



State Street S&P Global Institutional Investor Carbon Indicator

2024 Annual Report

Highlights

- The carbon emission exposures of institutional portfolios increased slightly between March 2023 and March 2024 (from 4.27 million tonnes to 4.34 million tonnes); above COVID-era lows but below 2019 levels.
- The efficiency with which portfolios use carbon emissions to generate revenues, however, continued to increase, with carbon intensity exposure falling over 20% from approximately 137 to 108 tonnes emitted per \$1 million of revenue in March 2024.
- From March 2023 to March 2024, high-carbon sectors such as Energy, Utilities, and Materials underperformed the overall market. This relative underperformance of high carbon sectors has reduced carbon intensity exposure and also reduced emissions exposures. However, these emissions exposure reductions were offset by increases in Consumer Discretionary, Communications, and Financial sector contributions, leading to the mild increase in emissions exposure versus last year. Oil prices have remained rangebound during this period, while carbon prices have fallen sharply in Europe.¹
- In the US, while carbon-intensive sectors themselves underperformed the market over the past year, decarbonization strategies that maintain index-level sector exposures, but underweight high carbon firms within each sector, also saw negative performance. Within Europe, however, all decarbonization strategies earned positive returns.

¹ <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/021324-european-carbon-prices-plunge-to-28-month-lows>

Indicators at a glance

The **State Street S&P Trucost Institutional Investor Carbon Indicator** captures the degree to which global institutional investors are exposed to carbon risk in their equity portfolio investments.² This exposure can increase in three ways: 1) if investors sell shares in companies with a lower emissions profile and buy shares with a higher emissions profile, 2) if underlying companies in the portfolio emit more carbon due to changes in their operations, or 3) if carbon emitters take on greater weight in the portfolio due to price appreciation. Carbon risk is realized when companies incur additional financial costs from emitting carbon into the atmosphere, which could take the form of explicit costs (such as a carbon tax) or implicit costs (such as consumer preferences for greener products or investor preferences for greener stocks) that impact their bottom line. Investors around the world—including some of the world’s largest pension funds, sovereign wealth funds, and investment managers—are increasingly taking this risk into account.

What is Carbon Risk and Why Does it Matter

As with other market risks, securities prices (and therefore, portfolio values) move in advance of carbon risk being realized as investor views on the severity and likelihood of outcomes evolve. Imagine that a new bill calling for a \$1,000 annual tax on gas-powered cars was introduced in the U.S. Congress. All else equal, automaker stocks would drop based on the probability that investors, in aggregate, place on the bill’s passage. If it secured the requisite votes in Congress, and the President was expected to sign the bill, automaker stocks would drop further as the outcome became more likely. But if the constitutionality of the bill were challenged and appealed the Supreme Court, automaker stocks might rise again. Whatever their views on climate change, investors need to manage these risks in their portfolios, whether they stem from government policy, regulations, corporate responses, or changes in consumer preferences and behavior. The more carbon exposure in a portfolio, the more it is exposed to carbon risk.

² We focus on equity investments because realized carbon will tend to impact equity investors, who stand to bear the costs of carbon taxes, changing consumer preferences, or changes in the cost of capital before bondholders.

What is the Carbon Indicator?

The **Carbon Indicator**, the first bellwether of its kind, will help investors, the media, policymakers, and the public at large understand how some of the world's most influential investors are managing carbon risk. It brings together aggregated and anonymized custodial holdings information from State Street, drawn from a pool of over \$41.8 trillion in institutional assets³, with Trucost carbon emissions data from S&P Global. At its highest level, the indicator has two variants: **emissions**, tonnes of carbon emitted by portfolio companies, and **intensity**, calculated as tonnes of carbon divided by company revenue.⁴ Whereas emissions captures the overall volume of carbon emitted, intensity measures how efficiently companies "use" carbon to generate revenues. Beneath these headline measures, we can break down movements in the Carbon Indicator into several components to better understand what is driving them:

- **Flow effects** represent the decisions of portfolio managers (investors) to buy and sell specific companies, which changes the overall carbon profile of their portfolios. If a portfolio manager sells a low-emissions company and buys a high-emissions company, the overall carbon exposure of her portfolio will rise.
- **Company effects** represent the decisions of the underlying company management to change their operations, thereby changing the carbon profile of their companies. If the management of one company in the portfolio decides to use new technology in its operations that reduces emissions, this will reduce the overall carbon exposure of the portfolio even though the portfolio manager took no action.
- **Price effects** represent the changing valuations of companies due to a range of market factors, which changes their weight in the portfolio and therefore the weighted-average carbon calculation. If utility stocks rise, this will increase the portfolio's carbon exposure, all else equal, because higher emissions companies now have a larger weight. As a result, if carbon risk is realized, the portfolio is now going to be hit harder than it would have been if those companies had a lower weight. In other words, a larger share of the portfolio's value is exposed to carbon risk. This is akin to the notion that an increase in real estate taxes will have a bigger negative impact on a portfolio that is 75% real estate than a portfolio that is 25% real estate.

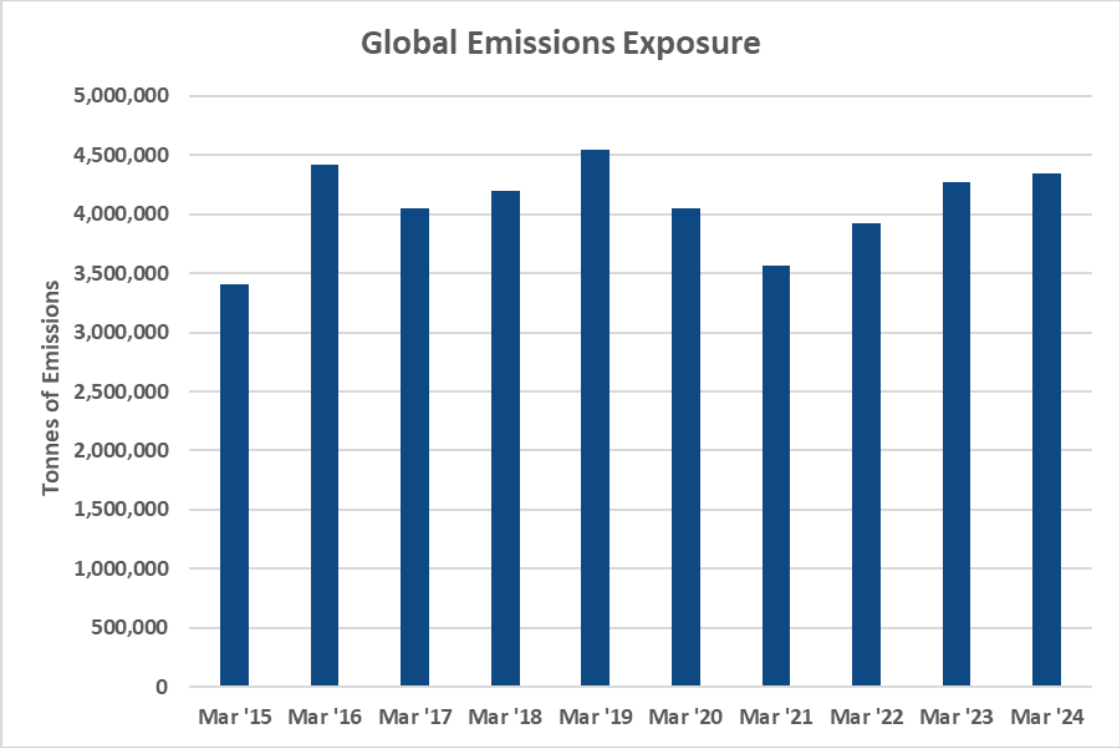
³ Assets under custody and administration as of December 31, 2023.

https://investors.statestreet.com/files/doc_financials/2023/q4/stt-2023-12-31-10-k-with-exhibits.pdf

⁴ Emissions is the carbon analogue of a firm's earnings in dollars, while intensity can be thought of as analogous to a firm's price to earnings ratio. High intensity means the firm "pays" a high amount (in carbon units) to earn a dollar of revenue, just as a high P/E multiple means an investor must pay a high amount for a dollar of earnings.

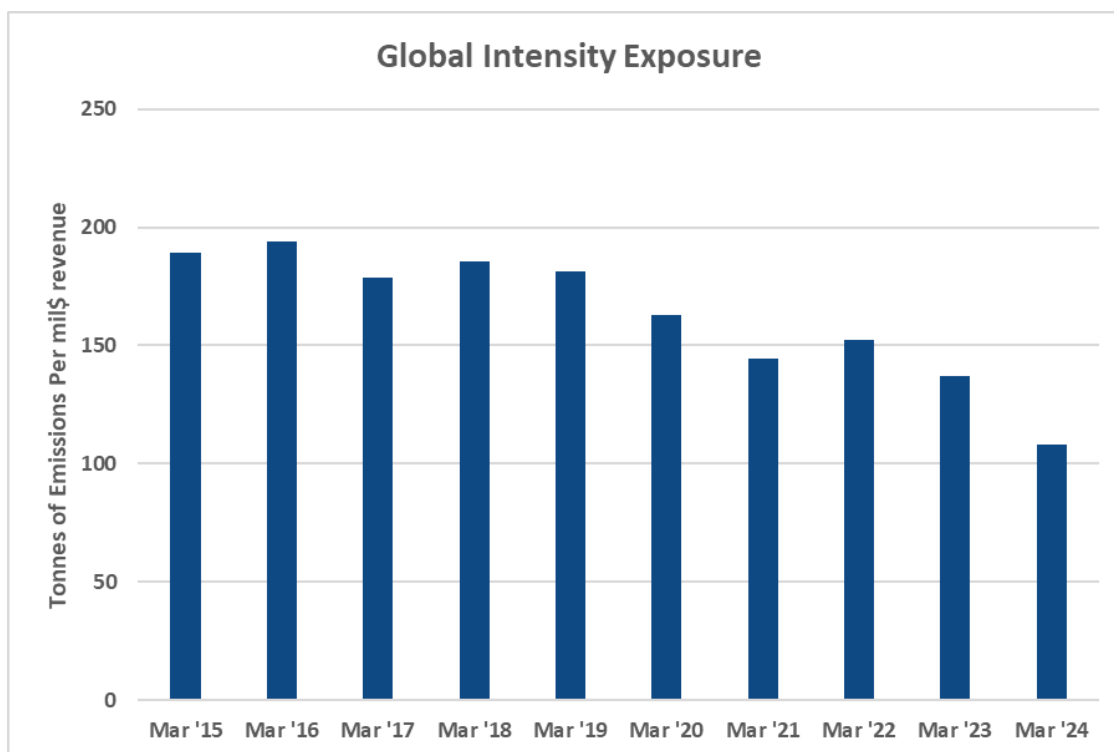
The Carbon Indicator: Where Investors Stood and Stand

Portfolio carbon emissions and intensity both exhibited declining trends from 2018-2021. Post COVID, we saw a recovery in economic activity, energy prices, and emissions exposures. However, from 2023-2024, the rate of increase has abated. The current level of portfolio carbon emissions exposure has risen slightly, from 4.27 million tonnes in March 2023 to 4.34 million tonnes in March 2024.



Source: State Street Global Markets

Meanwhile, revenues have increased without equivalent amounts of incremental carbon being used to earn them. This has led carbon efficiency to increase, and carbon intensity exposure to fall from 137 tonnes per million USD revenue to 108 in March 2024.



Source: State Street Global Markets

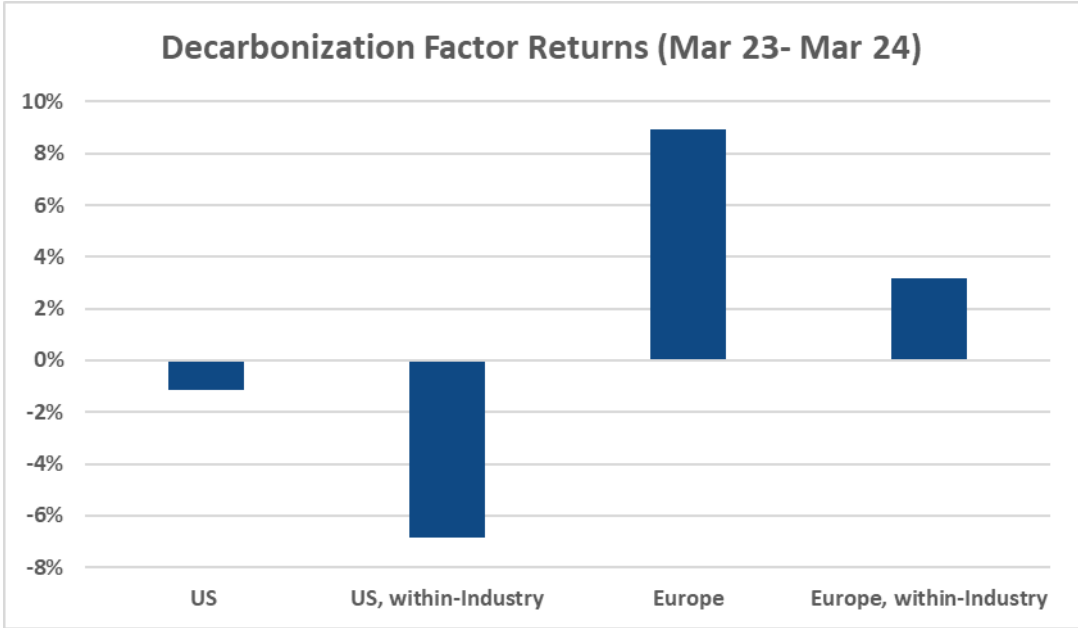
How Did Decarbonization Strategies Perform?

Some investors seek to reduce their carbon exposure by tilting their portfolios toward companies with lower carbon intensity profiles.⁵ These portfolios can be formed in two ways: across all stocks without regard to industry, or balanced within each industry (underweighting high carbon firms within the industry). Portfolios formed using the former approach tend to hold much smaller positions in carbon-heavy industries. However, the latter approach results in portfolios that have the same overall exposure to each industry but are tilted toward the more carbon-efficient companies within that industry.

Decarbonization model portfolios exhibited mixed returns over the past year. In the US, strategies formed across all stocks without industry balancing were down slightly (1.1%) for the year, while industry-neutral strategy returns earned more negative returns (down 6.9%). In Europe we saw positive performance for both flavors of decarbonization strategy, with the within-industry strategy earning 3.2% and the basic

⁵ Cheema-Fox, A., B.R. LaPerla, G. Serafeim, D. Turkington, and H. Wang. 2021(a). "Decarbonization Factors." *Journal of Impact & ESG Investing* 2 (1): 47-73

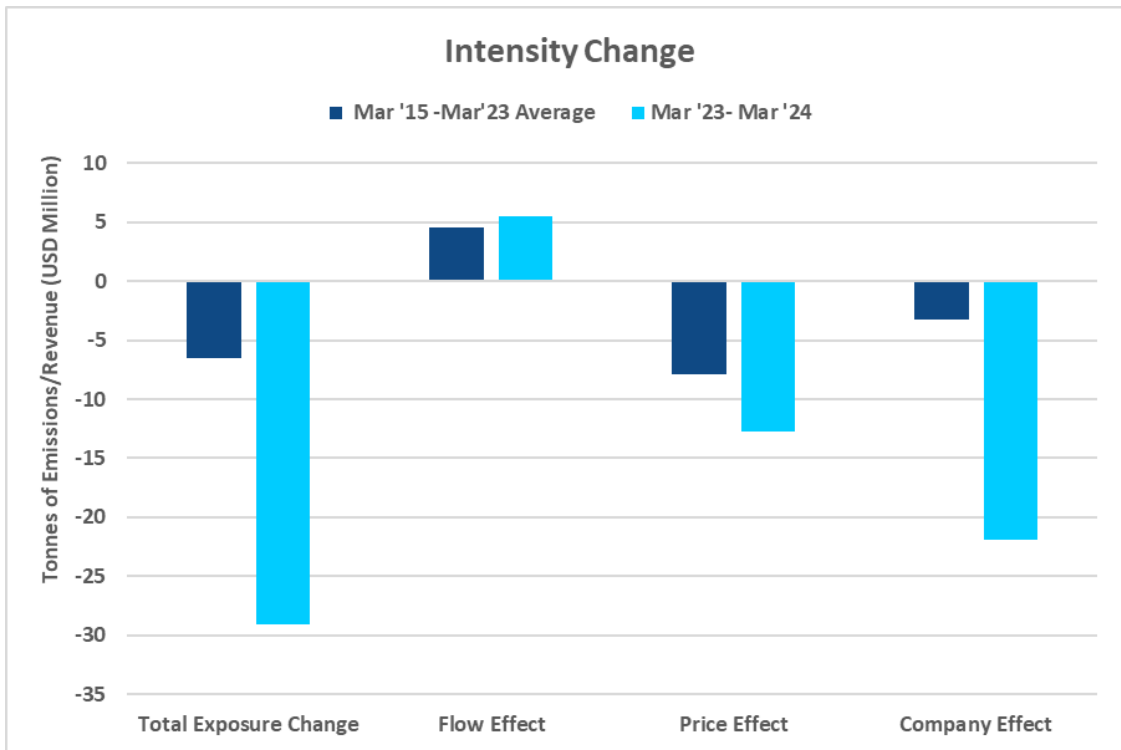
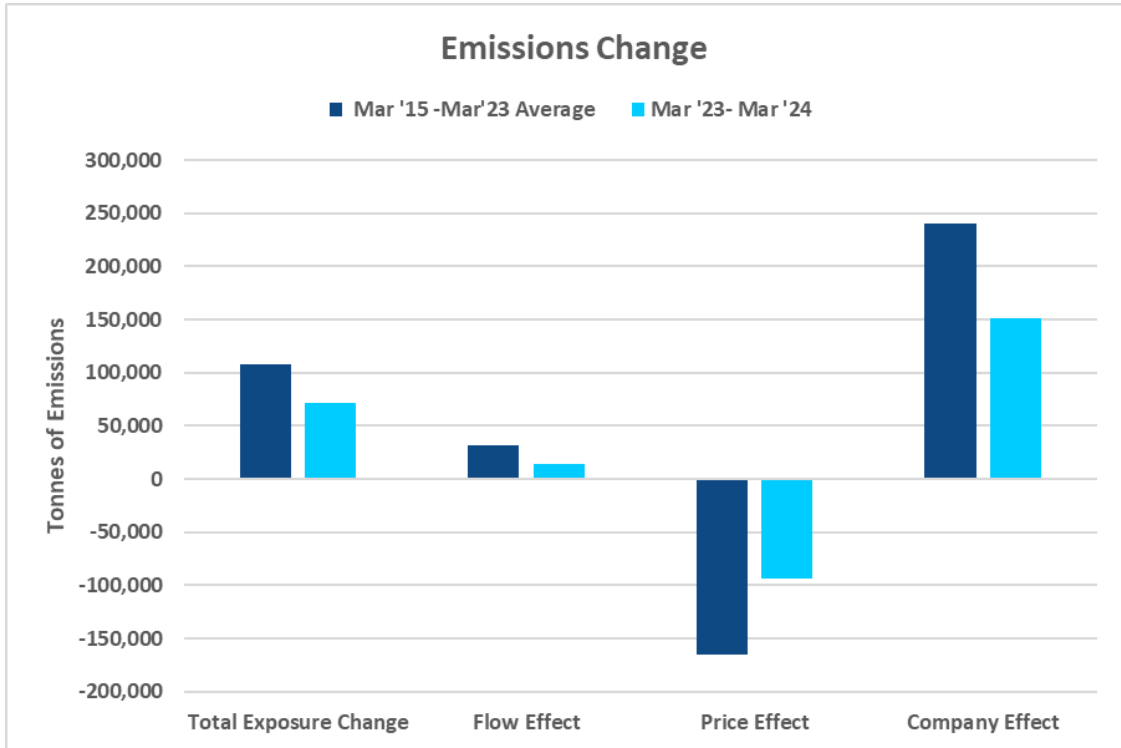
strategy earning 8.9%. Regionally, decarbonization strategies earned positive returns in Europe but not the US, while industry-neutral strategies were less extreme in each region.



Source: State Street Global Markets

What Moved the Carbon Indicator in 2024?

We can decompose the indicator to determine what is driving the trend toward slightly increased exposure to carbon emissions and decreased intensity exposure in 2024. The primary driver of the increase in emissions exposure was the company effect, which was largely offset by price effects. Flow effects were smaller and positive. This means that company emissions rose while the prices of high emitters tended to fall, and institutions bought carbon emitters to a limited extent. When we contrast what we saw in the last year with historical averages, there is a directional alignment of 2023-2024 with the historical trend. While the emissions behavior of companies drove an increase in emissions exposure, it did so to a lesser extent than was seen historically. The rate of total exposure change was lower than average in line with our observations above.

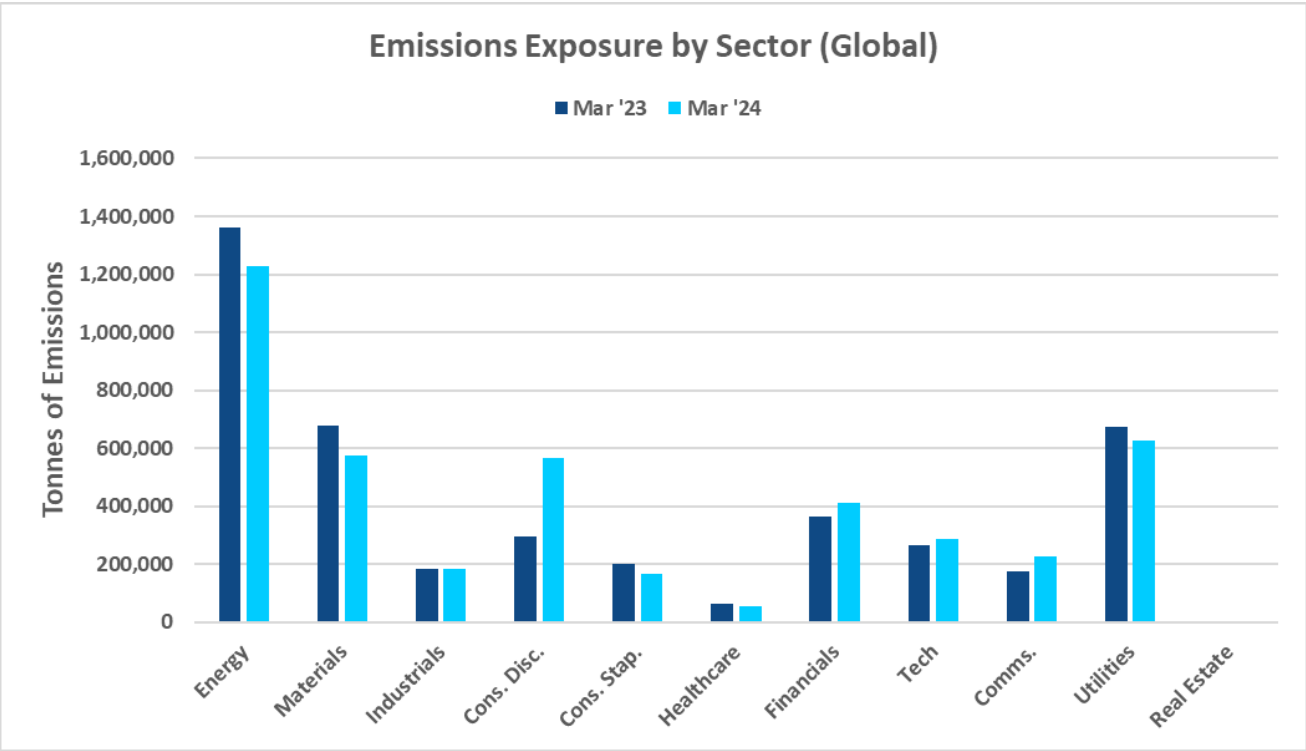


Source: State Street Global Markets

The intensity change chart shows us the same breakdown for carbon intensity, but shows a very different picture. When it comes to carbon efficiency, the story is more broadly one of reduced exposure, albeit with some buying of carbon-intensive firms (flow effects are positive). Both price and company effects are quite negative, with company effects contributing more to the overall reduction in intensity exposure. Companies with some heft in institutional portfolios exhibited greater carbon efficiency, driven in part by increased earnings without an accompanying rise in carbon emissions. Relative to historical trends, the rate of reduction in intensity exposure accelerated.

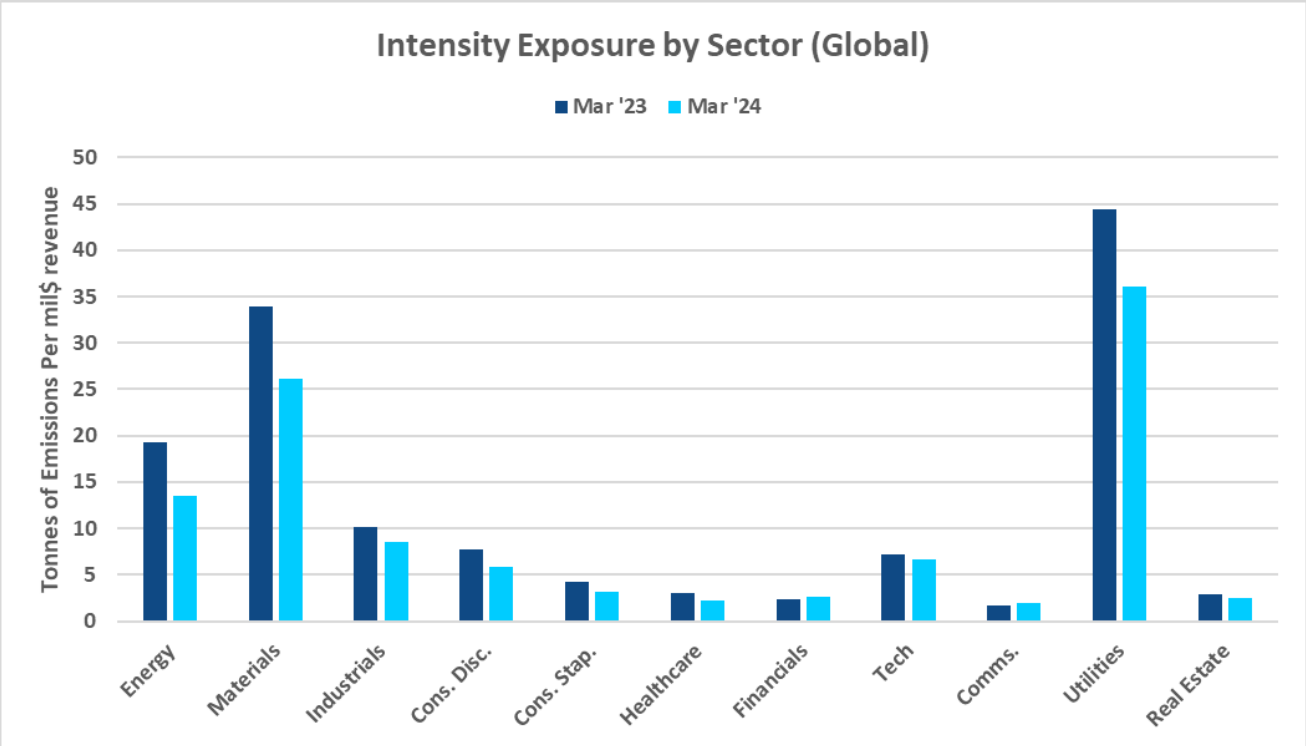
Carbon Indicator: Sectoral Breakdown

On a sectoral basis, Energy, Materials, Utilities and Consumer Discretionary sectors have driven changes in exposures but in differing ways. Emissions exposures fell for the high carbon sectors (in part driven by lower returns), but rose for Consumer Discretionary, which broadly kept pace with market returns and also saw increased company emissions.



Source: State Street Global Markets

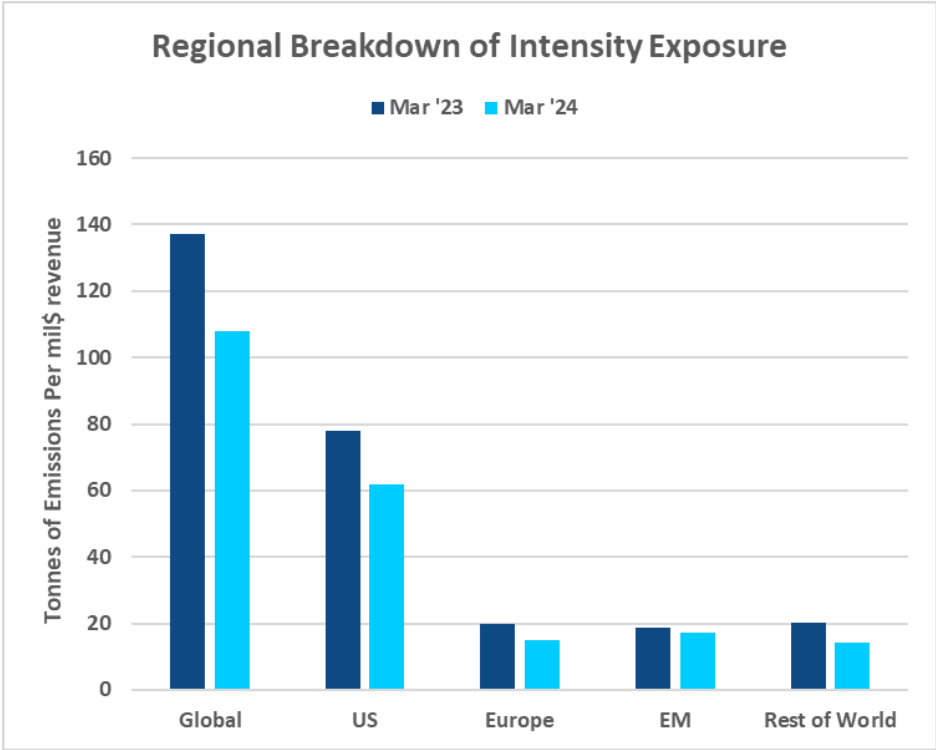
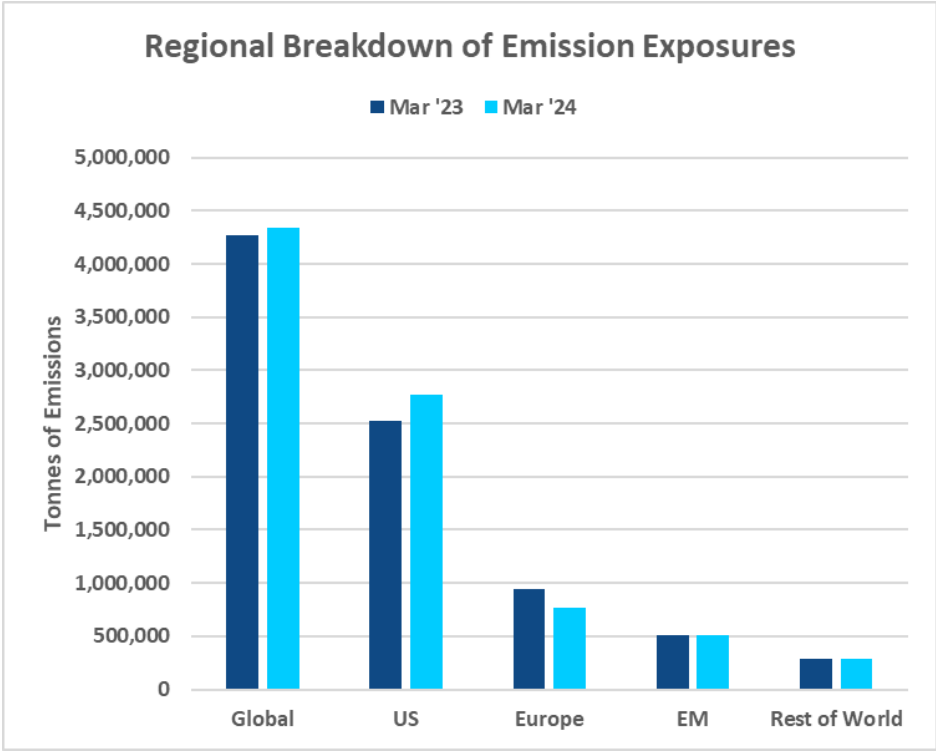
The reduction in intensity exposures unfolded broadly across Energy, Materials, and Utilities driven both by negative company and price effects partially offset by an overall positive flow effect.



Source: State Street Global Markets

Carbon Indicator: Regional Breakdown

Regionally, intensity exposures fell across all regions, while emissions exposures rose somewhat in the US, offset by a decline in Europe.



Source: State Street Global Markets

APPENDIX:

Carbon Data Dictionary

| Measure | Formula/ Description |
|---|--|
| Carbon Intensity | Issuer's Carbon Emissions divided by its revenue, covering Scope 1 and 2 GHG emissions under the Greenhouse Gas Protocol. Carbon Intensity denominates a quantity of GHG emissions metric by a company's annual consolidated revenues in millions of U.S. dollars: [tCO ₂ e] / USD 1 million revenue (the numerator is measured in tonnes also known as metric tons). |
| Carbon Emissions | Covers Scope 1 and 2 GHG emissions under the Greenhouse Gas Protocol. These are the emissions from the direction operations of the business and from the purchased electricity, steam, or other sources of energy generated upstream from a company's direct operations. We report these in tonnes (also called metric tons). |
| Emissions Exposure (tonnes) | $\sum_{stocks} weight_{stock} * emissions_{stock}$ in tonnes of GHG emissions |
| Intensity Exposure (tonnes/ million USD) | $\sum_{stocks} weight_{stock} * intensity_{stock}$ in tonnes of GHG emissions per million dollar revenue |

Concept Explainer

Following the methodology of "We'll Always Have Paris: How Institutional Exposures to Carbon Emissions Have Evolved Since 2015" by Alexander Cheema-Fox, George Serafeim and Hui (Stacie) Wang we report **exposures** and their changes, which we decompose into flow, price, and company components. To summarize: the exposure of a portfolio to a given characteristic (of assets) is the weighted average of asset weights and feature values. For example, if a given portfolio has a 10% allocation to Apple, and Apple has a price to book value ratio of 42, the price to book value exposure of this position in the portfolio is 10% X 42 = 4.2%. To obtain the overall portfolio exposure to the price to book feature, we

would compute this product for all positions in a given fund. Our methodology applies this idea to not one portfolio but an aggregate portfolio including thousands of institutional investors. This gives us the *level* of exposure at a given point in time. We further examine how exposures change through time.

Instead of price to book, we use our two carbon risk measures: **emissions**, the carbon emissions of a company in tonnes (metric tons), and the carbon **intensity** of a stock, which is defined as emissions of the firm divided by revenue of the firm in millions USD. While often behaving similarly, these metrics tell us two different things. **Intensity** tells us how “carbon efficient” a firm is, and tilts towards carbon efficient firms would imply lower carbon intensity. **Emissions** gives us the raw exposure to the quantity of carbon emitted by portfolio companies. If the economy is growing quickly enough, we might see weighted average emissions rise even as intensity falls; companies may increase their efficiency, but if they also upscale their output, emissions will still increase.

Carbon Exposures are defined as the weight of an asset in the aggregate institutional portfolio (comprised of thousands of portfolios representing trillions in assets under management) multiplied by the carbon risk value of the asset (either a company’s carbon intensity or its carbon emissions). For an individual portfolio, an exposure tells us the degree to which a portfolio’s investments tilt towards a given risk or security attribute. Consider, as analogues to emissions and carbon intensity respectively, company earnings and P/E ratios: a portfolio with a P/E ratio of 30 is on average holding expensive stocks; a portfolio with an earnings exposure of 10 billion USD is holding companies that, on average, earn 10 billion USD. This is distinct from how large a stake the investor (or group thereof) holds in their companies – an investor with a 10 billion dollar portfolio can have the same exposure as an investor with a 1 million dollar portfolio. In our case, we are reporting the aggregate portfolio representing thousands of investors, and reporting their collective exposures to carbon intensity and carbon emissions. An emissions exposure of 4 million tonnes means that the institutional portfolio holds companies that, on average, emit 4 million tonnes of carbon; an intensity exposure of 150 means that the institutional portfolio holds companies that, on average, require carbon expenditure of 150 tonnes per million USD revenue generated. We sum these exposures across the equity market to produce the aggregated series below, which are dissected regionally and by sector.

Since exposures are defined as a weight multiplied by a feature, changes in exposures are determined by how weights change over time and how company features (carbon emissions and intensity) change over time. Weights are affected by two forces: relative returns and flows. For instance, suppose I have a portfolio with two assets each held at 50% weight: if one dollar has been invested, I hold 50 cents of each

stock. If stock 1 doubles in value while stock 2 remains the same, I now have 75 cents in stock 1 and 50 cents in stock 2, leading to weights of $75/125 = 60\%$ and $50/125 = 40\%$. Relative returns alone move weight substantially. Buying or selling of assets will also affect weights and thereby affect exposures.

Of course, changes in the company-level attributes for which we measure exposure (intensity and emissions) also affect portfolio exposures. Now suppose the company weights were held constant at 50% each, and that stock 1 had a carbon intensity of 20 while stock 2 had a carbon intensity of 30. The portfolio's carbon intensity would come to $.5 * 20 + .5 * 30 = 25$. If stock 1 cuts its carbon intensity in half, to 10, without any change in portfolio weight (suppose returns and flows are both the same at zero), then the portfolio's carbon intensity becomes $.5 * 10 + .5 * 30 = 20$.

Carbon risk evolves based on companies altering their emissions or, in the case of carbon intensity, generating revenue with fewer concomitant emissions per dollar. Disentangling these drivers from one another can be effected analytically: further details may be found [in "We'll Always Have Paris: How Institutional Exposures to Carbon Emissions Have Evolved Since 2015"](#) by Alexander Cheema-Fox, George Serafeim and Hui (Stacie) Wang.

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