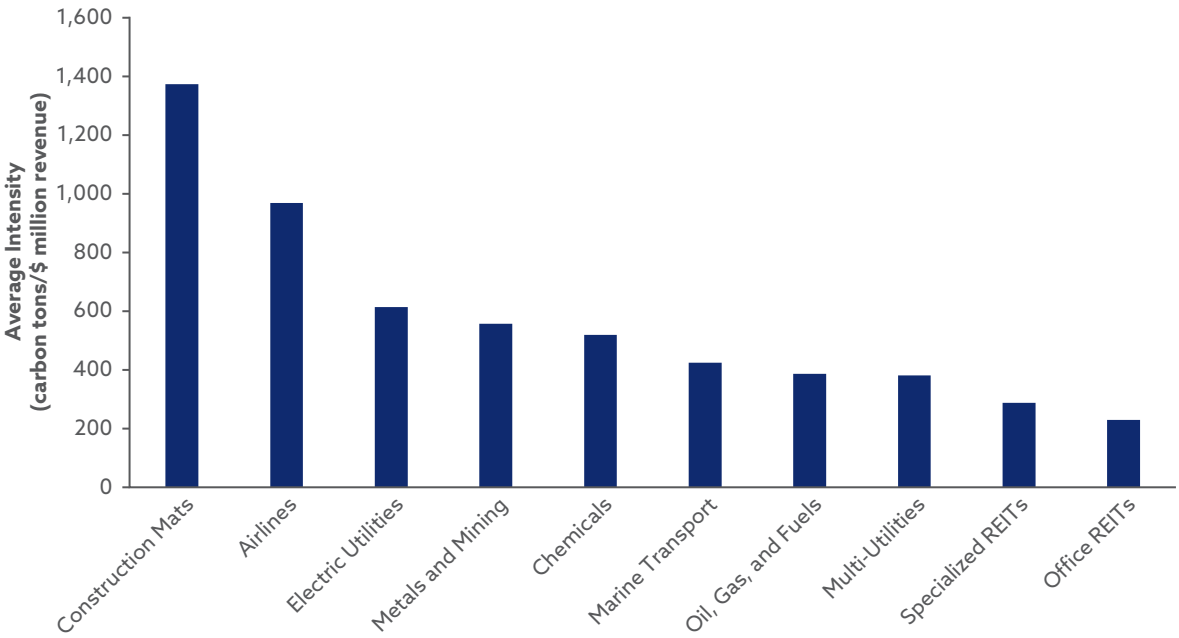
Sources: Man Group; MSCI ACWI universe (FY 2023).

there is for low emitters, which often influences portfolio analytics, where even small positions in extremely high emitters can have an outsized influence in reported carbon statistics.

To normalize for size, emission intensity levels are the preferred choice. They measure the tons of carbon emitted scaled per million dollars of revenue. The first set of bars in Exhibit 8 show the Scope 1 and 2 emissions combined (the most widely disclosed and most often quoted figure), with the second set of bars detailing all three scopes combined. The materials sector has the highest emission intensity (3,581 Scope 1 and 2; 3,702 Scope 1, 2, and 3), more than double the emission intensity of energy, the second highest sector. Financials have the lowest emission intensity (22 Scope 1 and 2; 54 Scope 1, 2, and 3), followed by communication services and health care. As noted previously, average emission intensity can vary due to both extreme emissions of certain companies and variability of the denominator—in this case, sales. The data used in the following analysis adjust for extreme outliers.

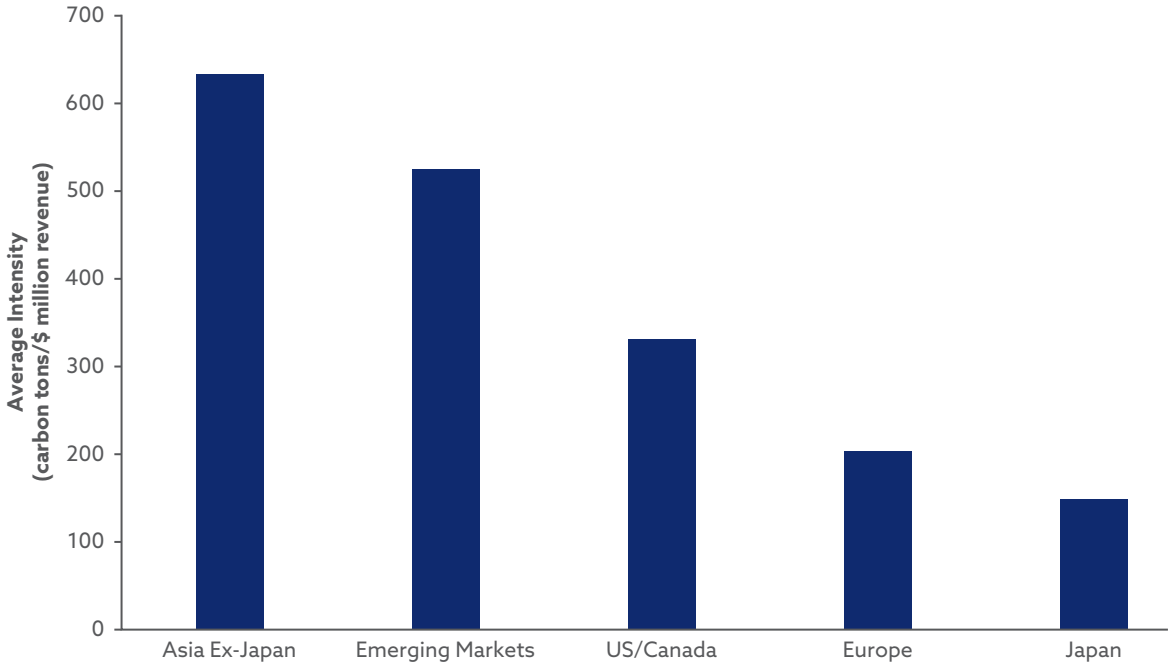
The highest-emitting industries or companies are not always in the highest-emitting sectors. **Exhibit 9** shows the 10 highest-emitting industries in the MSCI ACWI using combined Scope 1 and 2 intensity. Industries in the materials sector represent 4 of the top 10 industries. The construction materials

Exhibit 9. Average Carbon Intensity for High-Emitting GICS Industries (Scope 1 and 2)



Sources: Man Group; MSCI ACWI universe (FY 2023).

Exhibit 10. Average Carbon Intensity by Region (Scope 1 and 2)



Sources: Man Group; MSCI ACWI universe (FY 2023).

industry—primarily cement producers—leads the way, with chemicals, metals and mining, and paper and forest products also present in the top 10. Two industries in the industrials sector—airlines and marine transport—are in the top 10.

Asia leads emission intensity at the regional level. **Exhibit 10** details the regional emissions for the MSCI ACWI using combined Scope 1 and 2 intensity. Asia ex-Japan (developed) has the highest emissions, followed by emerging markets (currently ≈75% Asia). Europe, which has made emission reductions a priority, has about one-third the emissions of developed Asia. Japan has the lowest emissions, but that is partially driven by that market's sector composition, which has relatively low weights in the high-emitting utilities and energy sectors (see Exhibits 6 and 7).

Scope 3 Emissions

To truly understand a company's emission profile, one must account for all sources of corporate emissions. This process has begun in earnest, but most of the analysis focuses on Scope 1 and 2 emissions. However, Scope 3 emissions—those attributed to a company's value chain—are becoming increasingly recognized as equally if not more important. Scope 3 emissions are significant contributors to the carbon output of the company and can change the relative attractiveness of the overall emission intensities of the sectors, industries, and stocks when incorporated into the analysis. Scope 3 emissions will become increasingly important and necessary for accurate GHG

accounting. Even though the US Securities and Exchange Commission removed Scope 3 reporting from its "Final Rules," many European regulations (including the CSRD), the International Sustainability Standards Board, and the state of California require that large companies report their Scope 3 emissions, to be phased in starting in 2025.[7]

Given the rising relevance of Scope 3 emissions, this section focuses on understanding this historically difficult-to-measure and consequently overlooked category. We discuss the current GHG Protocol accounting guidelines in the context of current data quality and how Scope 3 differs from Scope 1 and 2. The remainder of the analysis in this section focuses on emission data from S&P Trucost, which provides the most detailed information on Scope 1 and 2 emission intensity, as well as Scope 3 intensity broken down by upstream and downstream activities.

Definitions

Because Scope 1 and 2 emissions are within the owned operations of the business, they are the easiest to measure and most frequently reported. However, Scope 3 emissions are those in the upstream or downstream value chain specifically not reported in Scope 2. Because Scope 3 emissions come from sources outside the company's directly owned operations, they are more difficult to estimate but can be very impactful to the overall company's carbon footprint.

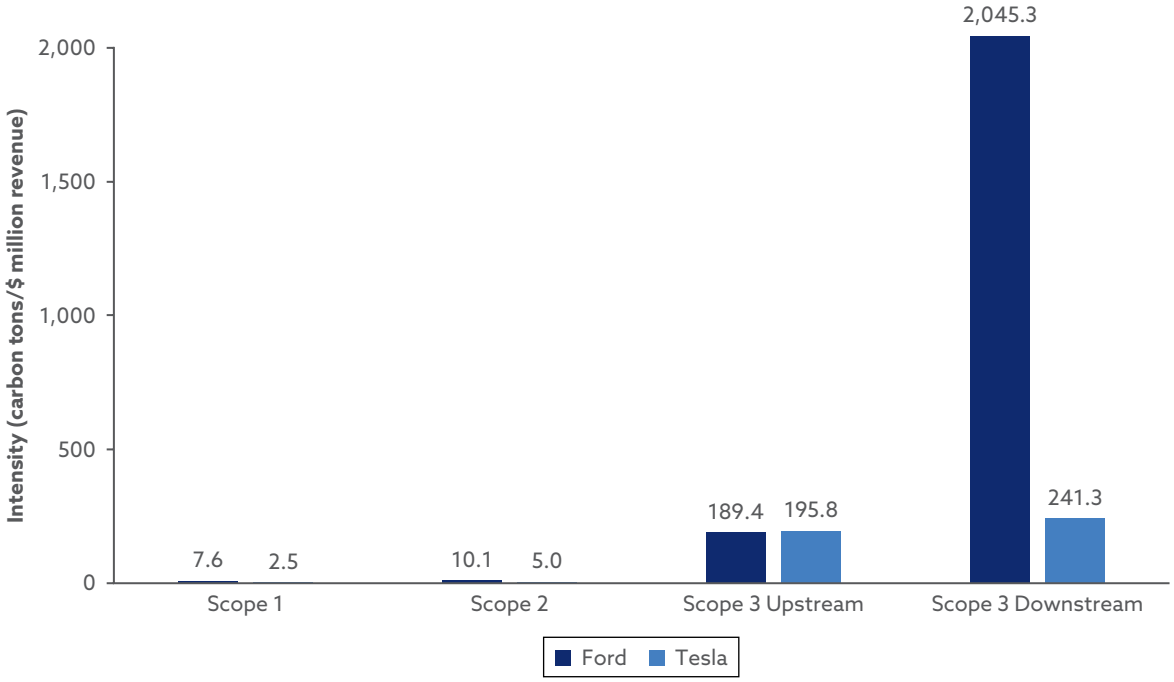
Measuring Scope 3 is a challenging problem; these emissions must be estimated by either the company itself or a third party. While the GHG Protocol supplies accounting guidance, the methodologies companies use may not be standardized. The GHG Protocol breaks Scope 3 into upstream and downstream emissions and, more specifically, into 15 categories.[8] Upstream emissions include those from the production of product inputs, such as purchased goods and services. In contrast, downstream emissions refer to emissions that occur from such sources as the use of a company's products.

One might believe Scope 3 is out of a company's control, but companies can make efforts to mitigate these emissions. For instance, they can use less emission-intensive materials to build their products, thus lowering upstream emissions, or they can create a product that uses less carbon throughout its product life cycle. Neither example would be captured in Scope 1 and 2, but they are nevertheless decisions that companies can make. In addition, a company can outsource all or part of its manufacturing process, effectively reducing its Scope 1 emissions, without truly lowering their emission footprint. Thus, it is important to account for Scope 3 to ensure that Scope 1 and 2 are not being reduced at the expense of increasing Scope 3 emissions, or vice versa.

[7]Aligned Incentives, "Navigating Mandatory Scope 3 Emissions Reporting in the EU, US, and Beyond" (26 April 2024). https://alignedincentives.com/mandatory-scope-3-emissions-reporting-eu-us-uk-international/.

[8]World Resources Institute and World Business Council for Sustainable Development, "Corporate Value Chain (Scope 3) Accounting and Reporting Standard: Supplement to the GHG Protocol Corporate Accounting and Reporting Standard" (September 2011). https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf.

Exhibit 11. Ford and Tesla Carbon Intensity, FY 2022



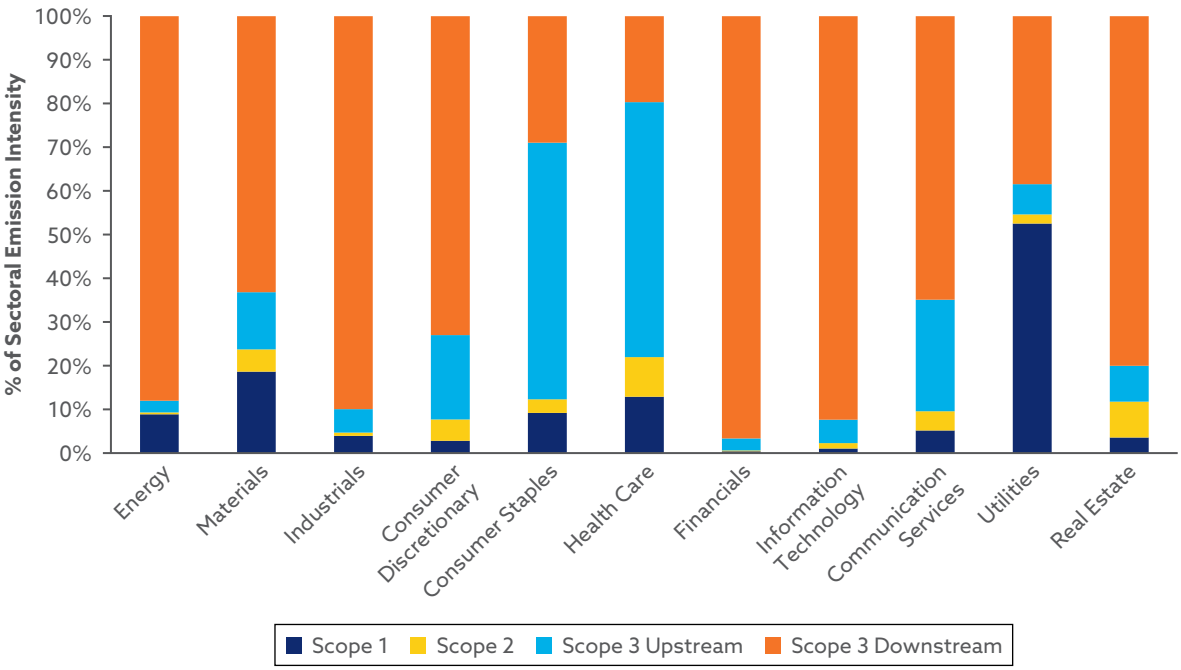
Source: S&P Trucost.

For example, Ford and Tesla have very low and similar Scope 1 and 2 emission intensity, while Scope 3 accounts for most of their emissions (see **Exhibit 11**). This situation is persistent across many companies, and thus incorporating only Scope 1 and 2 when evaluating such companies can miss a significant portion of their carbon emissions. Similar to Scope 1 and 2, Scope 3 data can be significantly skewed toward positive outliers (as shown in Exhibit 7), which can make these data difficult to incorporate in analytics and portfolio construction without special care.

Breaking down Scope 3 further, Ford and Tesla have similar upstream Scope 3 emissions from their auto production, but Tesla has much lower downstream Scope 3 emissions given its fleet consists solely of electric vehicles (EVs). If Ford wants to reduce its downstream emissions, it needs to either encourage its customers to drive less, extending the life of their car, or get them to switch to an EV model, which may be less popular or profitable. This fact creates a potential conflict for Ford in trying to maximize profitability.

The relative importance of Scope 3 can depend on a company's industry and business model. To examine this, we show the average percentage breakdown of Scope 1, 2, and 3 (upstream and downstream) carbon intensity by sector (**Exhibit 12**). When breaking down into upstream and downstream Scope 3 emissions, we see that there are large differences across sectors in terms of the dominant source of the emissions, making both important. At the sector

Exhibit 12. Average Percentage Breakdown of Carbon Intensity by Sector, FY 2023



Sources: Man Group; S&P Trucost.

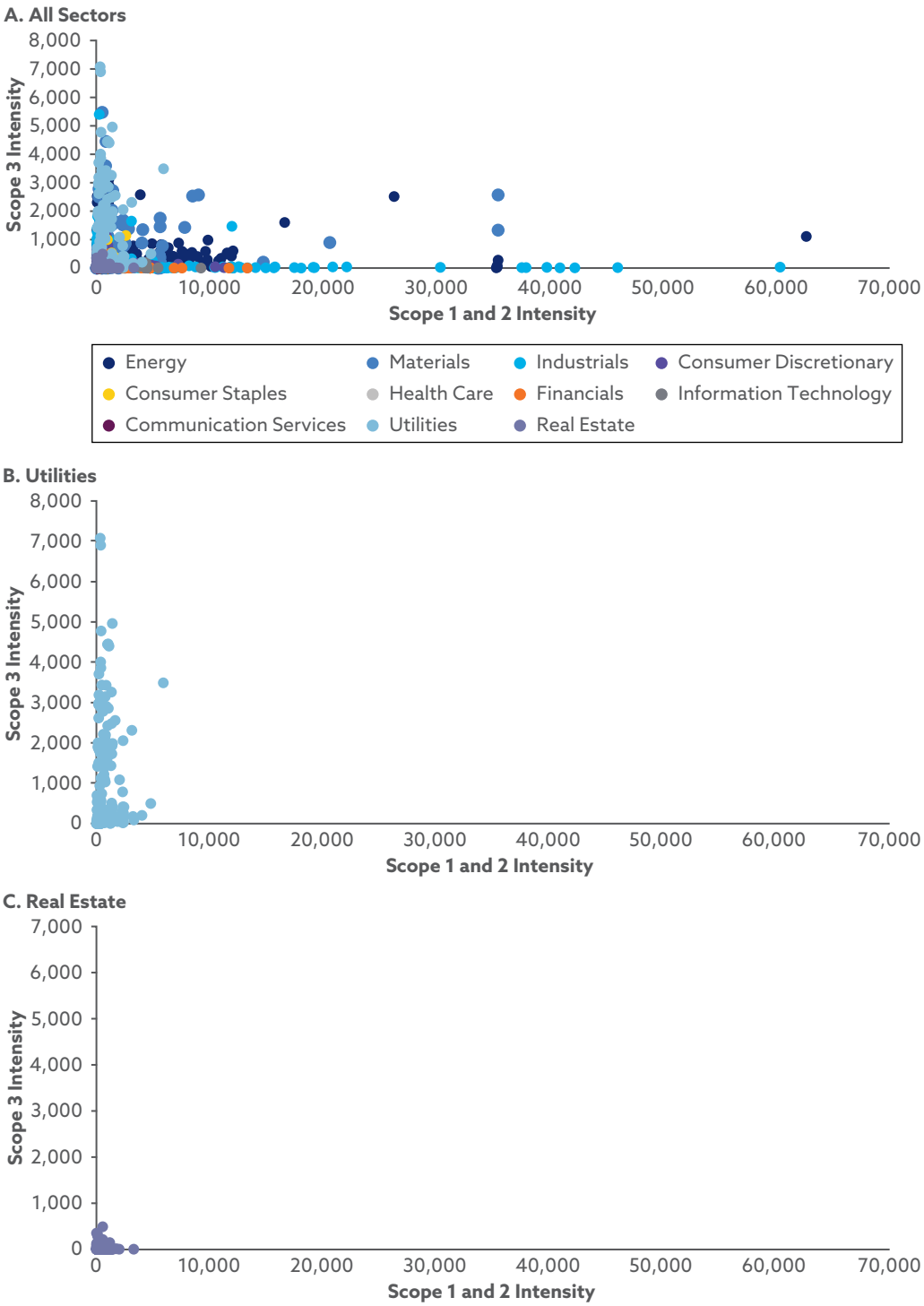
level, Scope 3 accounts for around 90% of total emission intensity in consumer staples but less than 50% for utilities, where Scope 1 is on average the most significant contributor to carbon intensity. These variations suggest that the incorporation of Scope 3 may paint a different picture of what sectors or industries are actually more or less energy intensive relative to the picture shown by Scope 1 and 2 alone.

Contrasting Scope 3 with Scope 1 and 2

Using estimated values from S&P Trucost, we can see quite a difference in the emission profile of the scope categorization by sector for upstream emissions. Plotting Scope 1 and 2 versus upstream Scope 3 emission intensity shows the relationship is fairly sector dependent (**Exhibit 13**).

The utilities sector (Panel B of Exhibit 13) has relatively low Scope 1 and 2 emissions and relatively high Scope 3 emissions. The outliers with higher Scope 1 and 2 numbers in this sector are generally power and energy generation companies. The real estate sector (Panel C of Exhibit 13), in contrast, reveals very small values for all three scopes, with the more extreme emissions from hotel and diversified real estate investment trusts (REITs) that have buildings used for high-emitting activities, such as data centers. Note that accounting for emissions for REITs is complicated and depends on project

Exhibit 13. Scope 1 and 2 vs. Scope 3 Carbon Intensity by Sector, FY 2023



Sources: Man Group; S&P Trucost.

financing and the type of lease used.[9] These details are often not disclosed. Overall, the correlation of Scope 1 and 2 with Scope 3 emissions varies across sectors, highlighting the different structural relationship of emissions. These dynamics are even more prevalent when looking at stock-level data, which have approximately zero correlation.

Potential Problems with Scope 3

Although the importance of Scope 3 emissions is clear, issues remain when using the data, such as spotty estimation techniques, relatively low reporting levels, and double counting of emissions when summing across companies. We now turn to the issues faced when using these data to accurately compare a company's total emissions across all three scopes or perform aggregated group emission levels.

Large Level of Estimation

As Exhibit 5 showed, Scope 3 is generally less reported than Scope 1 and 2 (as low as 48% in Asia ex-Japan). Because Scope 3 data vendors may be estimating a large percentage of Scope 3 values, it is important to understand the estimation methodology. Upstream and downstream emission intensity coverage from S&P Trucost begins in FY 2002 and FY 2017, respectively. For the upstream model, S&P Trucost uses an environmentally extended input–output model; relationships between sectors are used to attribute carbon intensity in a company's supply chain. Downstream emissions are either estimated through a bottom-up approach (for the oil and gas, coal, and automotive industries) or imputed at the subindustry level using reported emissions. Because Scope 3 can be difficult to measure, there are some limitations in using largely estimated data. For instance, we do not find large variation in Scope 3 intensity by sector, which may be the result of estimation techniques, such as imputation by subindustry. S&P Trucost also notes as another potential issue that the estimated values may be lower than the true Scope 3 emissions because the companies that report might be those that have lower emission intensity.[10]

Double Counting across Companies

For business-to-business firms, one company's Scope 3 can make up another company's Scope 1 and 2. This situation can be both problematic (from a total emission perspective) and desirable (on a comparison basis).[11] Take, for example, a grocery store that outsources delivery of its goods to a trucking company. The trucks' emissions would count as upstream supply-chain emissions for the grocery store and thus be reported in Scope 3. However, the same emissions would count toward the trucking company's Scope 1. Therefore,

[9]www.gc-insights.com/report/pcaf's-new-guidance-for-accounting-ghge-in-real-estate-sector#:~:text=For%20real%20estate%20investment%20trusts,proportionally%20according%20to%20their%20share.

[10]www.spglobal.com/spdji/en/documents/additional-material/faq-trucost.pdf.

[11]GHG Protocol, "Scope 3 Frequently Asked Questions" (June 2022), p. 20. https://ghgprotocol.org/sites/default/files/2022-12/Scope%203%20Detailed%20FAQ.pdf.

summing Scope 1 and Scope 3 for both companies would overstate total emissions. The matter is further complicated because the trucking company is carrying goods for other entities, so not all those emissions should be attributed to the grocery store. One potential solution to understand the degree of double counting would be to use detailed supply-chain data to see what percentage of the trucking company's revenues are from different grocery store chains and use that as a proxy for allocating its Scope 1 emissions to that chain's Scope 3 emissions. To be clear, despite an overstatement of total emissions of the grocery store and trucking company, we believe that we need to account for Scope 3 emissions not only to understand the extent of the grocery store's carbon footprint but also to fairly compare it with potentially more vertically integrated competitors. For instance, in the case of a competitor grocery store that transports its own goods via company-owned trucks, these emissions would count toward their Scope 1. If we were to compare only the Scope 1 emissions of the two grocery store companies, the store that outsources may appear more carbon efficient because we have not accounted for the full impact of outsourced upstream emissions.

There are also clear cases where emission overlap would not be an issue. A simple example would be a car company producing vehicles for personal use. Because the end user is not a business, these cars would not be counted in another company's emissions. However, it is not always that clear. The auto emissions incurred by Walmart's 2.2 million employees commuting to work are included in Walmart's Scope 3, but the personal use of those same cars is not. However, for the manufacturer, 100% of the auto use is included in its Scope 3. In an estimation by MSCI, approximately 80% of Scope 3 emissions are counted toward another company's Scope 1 and 2.[12]

One final consideration about double counting is the group of stocks that are being aggregated, which might have a significant impact on the amount of double counting that would be present. If an industry-level analysis on carbon emissions were the goal, there could be significantly more overlap than that for a diverse portfolio of 100 stocks.

Conclusion

We do not expect the current issues with Scope 3 emission data—mainly the low level of reporting and lack of reporting standards, allowing for inconsistent reporting—to improve through increased regulation and market demand. There are, however, ways we can gain insight through relative comparisons across companies and sectors, as well as trend analysis. Although Scope 3 data are more cumbersome to gather and interpret, this information is essential to capturing a full view of a company's carbon emissions.

[12]B. Baker, "Scope 3 Carbon Emissions: Seeing the Full Picture" MSCI (17 September 2020). www.msci.com/www/blog-posts/scope-3-carbon-emissions-seeing/02092372761.

Paris Alignment Data

While the carbon emission data described previously have improved in quality recently, one drawback is that the data are backward-looking and focused on *historical* emissions. In planning for a Paris-aligned future, the primary focus of companies should be on their trajectory toward net zero and reducing *future* emissions.

The Science-Based Targets initiative (SBTi)—a joint initiative between such key players as CDP, UN Global Compact, World Resources Institute, and World Wide Fund for Nature—established requirements for the net-zero standard. One key principle behind the standard is that "a company is only considered to have reached net-zero when it has achieved its long-term science-based target and neutralized any residual emission,"[13] which for most companies means long-term target emission reductions of at least 90% by 2050.

The year 2050 is more than two decades away, and a company committed to net zero should "set near- and long-term targets" to achieve that goal (another tenet of SBTi's net-zero principle). As companies commit to net zero, they report forecast target future emissions by year with the SBTi, alongside the budgeted emissions allocated using the SBTi methodology. They set a "base year" and near-term and long-term "target years":

- *Base years:* The base year is set as the emission baseline that future emissions are compared with. Working with SBTi, companies ensure that the base year has verifiable Scope 1, 2, and 3 emission data and is representative of typical business activity.
- *Target years:* SBTi requires near-term targets of 5–10 years and long-term targets of year 2050 or before.

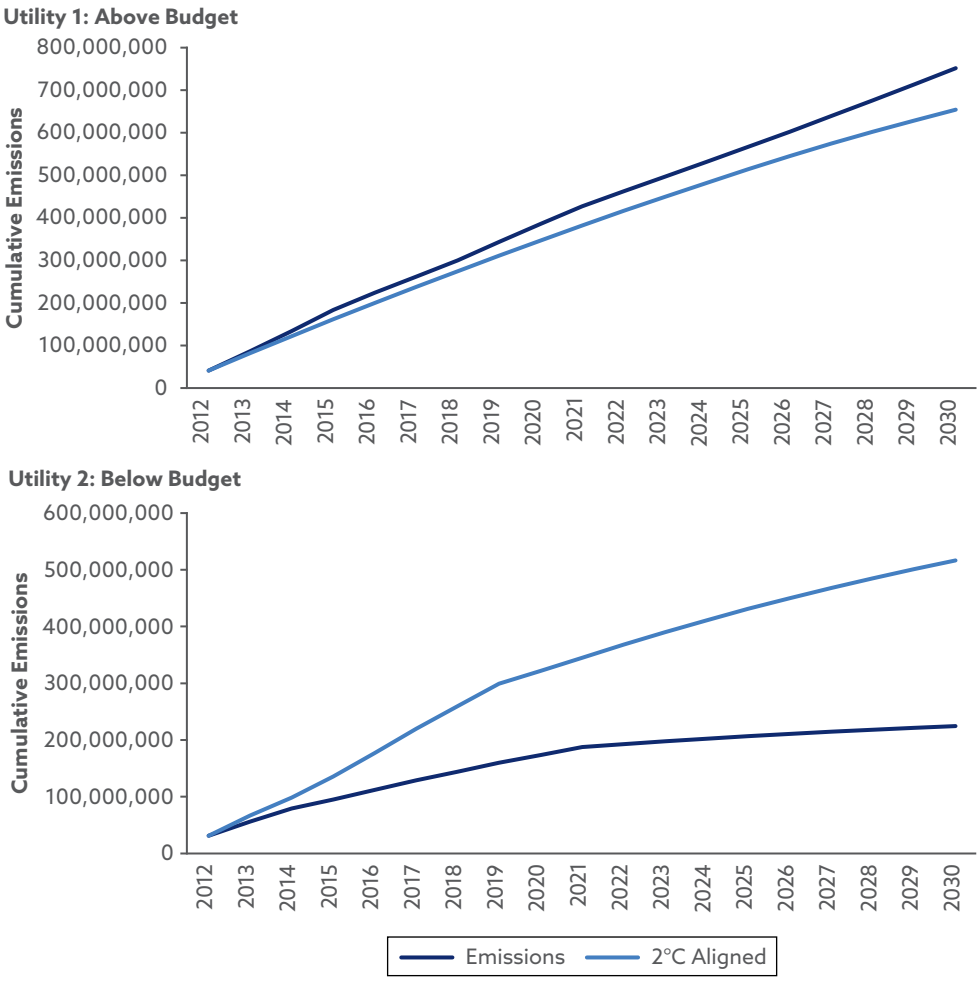
As it may be arbitrary to make projections out to 2050, investors can look at the over- or under-forecast of company emissions into the near future (near-term SBTi target) as an indication of whether a company is on the explicit path to net zero. **Exhibit 14** shows two contrasting utility companies, comparing future expected emissions with budgeted (aligned) emissions up to the near-term target of 2030. Utility 1 is above budget and hence not Paris aligned, while Utility 2 is below budget and Paris aligned.

Historical Emissions Do Not Equal SBTi Alignment or Net Zero

It is important to note that a lower-emission company is not necessarily more "2°C aligned" than a higher-emission company. Indeed, as **Exhibit 15** shows, there is very little relationship between carbon intensity (historical) and 2°C alignment (future). Typically, carbon intensity is measured based on a company's previous-year emissions over sales (in carbon tons/$ million revenue).

[13]https://sciencebasedtargets.org/net-zero.

Exhibit 14. Projected Emissions vs. 2°C Aligned Emissions, 2012–2030



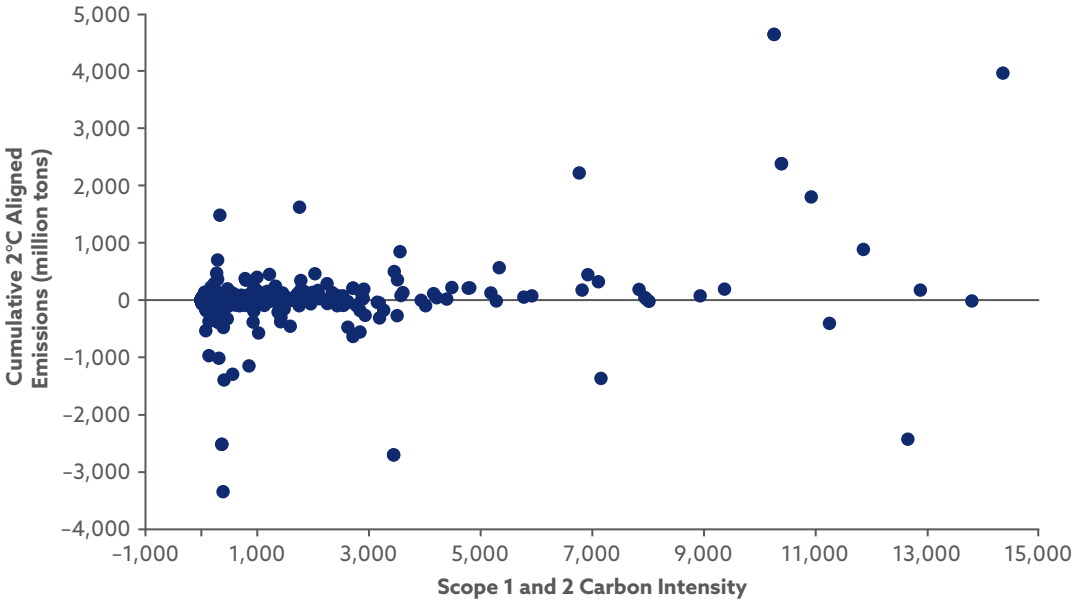
Notes: 2012 is the base year of the analysis. Alignment is measured by cumulative above/below constraints since the base year to 2030. Hence, historical emissions are important to the extent that companies are penalized should their actual emissions exceed projected emissions.

Sources: S&P Trucost; SBTi; as of 30 June 2024.

It is a backward-looking measure and does not take into account a company's future emissions.

For example, Utility 2 is an integrated electric company servicing multiple states and is regarded as a leader in the sector when it comes to alternative energy. At a carbon intensity of 278 carbon tons/$ million revenue (versus the MSCI World Index at 100 carbon tons/$ million revenue), the company looks unfavorable from a historical emissions perspective (see **Exhibit 16**). However, it is considered by many experts to be a leader in net-zero initiatives, including its Climate Change Investment Initiative, which includes providing investments to startups developing new technologies to reduce greenhouse gases. It has

Exhibit 15. Carbon Intensity vs. 2°C Alignment, 30 June 2024



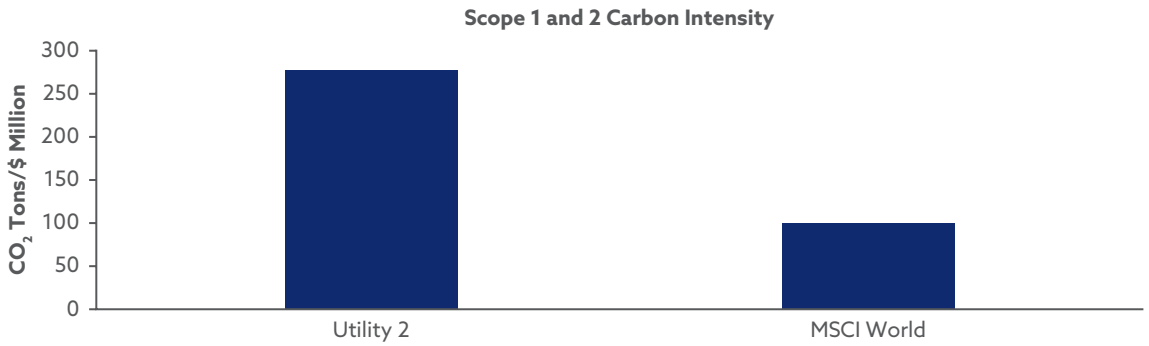
Sources: S&P Trucost; SBTi; MSCI ACWI.

been given an A– rating by CDP. Most importantly, it has significantly beaten the SBTi 2°C budgeted emissions by 277 million tons of CO_2 emissions, clearly doing more than its fair share of contributing toward a greener world.

Note that being "net zero" is a much more stringent requirement than being "carbon neutral." For example, Alphabet has recently removed its claims of

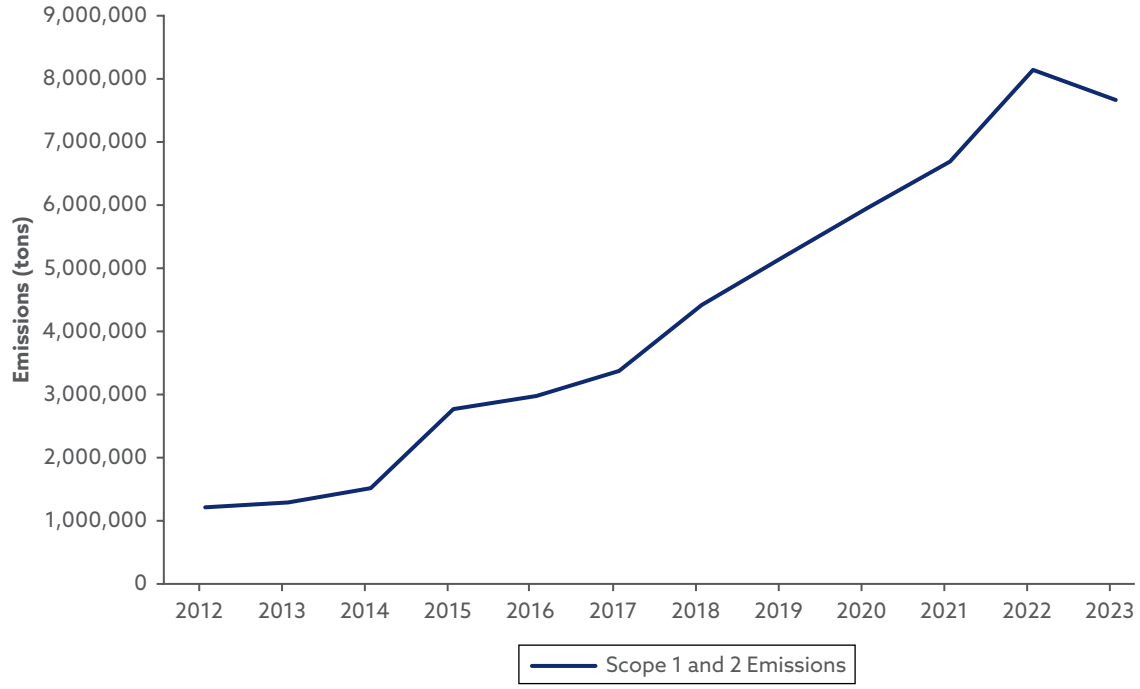
Exhibit 16. Key Carbon Metrics of Utility 2, 30 June 2024

Carbon Intensity (CO_2 tons/$ million revenue)	278
Cumulative tCO_2e under/over 2°C Carbon Budget (2025 Horizon)	–277 million
% Revenue from Nuclear Energy	34.10%



Sources: S&P Trucost; SBTi.

Exhibit 17. Alphabet's Carbon Emissions, 2012–2023



Sources: S&P Trucost; SBTi.

being "carbon neutral since 2007."[14] Previously, the company achieved carbon neutrality by purchasing renewable energy offsets, while it continued to emit (based on 2023 data) 7.7 million tons of CO_2 emissions (Scope 1 and 2), as shown in **Exhibit 17**. Of course, this would be insufficient based on SBTi's Corporate Net-Zero Standard, which explicitly requires companies to focus on "rapid, deep emission cuts" rather than achieving net zero by purchasing offsets.

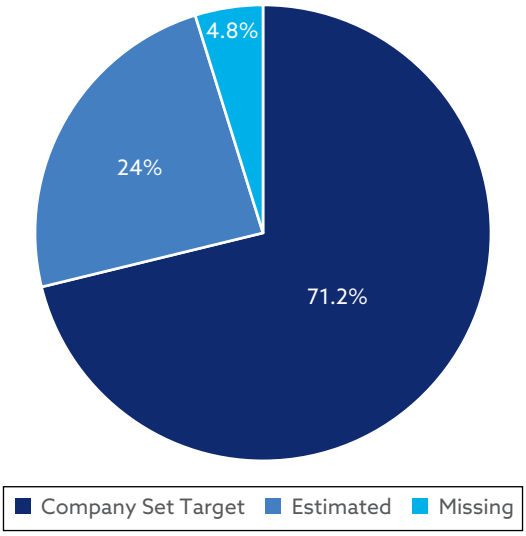
Data Coverage, Distribution, and Implications

Because not all companies have registered their commitments to SBTi, one should use the Paris-aligned data with an understanding of the assumptions the data vendor used to extend coverage to a broader universe. As of 30 June 2024, approximately 71% of the weight of the MSCI ACWI is sourced from company-set targets while the rest are estimated (either via subindustry or company trends) by the vendor (**Exhibit 18**).

An examination of the SBTi 2°C alignment data paints a picture that is somewhat bleak (see **Exhibit 19**): Only 47% of companies in the MSCI ACWI are

[14]S. Pichai, "Our Third Decade of Climate Action: Realizing a Carbon-Free Future," *The Keyword* (blog, 14 September 2020). https://blog.google/outreach-initiatives/sustainability/our-third-decade-climate-action-realizing-carbon-free-future/.

Exhibit 18. SBTi Data Coverage, 30 June 2024

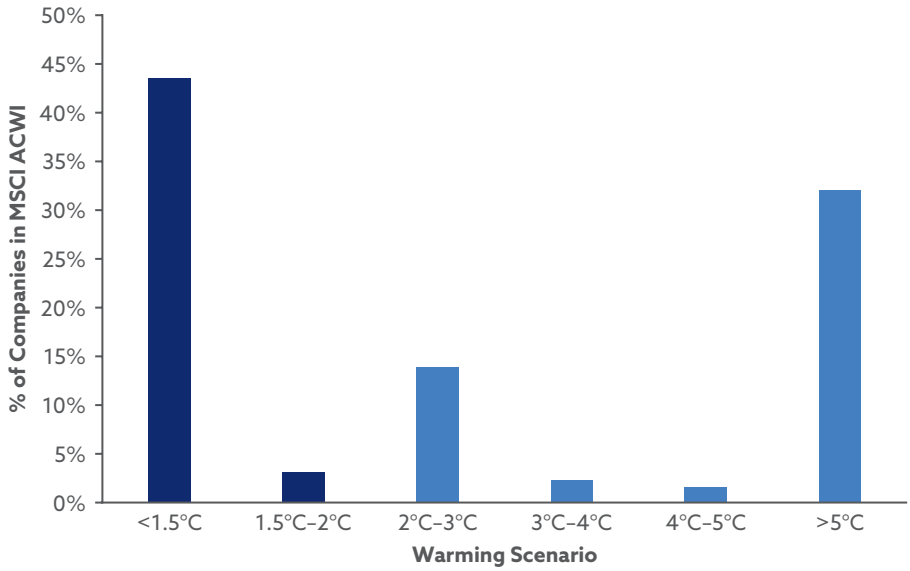


Sources: S&P Trucost; SBTi.

aligned with the 2°C goal (1.5°C–2°C and <1.5°C buckets), while more than 30% of companies are aligned at greater than 5°C.

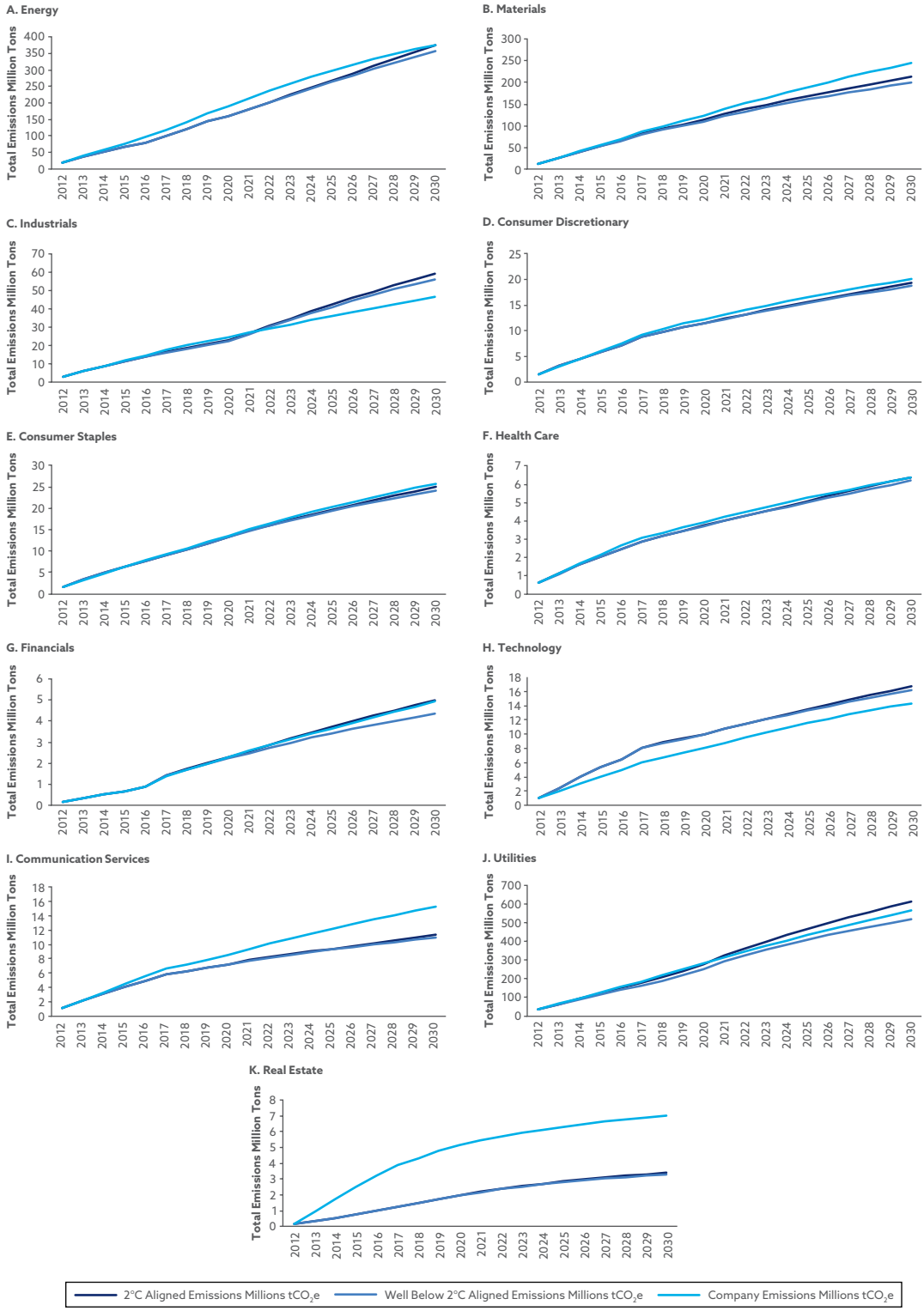
A look at the emission trajectory by sector shows a similar picture (see **Exhibit 20** and **Exhibit 21**), where many sectors are also not 2°C aligned.

Exhibit 19. SBTi Emission Alignment by Various Warming Scenarios, MSCI ACWI 30 June 2024



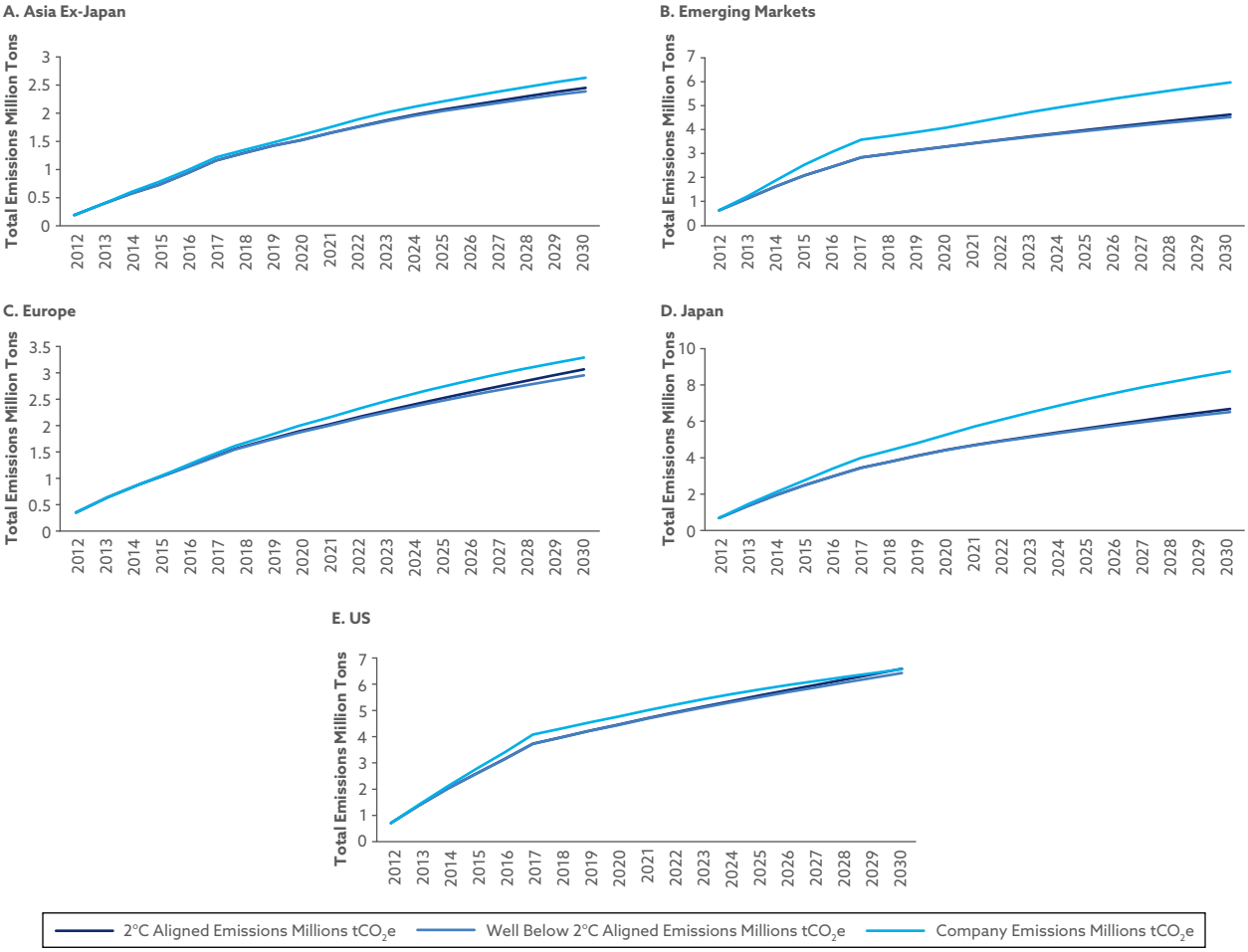
Sources: S&P Trucost; SBTi.

Exhibit 20. SBTi Emission Trajectory by Sector, 2012–2030



Sources: S&P Trucost; SBTi.

Exhibit 21. SBTi Emission Trajectory by Region, 2012–2030



Sources: S&P Trucost; SBTi.

For an ESG (environmental, social, and governance) manager focused on making a difference, it is imperative to focus on future alignment when evaluating companies for possible investment and/or engagement. Investors should recognize that certain companies are more predisposed to higher emissions than others. Instead of punishing a high-emitting cement or steel company, it is the company's future plans for committing resources or capital that are more important, in our view.

As with historical carbon emission data, careful attention also needs to be paid to the distribution of the data. Much like historical carbon emission data, the SBTi data are skewed (see **Exhibit 22**). But while the skew of historical emissions is all toward extreme emitters, the skew of the 2°C data occurs in both over- and under-budget amounts. In addition, the source, accuracy, collection methods, and coverage all need to be carefully considered in incorporating carbon-budgeted or Paris-aligned data into an investment process.

Exhibit 22. Distribution of Various Warming Scenarios: Tons of CO_2 under/over Budget, 30 June 2024

Sources: S&P Trucost; SBTi; MSCI ACWI.

Conclusion

To achieve net zero, investors must direct capital to those companies that will have the biggest impact on reducing future emissions. If we are to make informed decisions, we must have accurate data on both historical and expected emissions. Emission data have improved dramatically in the last 10–15 years, but these data are far from perfect and are much less standardized than the financial statement data used for most investment decision making. However, we should not let these issues deter our efforts. Investors always deal with uncertainty and must make the best decisions with the available information. Using climate data is no different.

Investors must understand emission data—what these data measure, how they are reported or estimated, and how the different scopes relate to each other. We showed that Scope 1 and 2 emission reporting is better than Scope 3 reporting and that reporting is best in Europe and in high-emitting sectors, such as utilities and energy. The data are very skewed, with large outliers in most sectors (on a relative basis). This is true for both the raw emission data and emissions scaled by company revenue. Users of carbon emission data must be aware of these issues to make the most informed decisions and assess potential pitfalls.

Practitioners have increased their focus on Scope 3 emissions to gain an accurate picture of a company's total value chain. While this gives the most accurate picture of emissions, Scope 3 comes with its own set of issues, such as proper measurement, double counting, and company comparison (owned operations versus outsourced operations). Despite being more cumbersome to gather and interpret, Scope 3 emission data are essential to capturing a full view of a company's carbon emissions.

Scope 1, 2, and 3 emissions are relevant to assess the current emissions and historical trends, but they are backward looking. Paris-aligned or SBTi data give us the best view of companies' future emission trajectory and their ability to achieve net zero. In fact, many high emitters are aggressively investing to decarbonize and are well below the 1.5°C Paris-alignment goal. But as with historic emissions, investors must be aware of the pitfalls and biases of using forward-looking SBTi data.

Climate change is one of society's greatest challenges. If we have any hope of achieving the goals of the Paris Agreement, we must set targets and monitor our progress toward achieving them, which relies on data. Emission data are imperfect, so it is important for practitioners to understand these data to ensure we are progressing down the path toward limiting climate change.

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