

Greenwheel Insights

Counting Carbon (Part 1): Problems with portfolio emissions

This is **Part 1 of 2** of the 'Counting Carbon' Insights note. Part 1 outlines the challenges with tracking portfolio-level emissions. Part 2 sets out options for investors to address these challenges.



Paul Drummond

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Executive Summary

- **The emissions profile of an investment portfolio is driven by a range of factors**, including changing operational emissions by holdings, data characteristics, valuation movements, and portfolio composition.
- **Valuation movements can drive significant changes in emissions intensity, even if absolute emissions remain stable.** Different financial metrics can also produce different results.
- **Reducing operational emissions from individual holdings most directly indicates real-economy decarbonisation.** Changes to operational emissions can be complex to aggregate from individual issuers and is instead broadly reflected by what remains once other influences have been stripped out from total reported emissions.
- **Individual issuers may use different methods to report emissions and may change these methods over time.** The Greenhouse Gas (GHG) Protocol is global standard, but its application can be subjective and inconsistent, and the Protocol is itself subject to change.
- **Data vendors and their investor clients face three key additional challenges around emissions data:**
 - **(1) reporting cycles** focused on annual values with often more than a year lag
 - **(2) estimated or zero-rated values** where reported data is not available
 - **(3) data quality problems** where restatements for historical periods are not captured, or data is copied incorrectly, for example.
- **Changing portfolio composition can have significant implications for portfolio emissions**, particularly through changing sector or regional weighting, which may have no connection to real-economy emissions changes.
- **Investors managing portfolios of listed equities require practical approaches** to address these issues, and to narrow their focus and adjust portfolio emissions pathways **to focus on those drivers that align most closely to their investment objectives.**

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Preface: The Investor Need

“Calculating, tracking and targeting portfolio emissions is not straightforward. It can lead to unintended consequences that undermine the core objective of the exercise. However, done properly, such an exercise can deepen our understanding of financed emissions and enrich the conversation with carbon intensive companies”



John Teahan

Portfolio Manager,
Redwheel Global
Intrinsic Value Team

Introduction

The emissions profile of an investment portfolio is driven by a range of dynamic factors. For asset owners and managers tracking portfolio emissions it is important to understand the role different factors play. Some investors may wish to focus only on the role of factors which matter to them. This is particularly the case for those with emissions targets or pathways and a focus on real-economy decarbonisation.

This paper – Part 1 of 2 - examines the drivers behind the emissions profile of a portfolio of listed equities, illustrated by mirroring the FTSE All-Share, and the challenges presented by the influence of these different drivers.

Part 2 will offer recommendations to tackle these challenges, including methods for ‘dynamic rebaselining’ of portfolio emissions based on investor objectives, how emissions targets could be set, and when and how to adjust them over time.

Four drivers of changing portfolio emissions

The emissions intensity of a portfolio of listed equities can be represented by the following formula (Figure 1). The emissions from individual issuers are apportioned to equity investors based on their share of ownership. When holdings are aggregated this gives the absolute emissions from the portfolio for a given period. The emissions intensity of the portfolio is derived by dividing this by total portfolio value. Other formulations are possible using different financial metrics (see below).

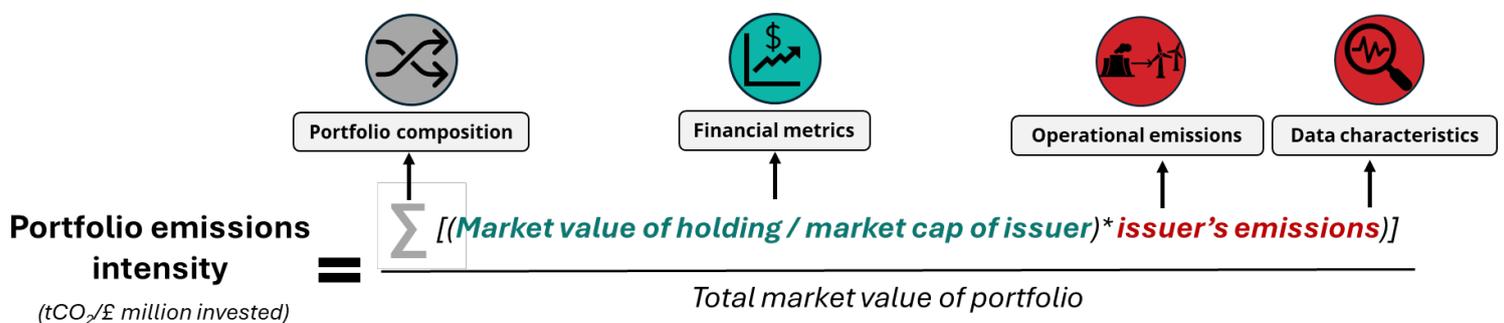


Figure 1 – Formula for emissions intensity for portfolio of listed equities. Graphic created by Greenwheel. The information shown above is for illustrative purposes.

Figure 1 also identifies the **four key drivers of changes to portfolio emissions, and to which elements of the formula they relate**. Drawing on the FTSE All-Share from January 2022 to September 2025 as a proxy portfolio (Figure 2), the following sections examine the role of these drivers in turn. All market capitalisation and emissions data are taken from Morningstar Sustainalytics.¹

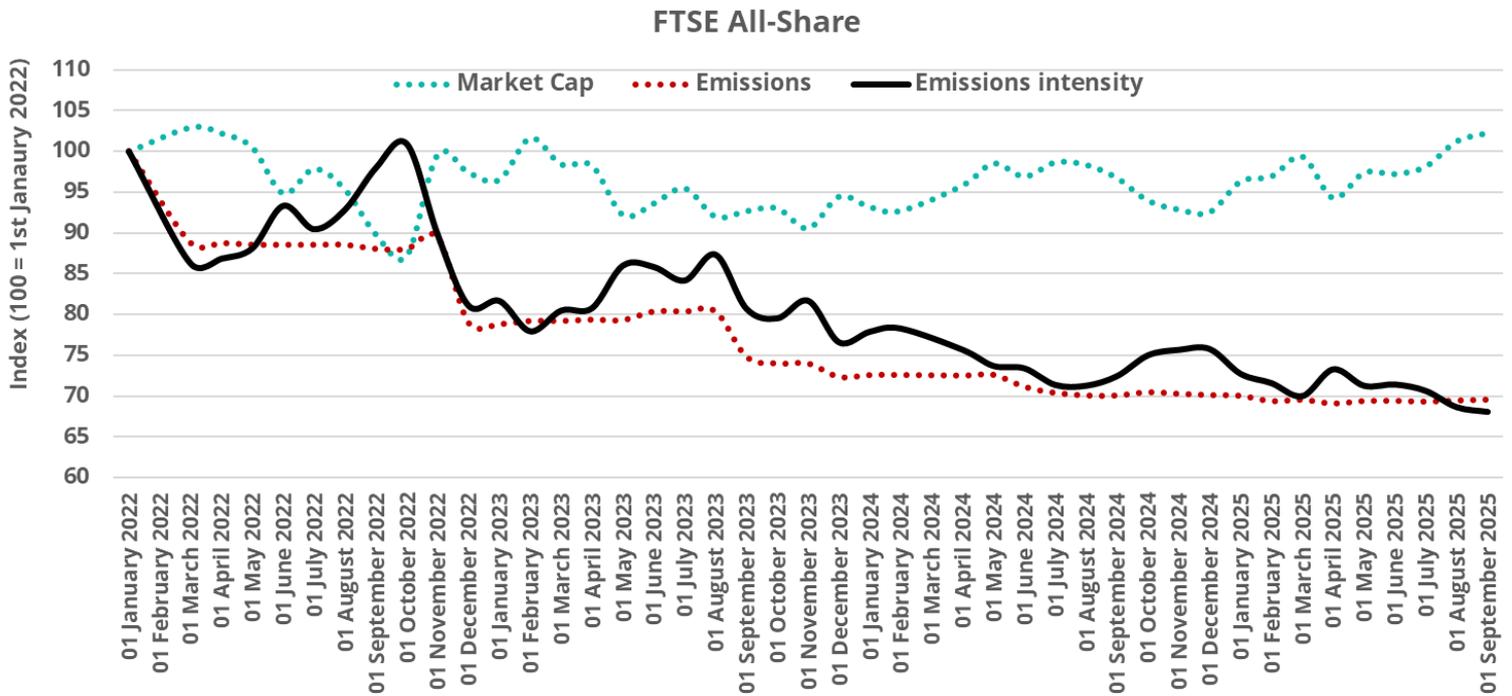


Figure 2 - FTSE All-Share market capitalisation (current prices), absolute emissions (scope 1 & 2), and implied emissions intensity. Data source: Morningstar Sustainalytics. Graphic created by Greenwheel. Past performance is not a guide to the future.



Financial metrics

Three financial metrics may be used in the formula set out in Figure 1 – market capitalisation (market cap), Enterprise Value including Cash (EVIC), and revenue. **Each option has benefits and limitations.**² For simplicity, this paper focuses on market capitalisation.

Despite a modest net change between early 2022 and late 2025, the market cap of the FTSE All-Share has seen some significant short-term movements. Figure 3 highlights two instances where such movements produced fluctuations in emissions intensity, while absolute emissions remained stable.

¹ Market capitalisation values were extracted in in EUR and covered to GBP using daily rates published by the ECB. The authors do not vouch for the accuracy of the data, which may be subject to errors, but which is acceptable for these illustrative purposes.

² For a concise overview, see [IIGCC \(2024\)](#), Section 3.

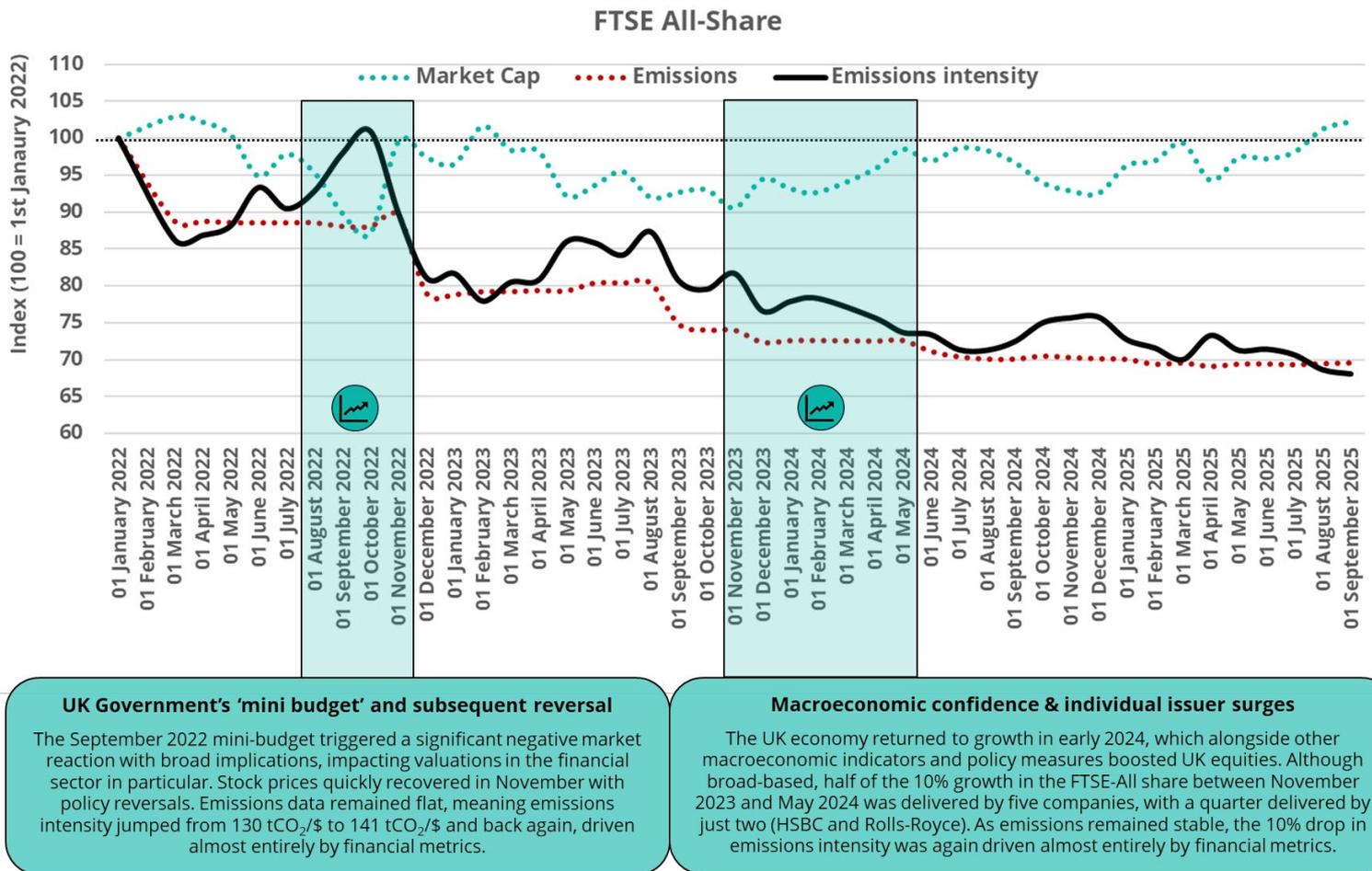


Figure 3 – Key events impacting financial metrics. Other information sources include: [Shankar \(2023\)](#); [Humphrey \(2022\)](#). Graphic created by Greenwheel. Past performance is not a guide to the future.

The ability for financial metrics to drive changes while absolute emissions remain stable **demonstrates a key limitation in using emissions intensity as the primary indicator of change**. Different financial metrics can also move in different directions in parallel, producing opposing intensity trends.ⁱ

Net flows in or out of a portfolio do not impact emissions intensity, assuming portfolio weights don't change. However, they do impact *absolute* emissions by changing the number of shares held by the portfolio.



Operational emissions

Changes to the operational emissions (Scope 1 & 2) of individual issuers is the most intuitive driver of changes to portfolio-level emissions, and **most directly indicates changes in the real economy**. Reductions to operational emissions can occur through changes to an issuer's asset base and how assets are operated. Scope 2 emissions can be further reduced by procuring cleaner electricity.

Operational emissions can also change due to acquisitions and divestments made by issuers. Acquisitions will increase absolute emissions, while divestments reduce them. However, divesting rather than retiring assets may not change total real-economy emissions (and may lead to an increase, depending how they are operated in future).

Despite their dominance in some sectors (e.g. oil and gas and financial services), **Scope 3 emissions are usually excluded from portfolio emissions**, for practical reasons. Scope 3 emissions are complex to estimate for individual issuers and aggregating to portfolio level may introduce significant double-counting. However, double-counting between Scope 1 emissions from power generators and the Scope 2 emissions from the users of this electricity is also a risk when both are held in a portfolio, and scopes are aggregated.

Determining changes to operational emissions through 'bottom-up' from individual issuers across a portfolio is complex. Instead, **changes to operational emissions are broadly reflected by what remains once other influences have been stripped out from reported emissions** (Figure 4) - including issuer-level acquisitions and divestments and net portfolio investments (discussed above) and changing data characteristics and portfolio composition (discussed below).

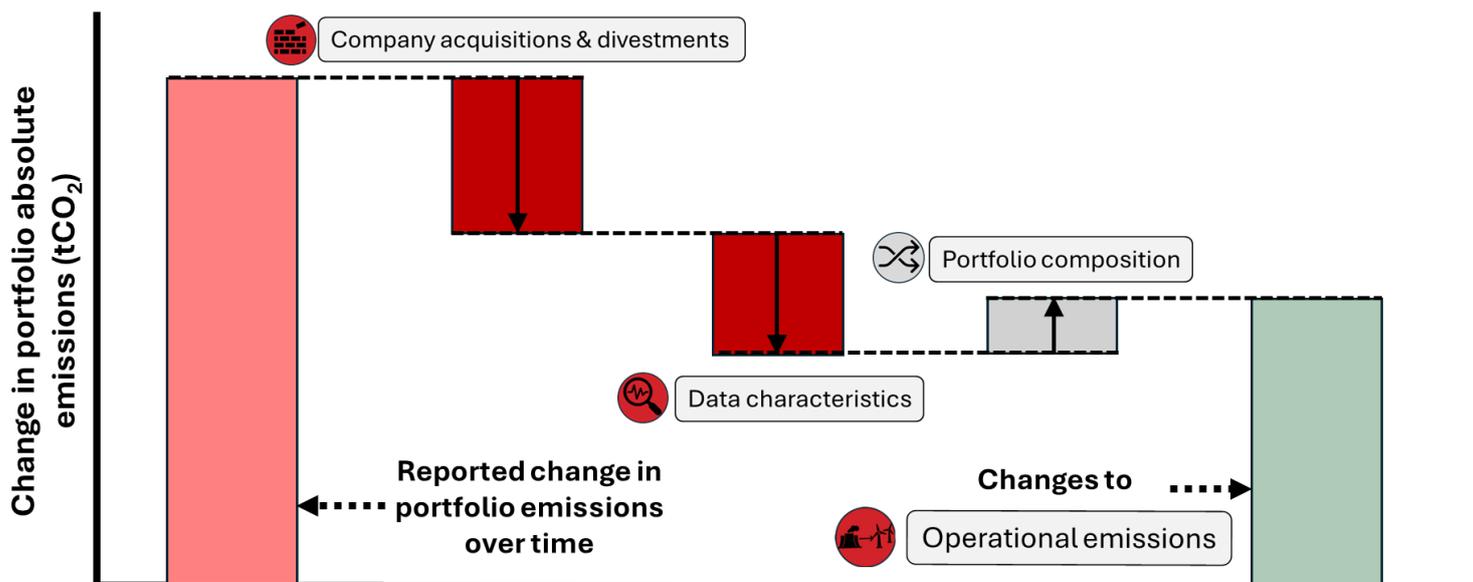


Figure 4 - illustrative approach to calculating operational emissions at portfolio level. Graphic created by Greenwheel. The information shown above is for illustrative purposes.

This top-down approach comes with significant margin for error if confounding factors are only partially corrected for, as is likely to be the case. **However, it seeks to balance conceptual clarity with practical limitations faced by portfolio managers.**



Data characteristics

Portfolio emissions can also move over time due to changes in data coverage and quality, as well as data collection and estimation methods.ⁱ Such changes can be introduced by both reporting issuers and data vendors.

Issuer-level methodologies

Individual issuers may use different methods to measure or estimate their emissions and may change these methods over time.

The Greenhouse Gas (GHG) Protocol is the leading set of accounting principles for issuers to measure and report GHG emissions from their operations and value chains.ⁱⁱ However, for issuers with complex structures and operations, its application can be subjective and inconsistent.^{iii,iv} Figure 5 illustrates **four key areas of potential difference**, drawing on examples from the oil and gas and electric utility sectors.

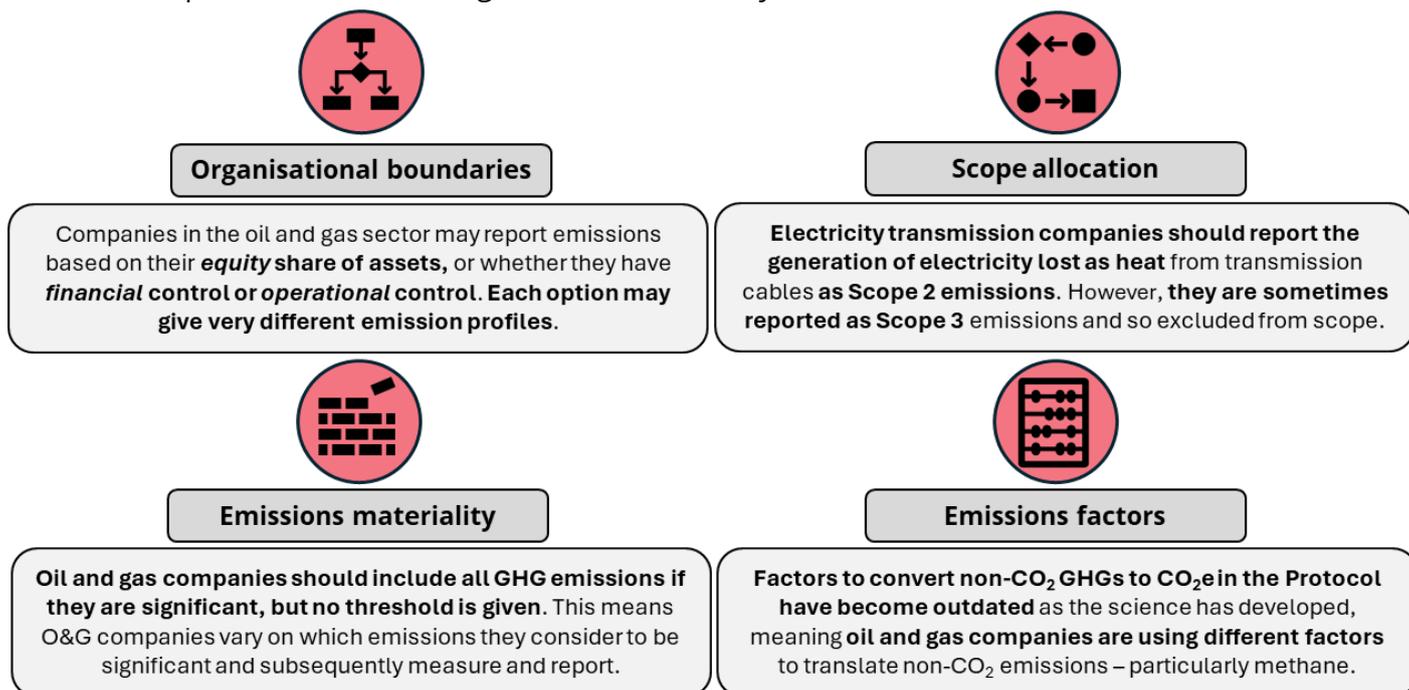


Figure 5 – Four key areas of methodological challenge (Sources: Greenwheel (2024; 2025). Graphic created by Greenwheel. The information shown above is for illustrative purposes.

Issuers may also report Scope 2 emissions using two methods, the ‘location-based’ approach (using emissions factors for local grids), or the ‘market-based’ approach, reflecting contractual arrangements. Under the GHG Protocol **all issuers should report using the location-based approach, and also report under the market-based approach where data is available**,ⁱⁱ but this guidance is not always followed.ⁱⁱⁱ

These issues can limit comparability between issuers, and in the case of methodological changes, for individual issuers over time. **In 2024, almost half of the FTSE100 issued restatements of historical emissions data, with half of these due to methodological changes** (and 30% to correct errors).^v Although data reported under the new methodology is captured moving forward, historical adjustments may not.

This is a live issue as upcoming changes to the GHG protocol and new regulatory requirements, such as those brought by the EU’s Corporate Sustainability Reporting Directive (CSRD), **are likely to force changes to reporting methodologies for many large, listed companies.**

Data Reporting

Investors typically rely on third party vendors to provide emissions data. These providers and their investor clients **face three key data challenges** (Figure 6).

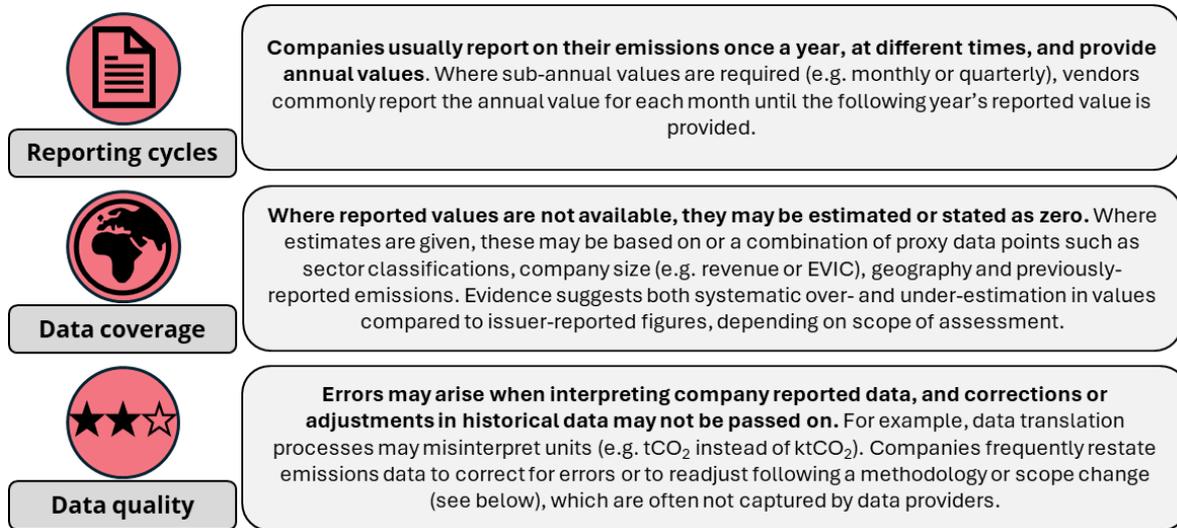
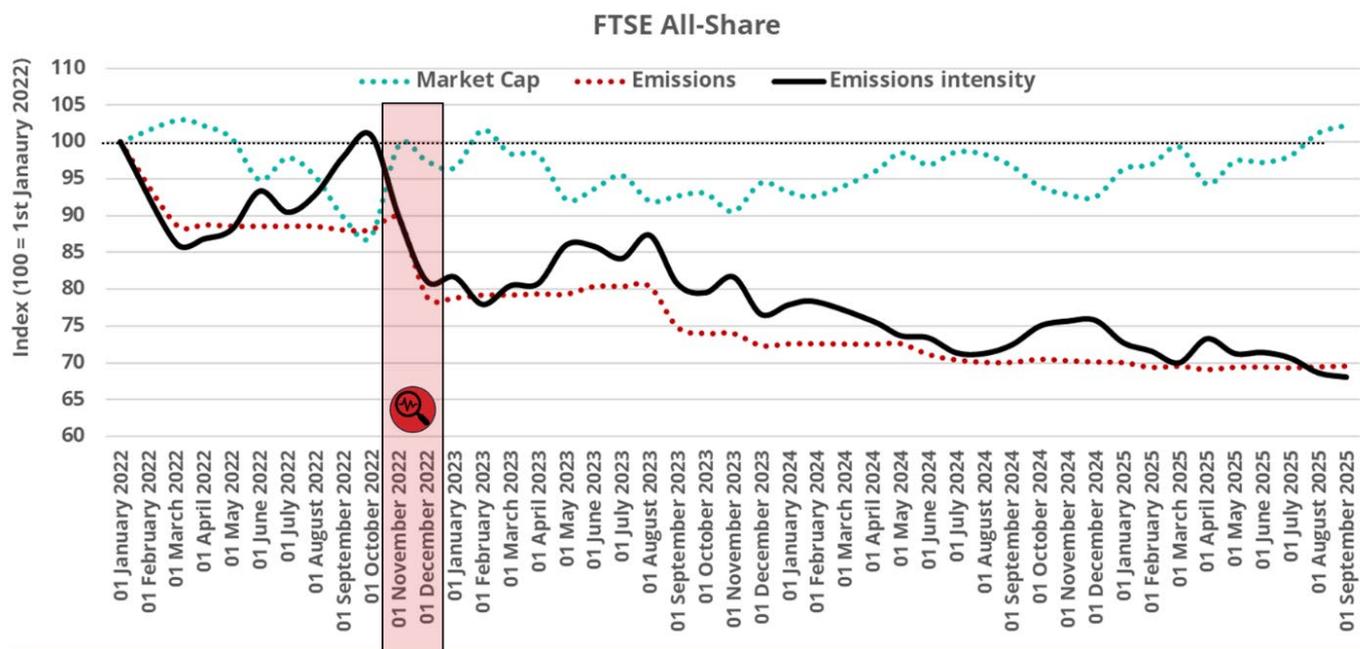


Figure 6 – Key challenges faced by data vendors collecting data from issuers. Information sources include: [Vinelli et al \(2024\)](#), [Bernstein et al \(2024\)](#), [Simmons et al \(2023\)](#), [Papadopoulos \(2022\)](#). Graphic created by Greenwheel.

Reporting cycles mean that **emissions data for any given period is often lagged by at least a year**, while market capitalisation is available in real time. **This means emissions intensity calculations use financial and emissions data from different time periods.** If reporting periods for emissions-intensive issuers cluster together, this could produce apparently significant changes in portfolio emissions over short periods (Figure 7).



Coinciding reporting periods and issuer-level divestments

The apparent >10% reduction in FTSE All-Share emissions between November and December 2022 was primarily driven by the coinciding reporting across several issuers, with some emissions-intensive companies reporting significant reductions, driven in significant part by issuer-level divestments.

Figure 7 – Changing data characteristics impacting portfolio emissions. Information sources include: [Trout et al \(2024\)](#), [Simmons et al \(2023\)](#), [ACCR \(2022\)](#). Past performance is not a guide to the future.

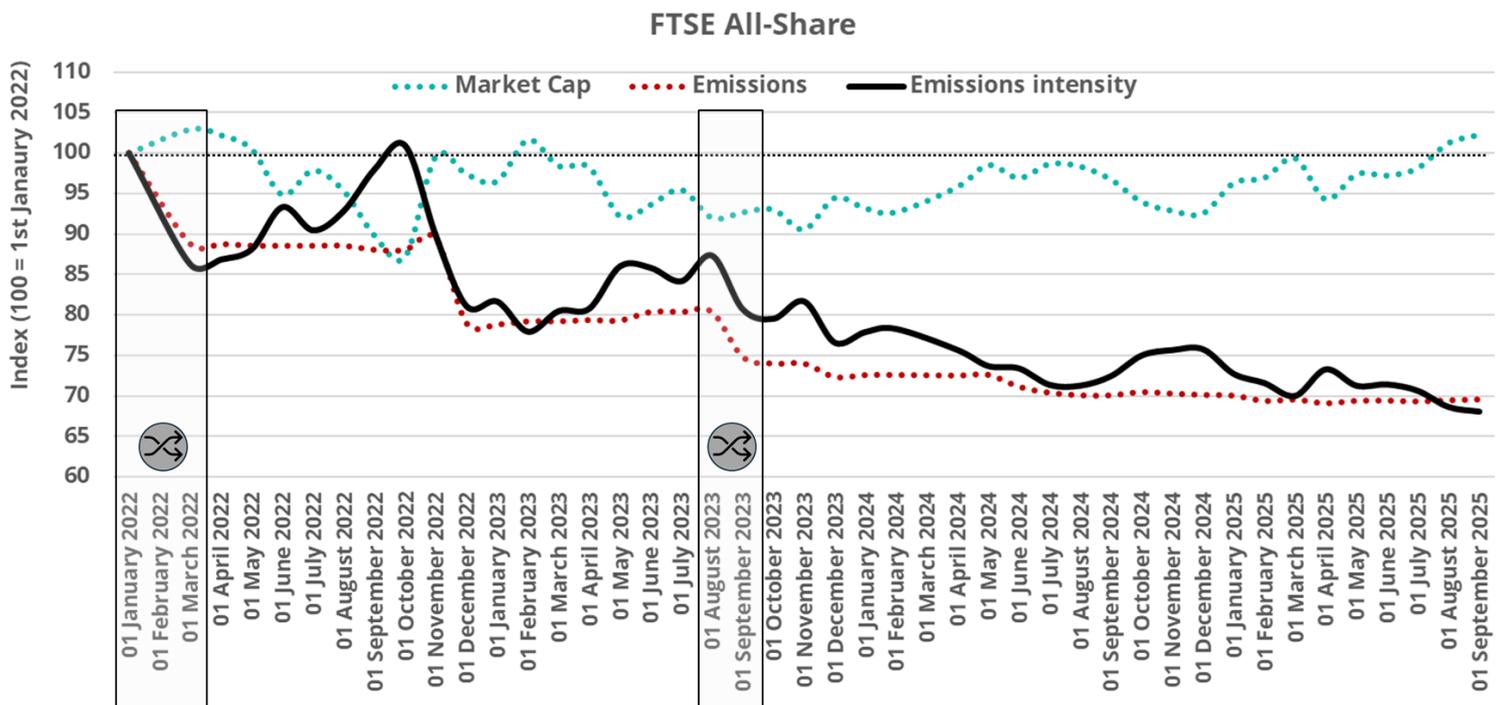
The ability to accurately track portfolio emissions can be further reduced by changing data coverage and quality, particularly if historical values are not revised to correct errors, adjust for methodological or scope changes, or gap-fill, for example.



Portfolio composition

Changing portfolio composition can have significant implications for portfolio emissions, particularly if this reflects shifts in sectoral or regional weighting.¹

Around four-fifths of the 30% reduction in emissions in the FTSE All-Share between January 2022 and September 2025 were driven by net issuer removals from the index (>100 were removed, while ~60 were added). However, most of the reduction was the result of removing just two issuers in the materials sector (Figure 8).



Index removals and listing changes

Evron PLC was removed from the FTSE in March 2022 due to sanctions on Russian-focused issuers. This accounted for almost the entire 11% emissions decline over January-March 2022 (other issuers were removed due to sanctions, but their impact was minimal). CRH was removed in September 2023 following a change in primary listing to the USA. This accounted for significantly more than the 7% emissions reduction observed and was partially offset by increasing emissions from other issuers. In both cases the impact on index value was minimal and were offset by broader rises (more than fully offset in the case of Evraz), meaning emissions intensity of the index reduced significantly in both cases.

Figure 8 – The impact of changing portfolio composition on portfolio emissions. Information sources include: [lessop \(2022\)](#); [FTSE Russell \(2023\)](#). Graphic created by Greenwheel. Past performance is not a guide to the future.

Changing sector weightings can have a significant impact on absolute emissions and emissions intensity. In September 2025, the energy and materials sectors accounted for two-thirds of FTSE All-Share emissions, but just 16% of its value (and just 7% of the issuers). By contrast, the financial sector accounted for 22% of the index value but just 0.3% of emissions (Scope 1 & 2).

Figure 9 illustrates **the impact on the emissions profile of a portfolio modelled on the FTSE All-Share by divesting all energy issuers), and reallocating funds to financial issuers. Absolute and emissions intensity immediately reduce by over one-third (from around 86 tCO₂/£ to 54 tCO₂/£). This is despite no changes to real-world emissions.**

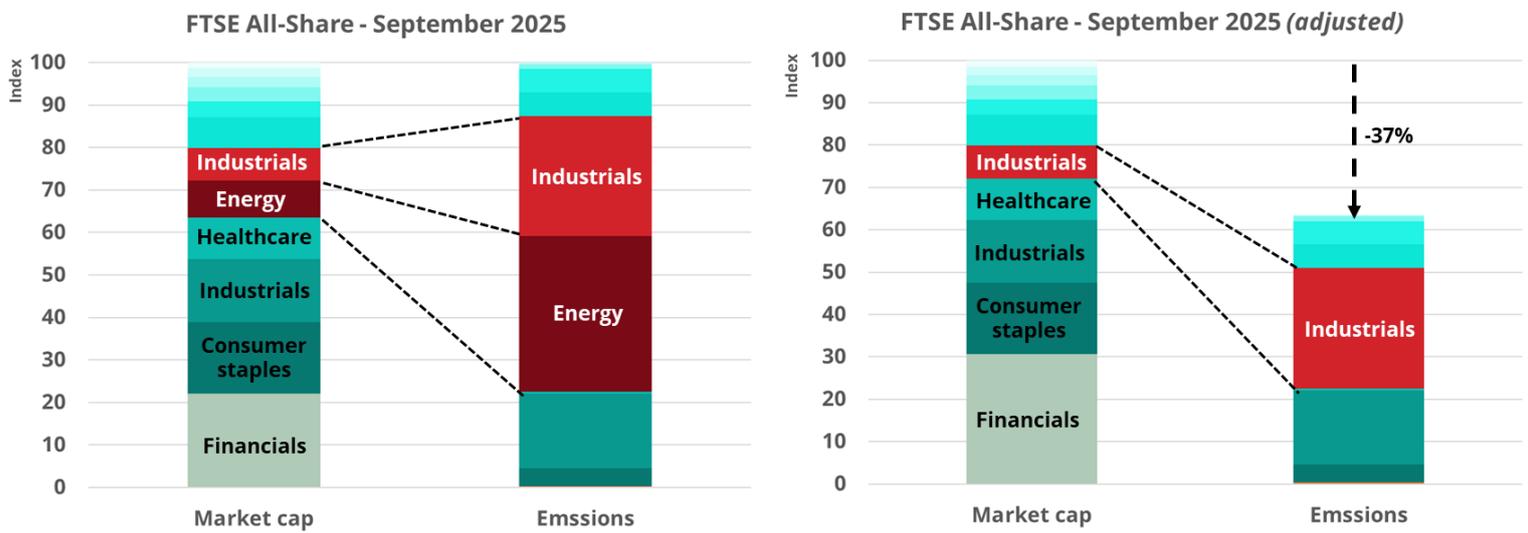


Figure 9 – Indicative impact on emissions from changing portfolio composition. Data source: Morningstar Sustainalytics. Graphic created by Greenwheel. The information shown above is for illustrative purposes.

Measuring what matters

Part 2 of this paper will dive into how investors managing portfolios of listed equities can seek to address these issues. This includes offering **practical approaches for adjusting portfolio emissions pathways** to include or exclude different drivers of portfolio emissions, **based on their investment objectives.**

Endnotes

ⁱ [IIGCC \(2024\)](#)

ⁱⁱ [Greenhouse Gas Protocol \(2025\)](#)

ⁱⁱⁱ [Greenwheel \(2024\)](#)

^{iv} [Greenwheel \(2025\)](#)

^v [ICAEW \(2024\)](#)

We thank Professor Tom Gosling of the London School of Economics for his feedback during the drafting of this paper, but we stress that the contents are entirely the author's own

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