

# State Street S&P Global Institutional Investor Carbon Indicator

## 2023 Annual Report

### Highlights

- The carbon emission exposures of institutional portfolios rose in between March 2022 and March 2023, returning to levels higher than any seen since 2019: portfolio companies emitted more carbon overall with emissions exposure rising over 8% from 3.93 to 4.27 million metric tonnes year over year.
- The efficiency with which portfolios leverage carbon emissions to generate revenues, however, increased, with carbon intensity exposure falling over 10% from 152 to 137 tonnes emitted per \$1 million of revenue.
- These contrasting moves represent, respectively a sharp reversal in the trend of declining exposures and a continuation of the trend in efficiency gains that we observed between March 2018 and March 2021. The low emissions exposures of 2020 and 2021 were driven in part by global declines in emissions due to COVID restrictions, and these have reversed as the economy has recovered.
- From March 2022 to March 2023, high-carbon sectors, such as Energy, outperformed the overall market as oil prices remained elevated. These companies performed well even as the regulatory price of emissions rose in Europe.<sup>1</sup> As a result of these higher valuations, Energy holdings represented a larger share of many institutional portfolios; this repricing was the main driver of increased weighted-average carbon emissions exposure at the portfolio level, while the general post-COVID renewal of economic activity accompanied increased emissions by Energy, Materials, and Utilities firms. The decrease in intensity exposure was driven by Energy and Materials companies – in this case by their reductions in company carbon intensity as firms grew revenues faster than emissions.
- Despite the fact that carbon-intensive sectors like Energy outperformed the market in 2022, many sophisticated decarbonization strategies also outperformed. This seeming paradox is due to the fact that sophisticated decarbonization strategies hold sector weights neutral and tilt toward more carbon-efficient firms within each sector. For example, they might hold overall exposure to the Energy sector

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<sup>1</sup> <https://www.reuters.com/markets/carbon/europes-carbon-price-hits-record-high-100-euros-2023-02-21/>

constant, but tilt toward more efficient emitters within that sector. As a result, they can benefit when energy prices rise since they are tilted toward companies that use energy more efficiently.

## Indicator 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.<sup>2</sup> 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.

## 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 \$36.7 trillion in institutional assets<sup>3</sup>, 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,

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<sup>2</sup> 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.

<sup>3</sup> Assets under custody and administration as of December 31, 2022.

and **intensity**, calculated as tonnes of carbon divided by company revenue.<sup>4</sup> 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:

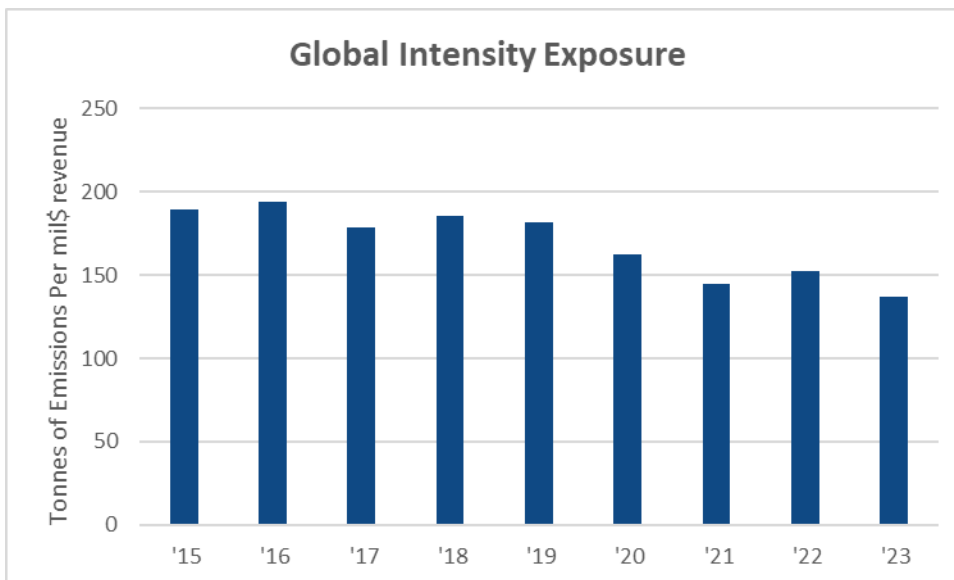
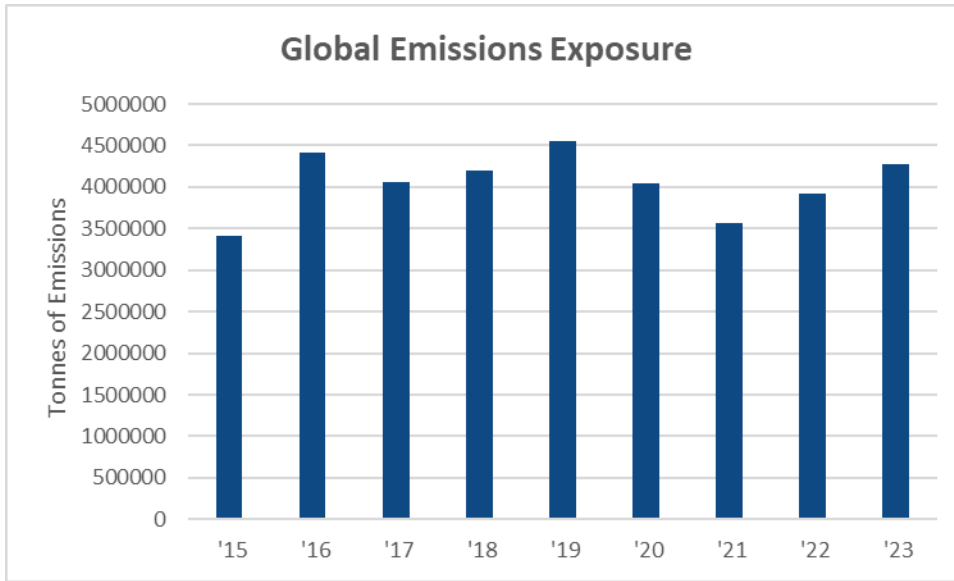
- **Flow effects** represent the decisions of portfolio managers (investors) to buy and sell specific companies, which changes the overall carbon profile of their portfolios. If a portfolio manager sells a low-emissions company and buys a high-emissions company, the overall carbon exposure of her portfolio 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.

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<sup>4</sup> 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.

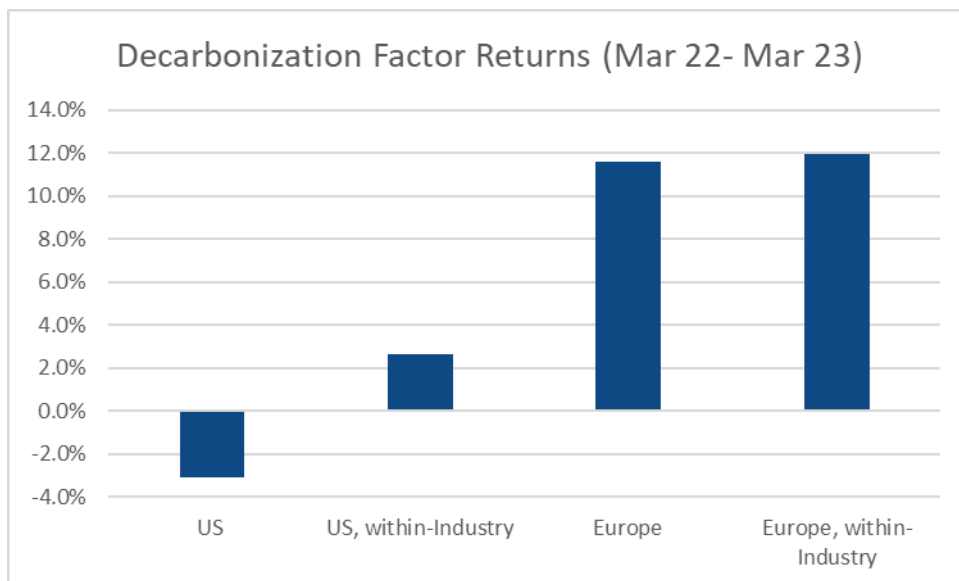
**The Carbon Index: Where Investors Stood and Stand**

Portfolio carbon emissions and intensity both exhibited a declining trends from 2018-2021. However, during 2022 and 2023 as energy prices have risen and Energy stocks have outpaced the market, emissions exposure has increased. The current level of portfolio carbon emissions exposure has increased from ~3.9 million tonnes in March 2022 to ~4.2 million tonnes in March 2023, while the corresponding intensity exposure now reads at 137 tonnes per million USD revenue, falling from ~152 in March 2022.



Does this Mean Decarbonization Strategies Underperformed?

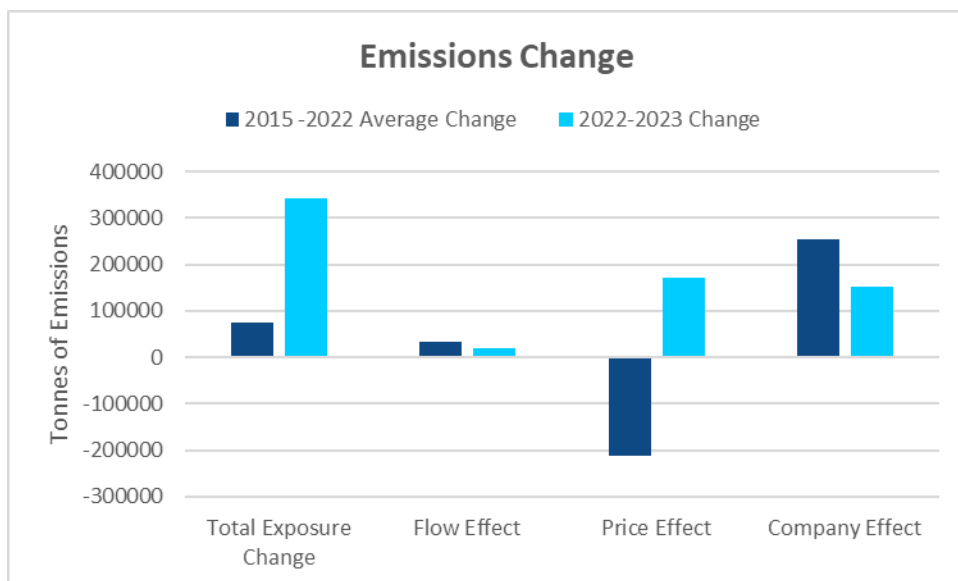
Some investors seek to reduce their carbon exposure by tilting their portfolios toward companies with lower carbon intensity profiles.<sup>5</sup> These portfolios can be formed in two ways: across all stocks without regard to industry imbalances, or balanced within each industry. Portfolios formed using the former approach tend to hold much smaller positions in carbon-heavy industries like Energy. 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. Most decarbonization model portfolios exhibited positive returns over the past year. The sole exception is the US portfolio, where tilts against the high-performing US Energy sector led to negative returns. US industry-balanced portfolios, as well as all European portfolios earned positive returns. How can it be that decarbonized portfolios performed well during a period of rising Energy share prices? In the U.S., which is a net producer of fossil fuels, decarbonization without regard to industry weightings underperformed the market - the decarbonization portfolio was underweight Energy, even as Energy outperformed the market. However, if industry weights (and particularly, Energy) tracked market weights in the portfolio, it outperformed: Energy as a sector was held at market weights, but the portfolio tilted towards the most carbon-efficient Energy companies. In Europe, which is a net consumer of fossil fuels, energy represents a input to most of the economy. When energy prices rise, companies that use less of it (or use it more efficiently) perform well. As a result, both the unbalanced and industry-balanced versions of the decarbonization portfolio outperformed in Europe from March 2022- March 2023.



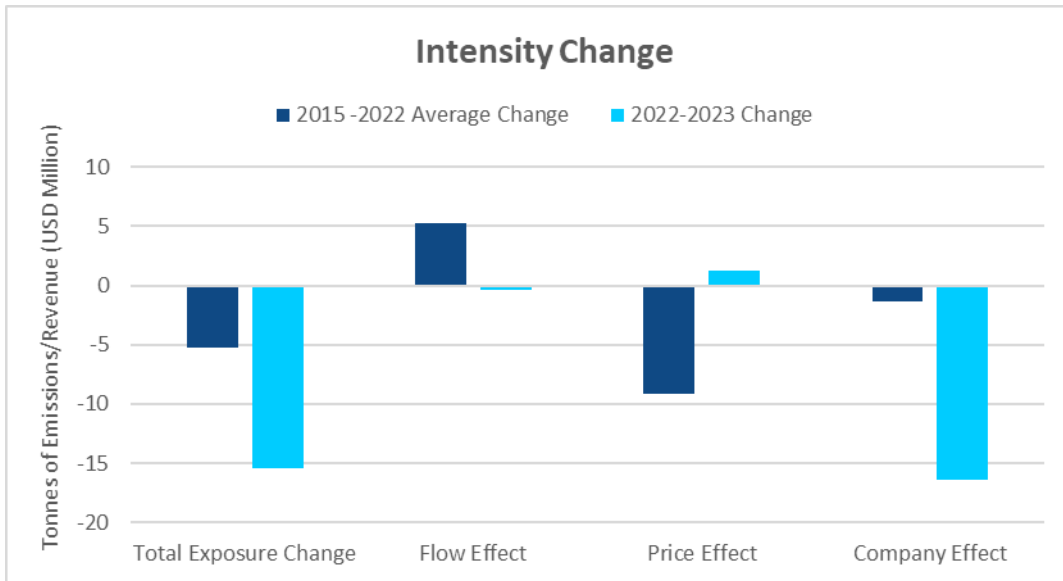
<sup>5</sup> Source: State Street Global Markets Insights

What Caused the Increase in the Carbon Indicator in 2023?

We can decompose the indicator to determine what is driving the trend toward increased exposure to carbon emissions and decreased intensity exposure in 2023. The primary driver of the increase in emissions exposure was the price effect, followed by the company effect. Price effects have long been a key driver of the indicator, though until recently with a negative sign. In other words, the share prices of Energy companies and other carbon-heavy companies had been declining, meaning that these shares represented a lower proportion of portfolio value. That trend reversed in recent years.



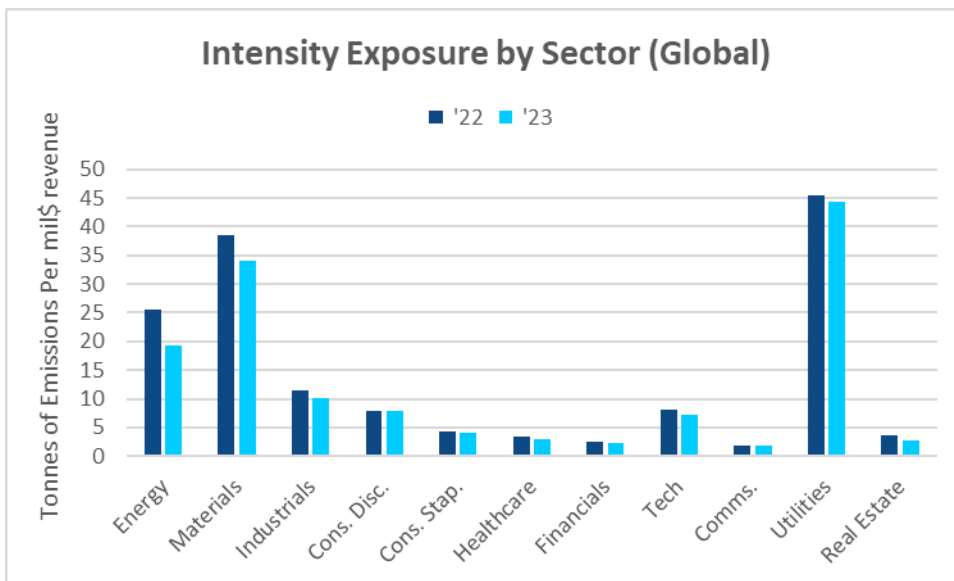
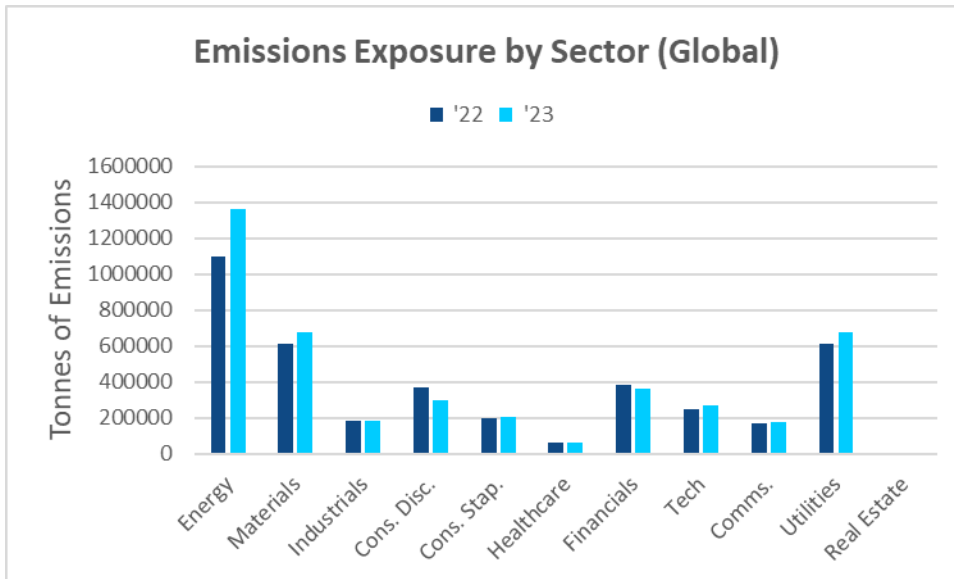
The rising valuations of emissions-heavy companies means they were a bigger share of portfolios in 2023, resulting in a positive price effect. Company effects have on average been positive, and while they did increase from March 2022 to March 2023, they did so at a rate slower than the historical average. Absent a sufficient offsetting increase in carbon efficiency, companies tend to emit more carbon as the economy grows and demand for their services rises. Flow effects have been relatively minor contributors to emissions exposures – although investors have bought high emitting companies at a lower rate between March 2022 and March 2023 versus their average pace over prior years.



The intensity change chart shows us the same breakdown for carbon intensity, but shows a very different picture. Here we observe that price effect was no longer the main driver of March 2022 to March 2023 changes. While less carbon-efficient firms experienced a share price rise relative to peers (positive price effect), and therefore represented a larger share of portfolios in March 2023, the company effect (decreased carbon intensity, or equivalently increased carbon revenue efficiency) exerted a stronger pull, reducing overall intensity exposures at a higher rate than the historical average. This move was substantially driven by reduced carbon intensity from Energy firms, reflecting in part to their considerable rise in revenues outpacing their emissions. Net investor flows were nearly flat with regard to carbon intensity, though the slight negative flow effect for March 2022-March 2023 stands in contrast to the historical average pattern of buying high intensity firms..

**Carbon Index: Sectoral Breakdown**

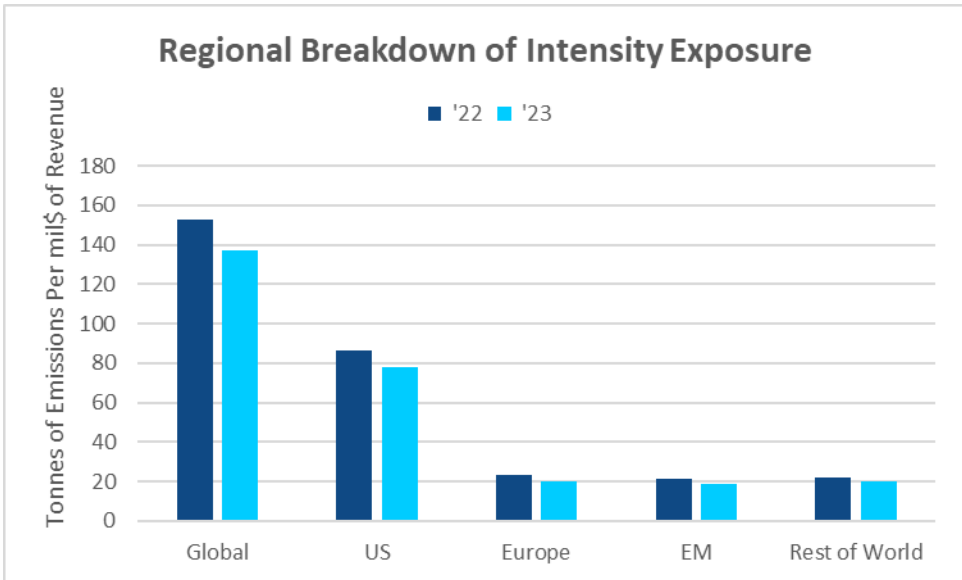
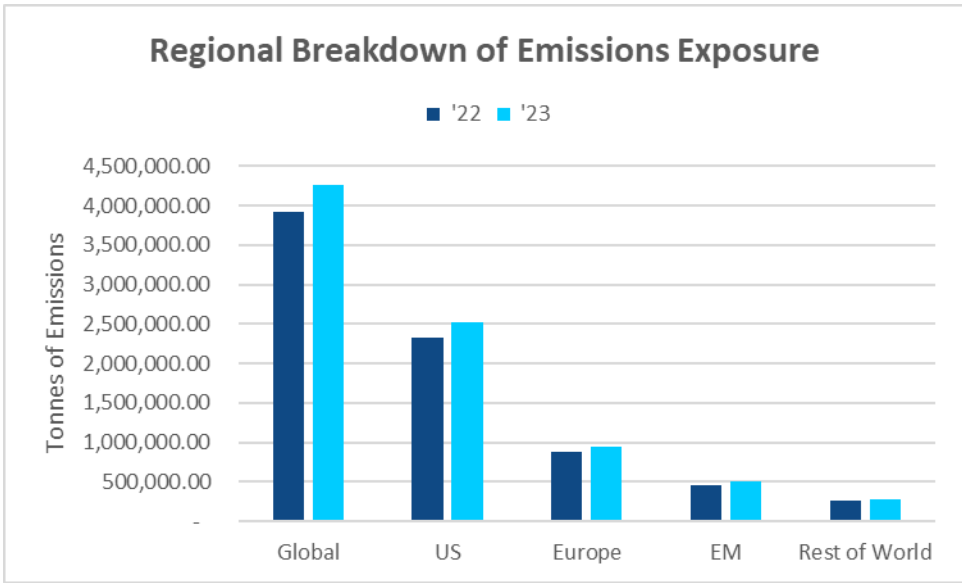
On a sectoral basis, Energy, Materials, and Utilities sectors have driven changes in exposures but in differing ways. All have increased exposures on an emissions basis via price effects (they have seen high relative returns in the last year) though the primary driver was increased company emissions. From an emissions standpoint, Energy stocks have thoroughly dominated all other sectors. However, in terms of carbon intensity, while price effects again worked to increase exposures, negative company effects predominated, as firms increased their carbon efficiency by reducing their carbon intensities (due to revenues rising more quickly than emissions). For intensity exposure, the impact of Energy alone is similar to that of Materials and Utilities taken together.





**Carbon Index: Regional Breakdown**

Regionally, the US has driven most of the changes (in part by virtue of outpacing the rest of the world in relative returns). While emissions exposures have risen as the post-COVID recovery has unfolded, intensity exposures have fallen.



## APPENDIX:

## Carbon Data Dictionary

Measure	Formula/ Description
<b>Carbon Intensity</b>	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: $[tCO_2e] / USD\ 1\ million\ revenue$ (the numerator is measured in tonnes also known as metric tons).
<b>Carbon Emissions</b>	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).
<b>Emissions Exposure (tonnes)</b>	$\sum_{stocks} weight_{stock} * emissions_{stock}$ <p>in tonnes of GHG emissions</p>
<b>Intensity Exposure (tonnes/ million USD)</b>	$\sum_{stocks} weight_{stock} * intensity_{stock}$ <p>in tonnes of GHG emissions per million dollar revenue</p>

## 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  $10\% \times 42 = 4.2\%$ . 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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