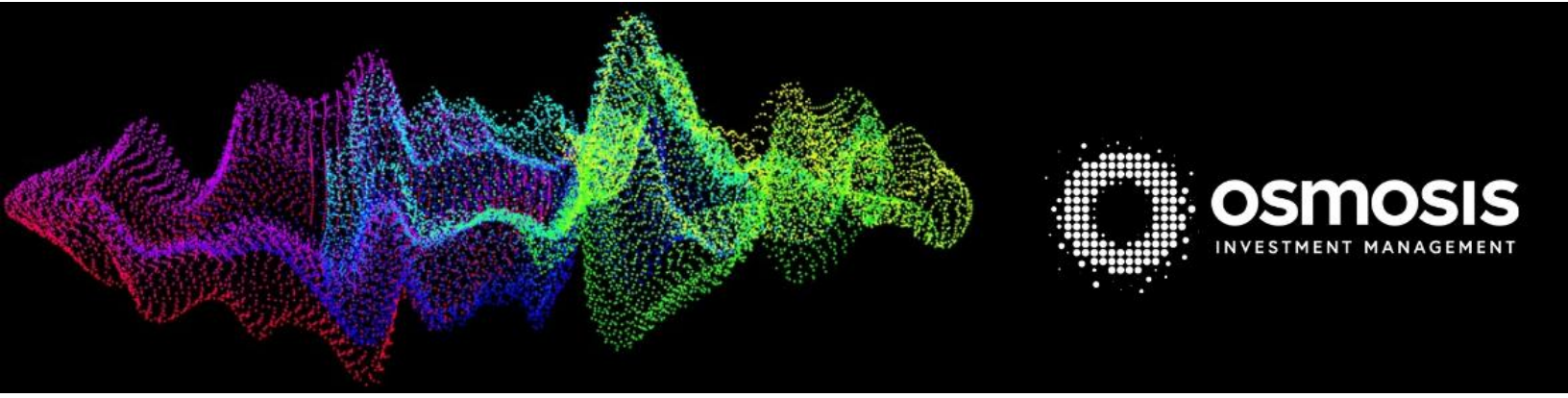


Whitepaper 28 January 2026

The Technology Hardware & Equipment Sector Split

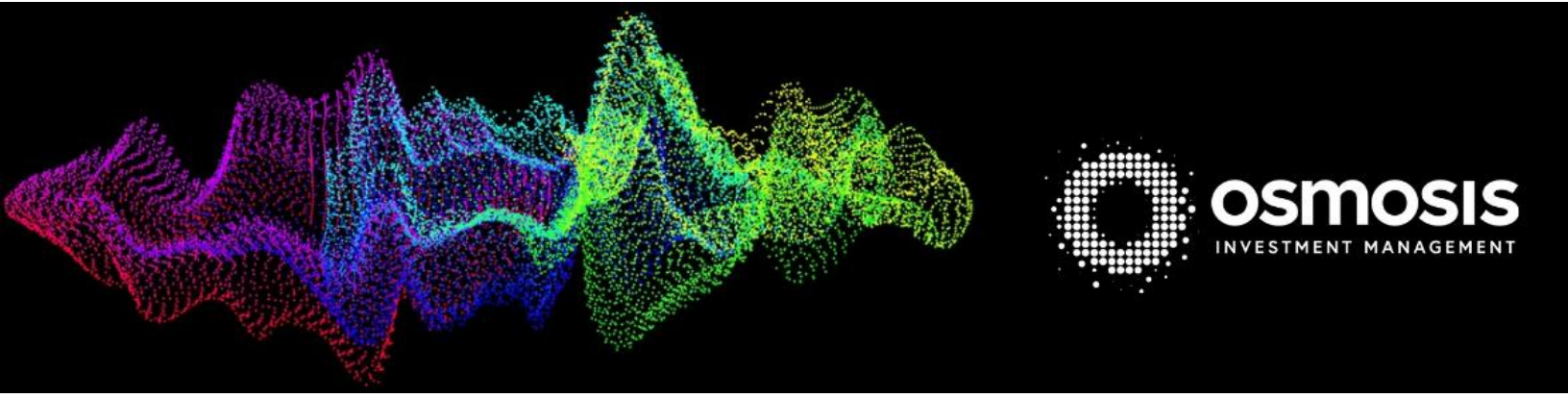
Introduction

Evaluating the environmental efficiency of companies within the Technology Hardware & Equipment sector requires an approach that reflects the underlying economic and operational realities of their business models. Legacy sector definitions have tended to favour asset-light Design, Testing and Distribution (DTD) companies while penalising manufacturers and companies operating fabrication plants (Fabs), creating structural biases that affect portfolio construction.

This paper outlines a refined segmentation, splitting the sector into Semiconductor Fabs, DTD, and Technology Manufacturing, designed to enable like-for-like comparisons, improve risk assessment, and ensure investment decisions are grounded in economic and environmental fundamentals rather than historical distortions.

Executive Summary

- **MoRE Framework**: Osmosis' Model of Resource Efficiency integrates proprietary environmental data for more than 2,500 global companies and applies bespoke sector definitions to enable robust, like-for-like assessments of Resource Efficiency (RE) across diverse business models.
- **Refined sector segmentation**: The current Technology Hardware & Equipment sector as defined by Osmosis is decomposed into three economically distinct subgroups, Semiconductor Fabs, DTD companies, and Technology Manufacturing, reflecting material differences in asset intensity, operating profiles, and

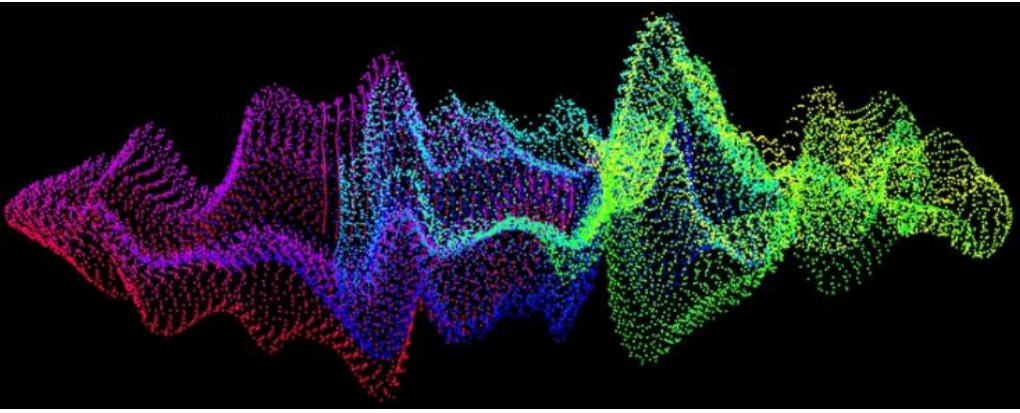


environmental footprints. At the next rebalancing date in February 2026, the three subgroups will be implemented across the Osmosis Strategies.

- **Rationale**: Existing off-the-shelf classifications unintentionally favour asset-light DTD companies' while penalising manufacturers, obscuring genuine economic and environmental differences.
- **Portfolio and factor implications**: Historically, Developed Markets (DM) performance benefited from an overweight to DTD, while Emerging Markets (EM) were constrained by under-exposure to Fabs during a period of strong Fab performance. These outcomes are retrospective and may not persist in either region.
- **Forward-looking neutrality**: The sector is not being re-classified with the aim of timing performance. Its purpose is to eliminate unintended structural biases and ensure portfolio comparisons and allocations are based on economic and operational comparability, not legacy sector definitions.

Building a Robust Model for Sector-Wide Environmental Analysis

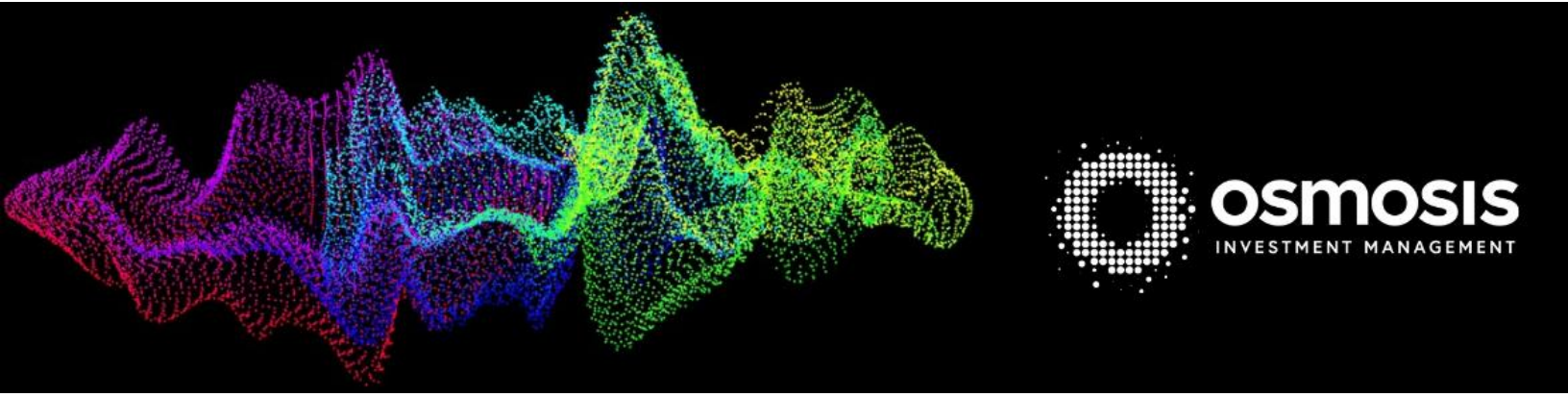
Osmosis' MoRE is a standardised, purpose-built in-house model that integrates corporate environmental data into investment decision making. We pioneered the Resource Efficient approach to standardising public corporate sustainability data and now cover more than 2,500 companies globally from both the MSCI World (DM) and MSCI Emerging Markets (EM) indices. We believe we have one of the industry's best repositories of environmental data, which has allowed us to build unique insights and avoid biases caused by a less granular approach often used by other third-party providers. To compare this data on a like-for-like basis, Osmosis has created its own sector



definitions which allow relative assessments of each company's Resource Efficiency versus its peers. We constantly update, improve, and reassess how we create these sectors, enabling fairer comparisons between companies across sectors.

Understanding Sectoral Dynamics in the Osmosis' Technology Hardware & Equipment Sector

The Osmosis Technology Hardware & Equipment sector is one of the largest sectors both in DM and EM and it comprises a diverse range of companies primarily focused on the development of the information technology industry. Essentially, three main subgroups were identified in the sector: 1) Semiconductor Fabs, defined as companies that operate as pure-play foundries: own and operate in-house manufacturing facilities to create integrated circuits chips; 2) DTD companies, defined as fabless companies that design, test and/or distribute products while outsourcing manufacturing; 3) Technology manufacturing companies, defined as companies that are involved in the manufacturing of specialised technology equipment, advanced image processing and printing, displays, printed circuit boards and other non-semiconductor technology equipment in in-house manufacturing facilities. With different business models, each of these subsectors has a distinct resource intensity profile.



A tale of two models: manufacturers vs fabless business models

Companies that own manufacturing facilities typically have much higher emissions than those that are involved in design processes. Semiconductor Fabs rely on energy and heat-intensive manufacturing processes, often derived from fossil fuels. Direct emissions (Scope 1) arise from harmful process gases with high global warming potential (GWP) produced during wafer etching, chamber cleaning, heat-transfer, and other processes in foundries, as well as fuel-burning processes accounting for around 80% of their total emissions. Indirect emissions (Scope 2) are also high due to increased electricity demand, linked to the production of AI chips. As chips get smaller, manufacturing becomes inherently more resource intensive. The high-performance manufacturing techniques required for advanced AI chips demand a significant amount of electricity to operate foundries. Therefore, the adoption of renewable energy, efficiency improvements and low-carbon manufacturing innovations are imperative within this subsector.

The second subgroup, Technology Manufacturing companies, employ physical, chemical, and electromechanical manufacturing processes, such as etching, coating and drying, which are the main drivers of carbon emissions, albeit they are not as resource-intensive as the former, as they are far less energy-intensive.

Conversely, DTD firms operate without factories, machinery, equipment, or other significant capital investments and have very low direct emissions (Scope 1). Around 90% of their footprint comes from electricity consumption (Scope 2) in offices, R&D labs and from the value chain linked to Scope 3 emissions.

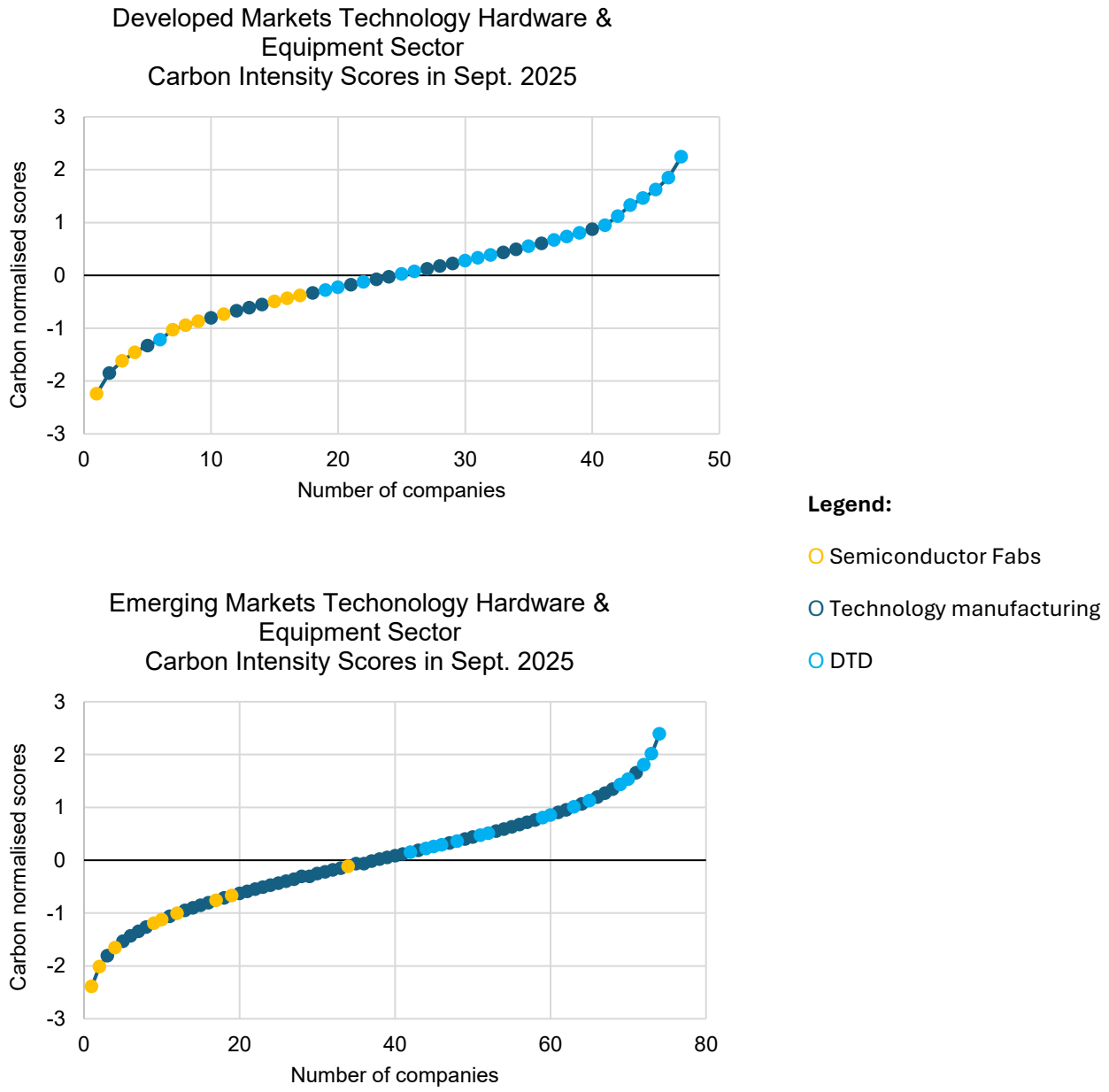
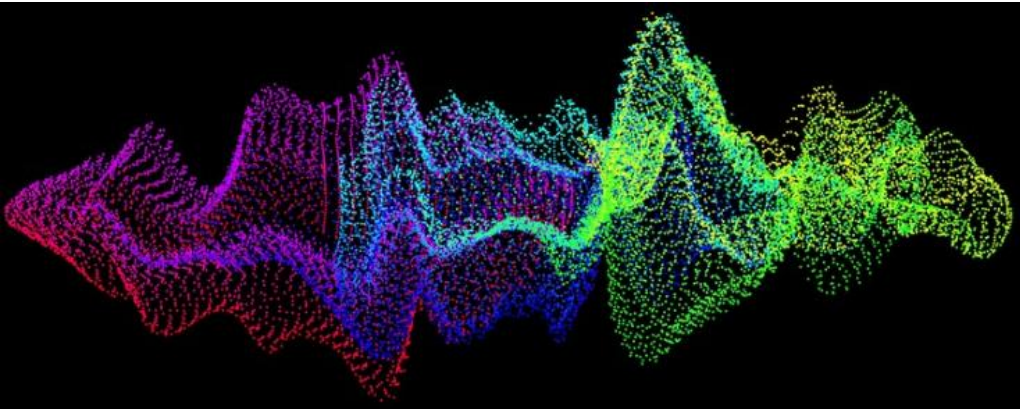
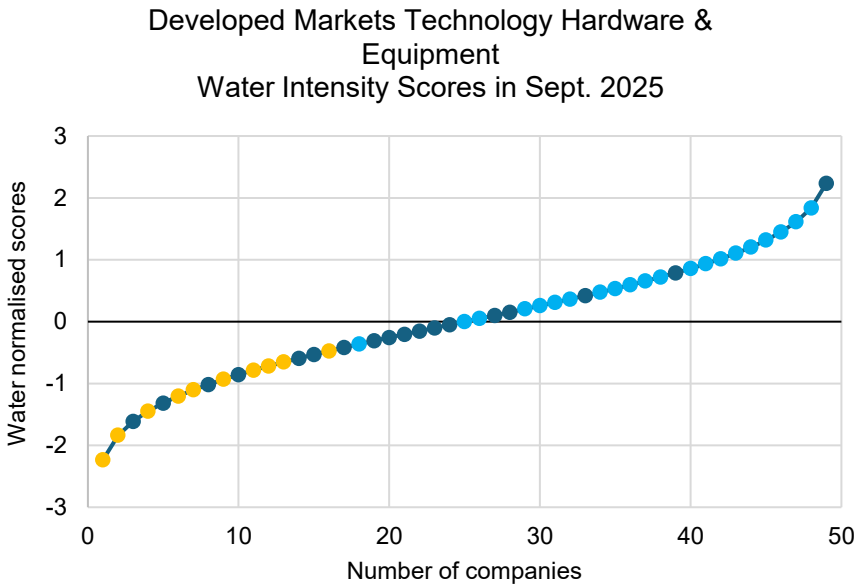


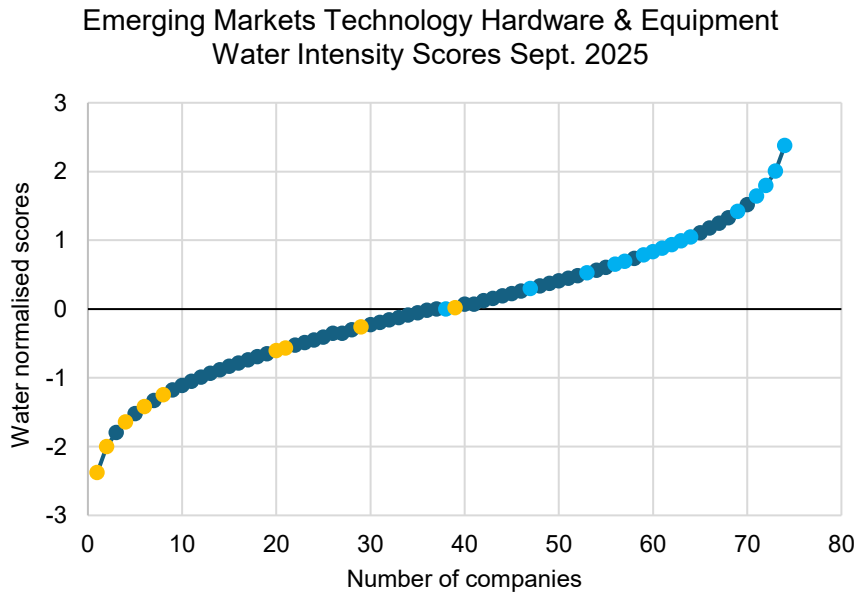
Figure 1a, b. Source: Osmosis IM. The graphs above illustrate normalised carbon scores (tCO2e / $m revenue) for all disclosing companies in the respective MSCI Index Technology in the Hardware & Equipment Sector.



The water footprint also varies dramatically depending on the purity of water required in operations. Water consumption in a foundry is used for processing gas abatement, cooling towers, air purification in cleanrooms and for cleaning silicon wafers. Semiconductor manufacturers require massive volumes of water to produce ultrapure water (UPW). This water removes all minerals, particles, and contaminants, making it effective to treat chip devices to avoid any imperfections that could cause critical damage or errors in integrated circuits or slow performance. It is estimated that to produce 3,800 litres of UPW takes roughly 5,300-6,100 litres of municipal water, and a single foundry uses millions of litres of water per day, roughly equivalent to the daily water consumption of 300,000 homes.

In addition, water use and energy consumption are correlated as wastewater management processes require large amounts of energy. In the case of Technology Manufacturing companies, only a few disclose the production of UPW for their operations. On the other hand, water consumed by fabless DTD companies in their operations is mainly destined for data centres that support R&D labs and global offices, representing a moderate to low water requirement compared to semiconductor foundries or companies with more integrated business models.

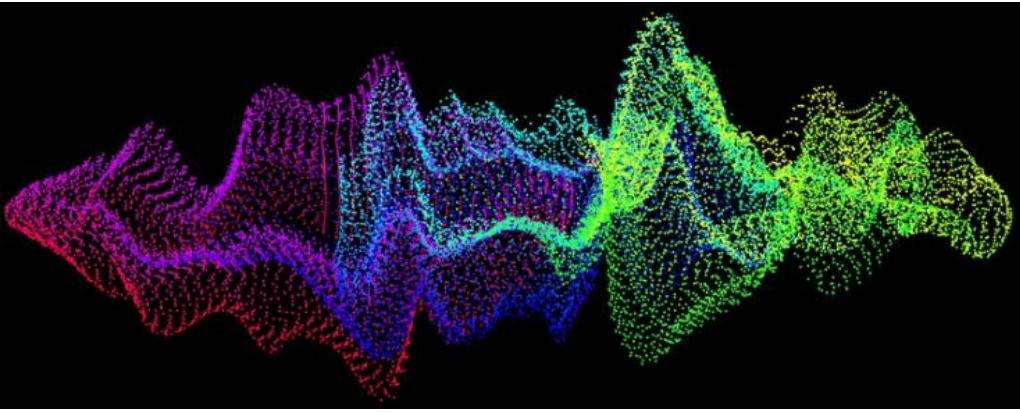




Legend:

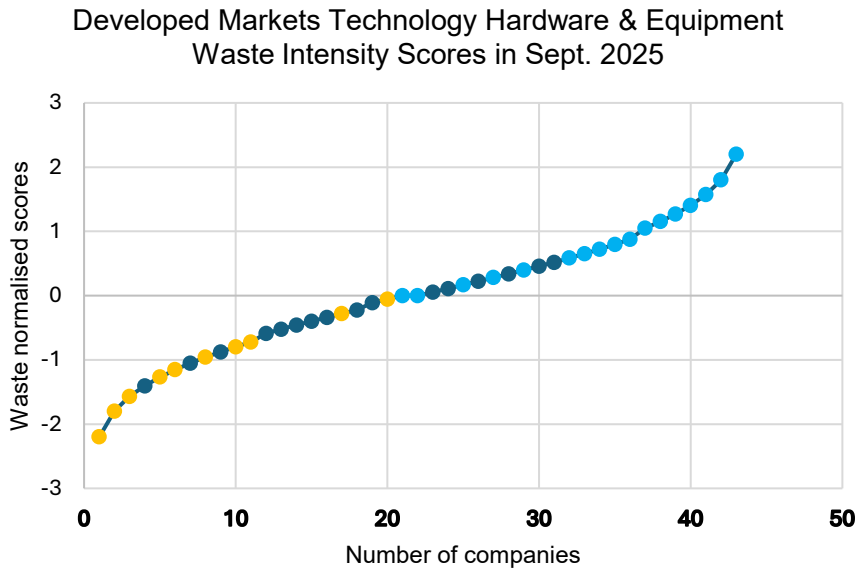
- Semiconductor Fabs
- Technology manufacturing
- DTD

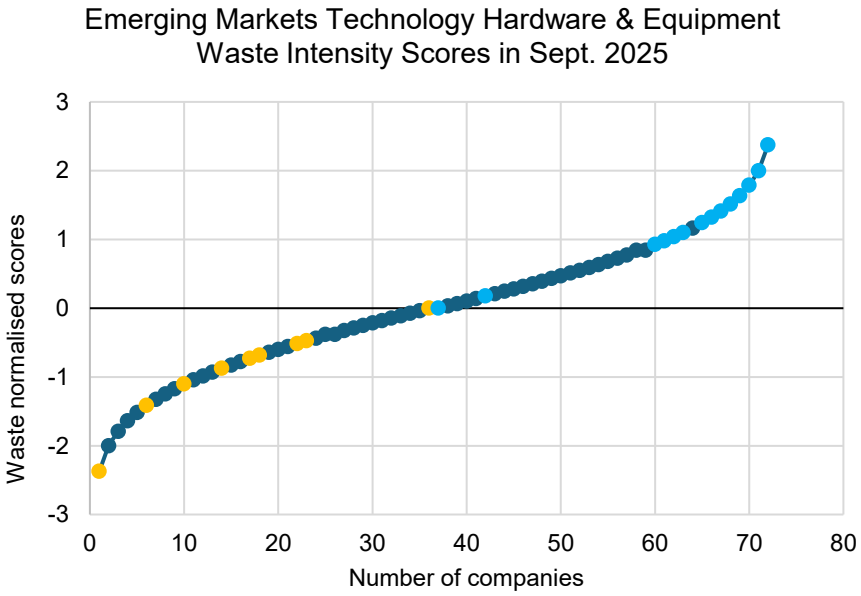
Figure 2a, b. Source: Osmosis IM. The graphs above illustrate normalised water scores (cubic meter / $m revenue) for all disclosing companies in the respective MSCI Index Technology in the Hardware & Equipment Sector.



The mismanagement of waste can negatively affect some more than others. Semiconductor foundries generate considerable amounts of hazardous waste (especially chemical sludge), as chip production involves the use of over 400 chemical products in etching, cleaning, and stripping processes. In response, chipmakers are increasingly applying circular economy measures to reduce waste. Complementary strategies focus on prevention at the source, such as minimising material inputs or reducing the thickness of deposited layers during fabrication.

Moreover, semiconductor manufacturers are making concerted efforts to maximise resource circularity by reusing and recycling materials more efficiently. Technology Manufacturing companies generate large volumes of waste liquids, with hazardous industrial waste accounting for the majority of total waste generated. However, these volumes are generally lower than those generated by semiconductor foundries, owing to the comparatively less complex nature of their manufacturing processes. Technology Manufacturing companies also seek to reduce raw material consumption and waste during the manufacturing process. In contrast, fabless DTD companies' generate minimal hazardous waste, as they do not engage in high-volume chemical processing during design or distribution processes.

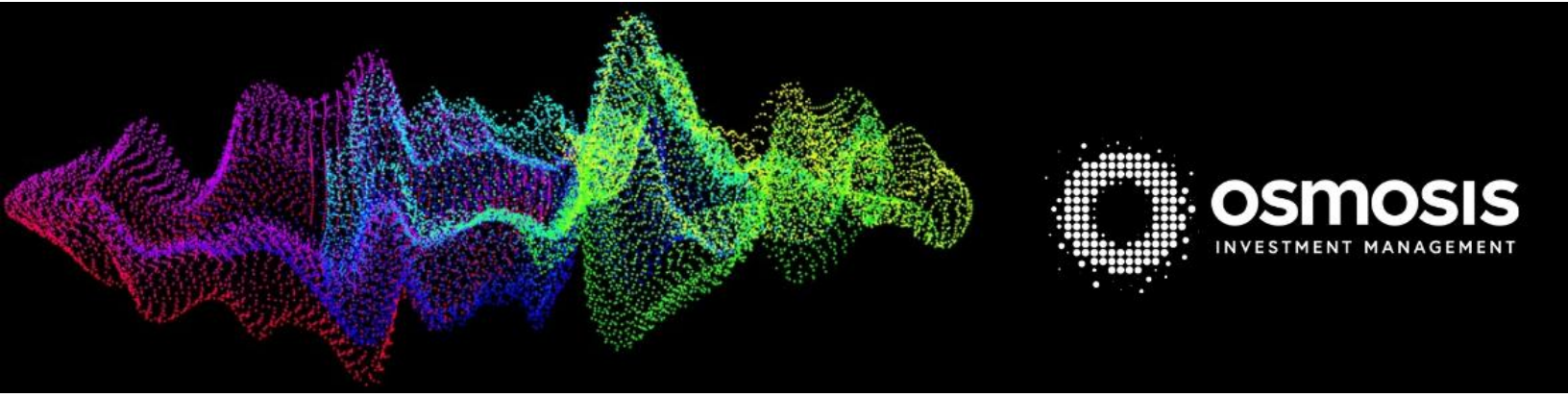




Legend:

- Semiconductor Fabs
- Technology manufacturing
- DTD

Figure 3a, b. Source: Osmosis IM. The graphs above illustrate normalised waste scores (metric tonnes / $m revenue) for all disclosing companies in the respective MSCI Index Technology in the Hardware & Equipment Sector.



The Hidden Structures in the Technology Hardware & Equipment Sector

Segmentation of the sector leads to a distinct distribution of Resource Efficiency (RE) Scores. Until now, the Osmosis Technology Hardware & Equipment sector has been in line with off-the-shelf sector definitions and has not been segmented by the business models of the companies in the sector, and our research shows that distinct populations with contrasting business operations and strikingly different pollution profiles exist within the sector. In fact, we see consistently positive RE scores from DTD and consistently negative RE scores from semiconductor Fabs, sandwiched by Technology Manufacturing. This is observed in both DM and EM.

Using the Kruskal–Wallis H test* to assess differences in medians, we tested whether the three subsector samples originate from the same underlying population. The results are highly statistically significant in both DM and EM.

Violin plots visually illustrate the distinct distribution patterns across subsectors, with the separation being even more pronounced in Emerging Markets (Figures 4, 5).

Scatter plots of scores, both in the status-quo and post-split scenarios, further highlight the differences in subsector distributions (Figures 6 and 7). In these plots, three distinct lines emerge, reflecting each subsector's characteristic intensity profile arising from their different business operations.

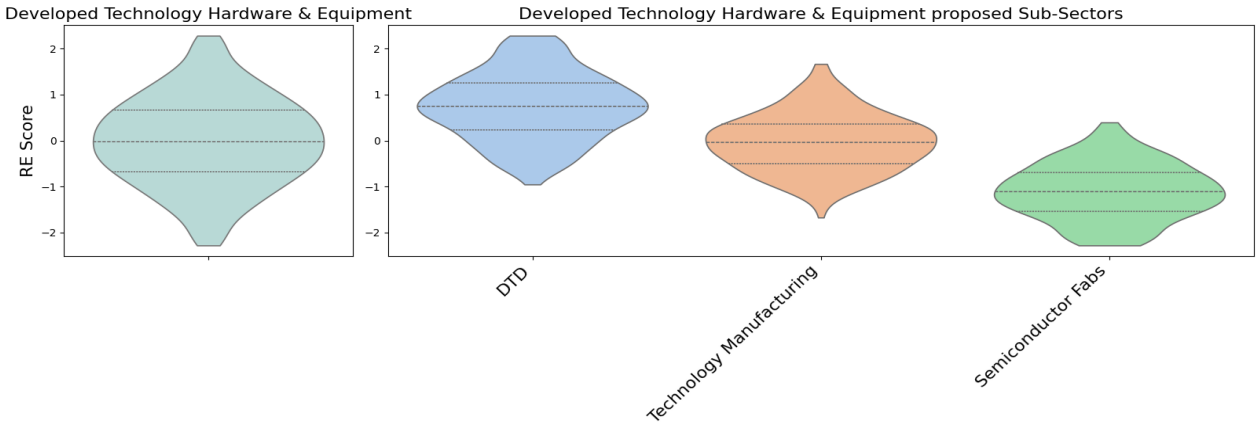


Figure 4. MSCI World Developed Markets. Source: Osmosis IM, FactSet. Time period: 31-Dec-2005 to 30-Sep-2025. There is sufficient data coverage in DM in this time period. The left panel shows the distribution of year-end RE scores within the Technology Hardware & Equipment sector in DM from 2005 onwards. The right panel presents the distribution of year-end RE scores across the proposed subsectors: DTD, Technology Manufacturing, and Semiconductor Fabs. DTD companies are predominantly concentrated toward the positive end of the distribution, while Semiconductor Fabs are skewed toward negative values. Technology Manufacturing firms exhibit intermediate RE scores, with distributions lying between those of DTD and Semiconductor Fabs.

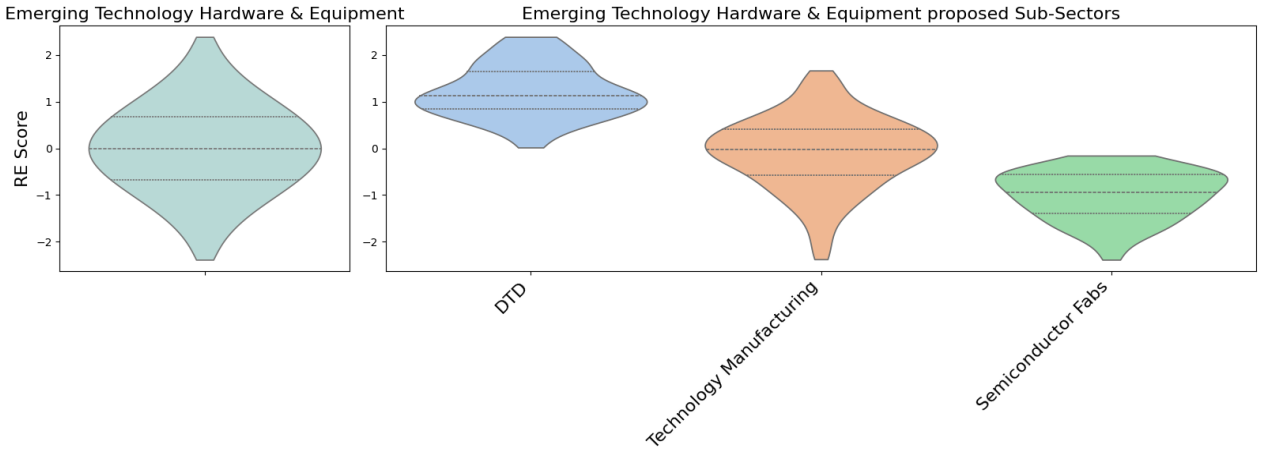


Figure 5. MSCI Emerging Markets. Source: Osmosis IM, FactSet. Time period: 31-Dec-2017 to 30-Sep-2025. There is sufficient data coverage in EM in this time period. The left panel displays the distribution of

year-end RE scores within the Technology Hardware & Equipment sector in EM. The right panel shows the corresponding distributions for the proposed subsectors. DTD companies consistently exhibit positive RE scores, whereas Semiconductor Fabs are consistently negative. Technology Manufacturing companies again occupy a middle ground, with RE scores sandwiched between those of DTD and Semiconductor Fabs. The separation between subsector distributions is even more pronounced in EM than in DM, as illustrated by comparison with Figure 4.

In essence, the current sector classification disproportionately favours asset-light companies, notably the DTD companies, while underweighting asset-heavy entities, most notably Semiconductor Fabs. This imbalance stems from inappropriate peer group comparisons, which unintentionally reward DTD companies while penalising technology manufacturers and semiconductor fabrication firms.

With the proposed sector split, asset-light companies such as *NVIDIA* will be compared with other DTD peers including *Advanced Micro Devices (AMD)* and *Apple*. These firms primarily focus on research and development (R&D) and due to outsourcing manufacturing to third parties, they are often located in emerging economies such as China, Taiwan, South Korea, and India.

Conversely, asset-heavy Semiconductor Fab companies, such as *Taiwan Semiconductor Manufacturing (TSMC)*, will be compared with peers like *SK Hynix* and *Vanguard International Semiconductor Corporation* based on their RE performance: how much carbon they are emitting in their foundries' facilities, the amount of water they are using in chip operation and their relative waste generation.

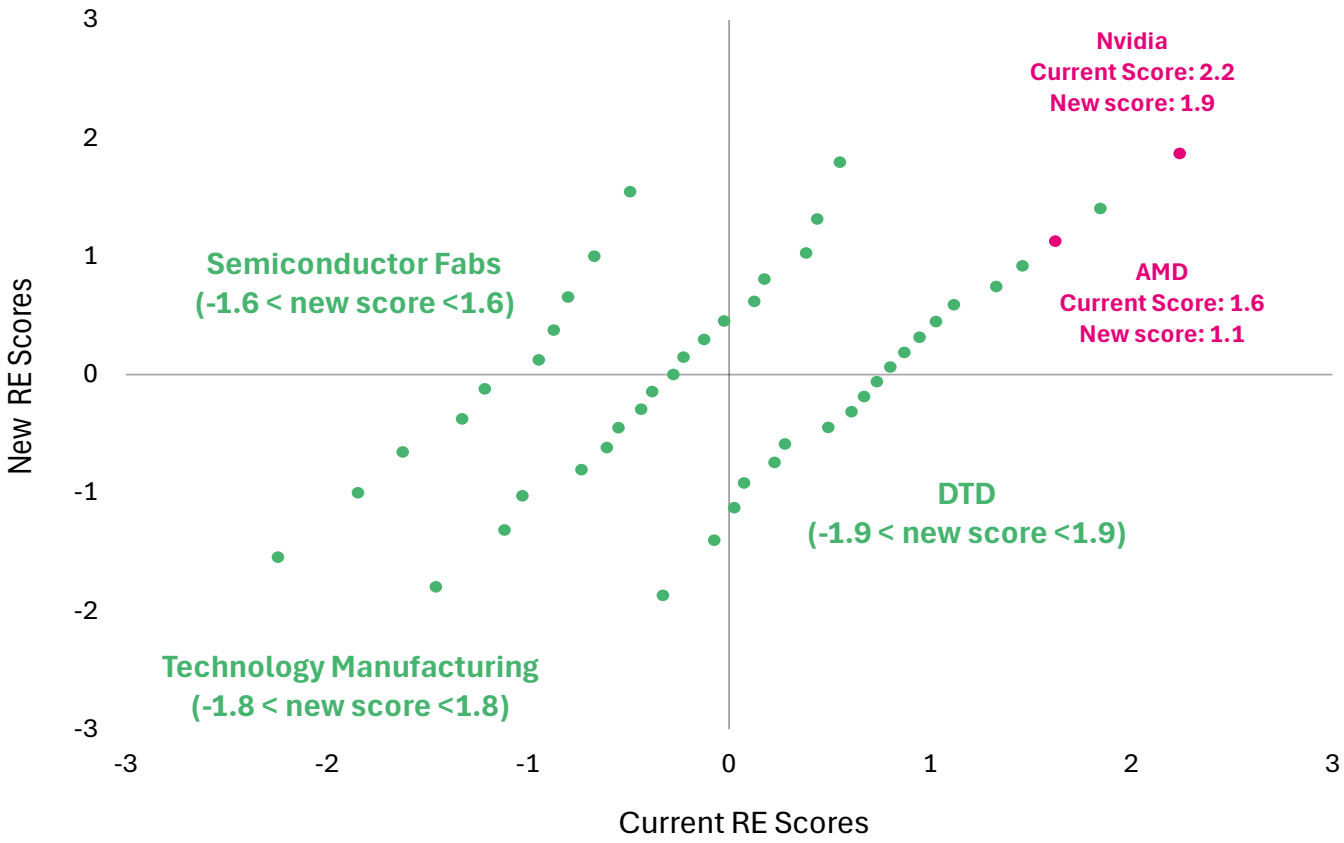


Figure 6. MSCI World Developed Markets. Source: Osmosis IM. Data as of end of September 2025. Three distinct lines emerge, reflecting each subsector's characteristic intensity profile arising from their different business operations. Each data point represents an MSCI World Developed Markets Technology Hardware & Equipment company with an Osmosis RE score.

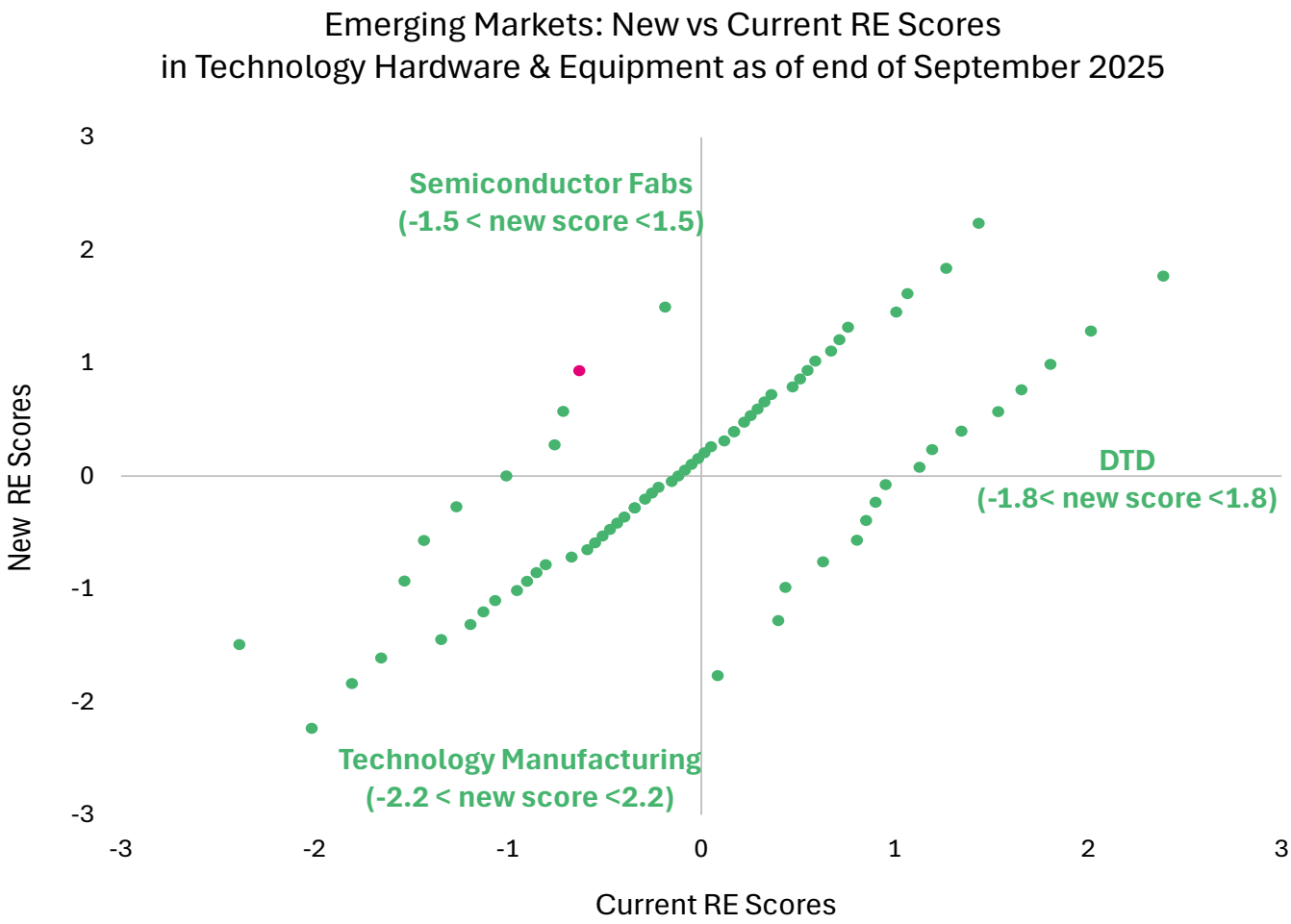


Figure 7. MSCI World Emerging Markets. Source: Osmosis IM. Data as of end of September 2025. Three distinct lines emerge, reflecting each subsector's characteristic intensity profile arising from their different business operations. Each data point represents an MSCI Emerging Markets Technology Hardware & Equipment company with an Osmosis RE score.

The amount of carbon emitted, water extracted, and waste generated in relation to the economic value a company produces is the basis for effective benchmarking against peers. To construct portfolios that overweight Resource Efficient companies and

underweight Inefficient ones, we believe it is necessary to implement this sector split in our model. This will produce RE scores that are more representative and aligned with Osmosis' core principles.

What are the implications of the sector split on factor performance?

Historically, over-allocating to DTD has paid off in DM, while under-allocating to Fabs has detracted from performance in EM. Thus, the sector is not being re-classified with the aim of timing performance, but rather to eliminate unintended structural biases and ensure portfolio comparisons.

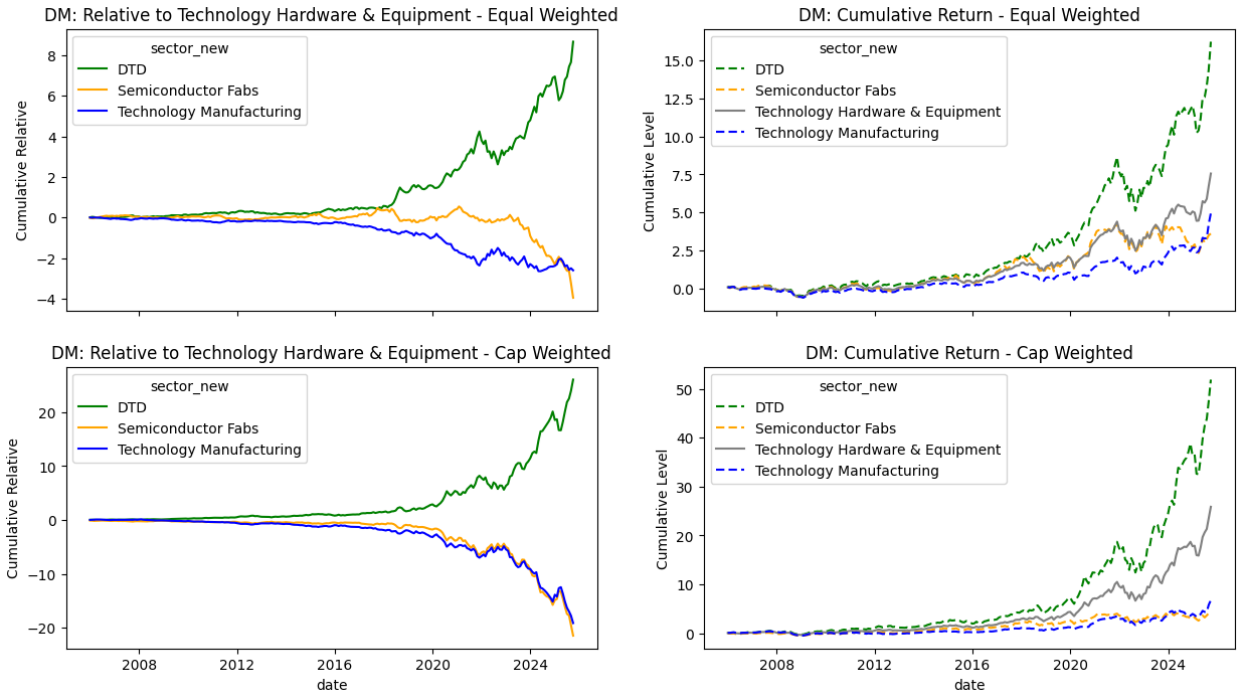


Figure 8. Universe: MSCI World. Source: Osmosis IM, FactSet. Time period: 2005-12-31 to 2025-09-30. There is sufficient data coverage in DM in this time period. Data coverage in DM prior to this date is considered inadequate. The top-right panel shows the cumulative equal-weighted return of the three

subsectors (post-split) alongside the Technology Hardware & Equipment sector (status quo) since 2005-12-31. The bottom-right panel presents the cumulative market-cap-weighted return over the same period. The top-left panel displays the cumulative equal-weighted return of each subsector relative to the current Technology Hardware & Equipment sector, while the bottom-left panel shows the cumulative market-cap-weighted return relative to the sector. The historical outperformance of DTD was observed in DM. Semiconductor Fabs and Technology Manufacturing have generally lagged behind.

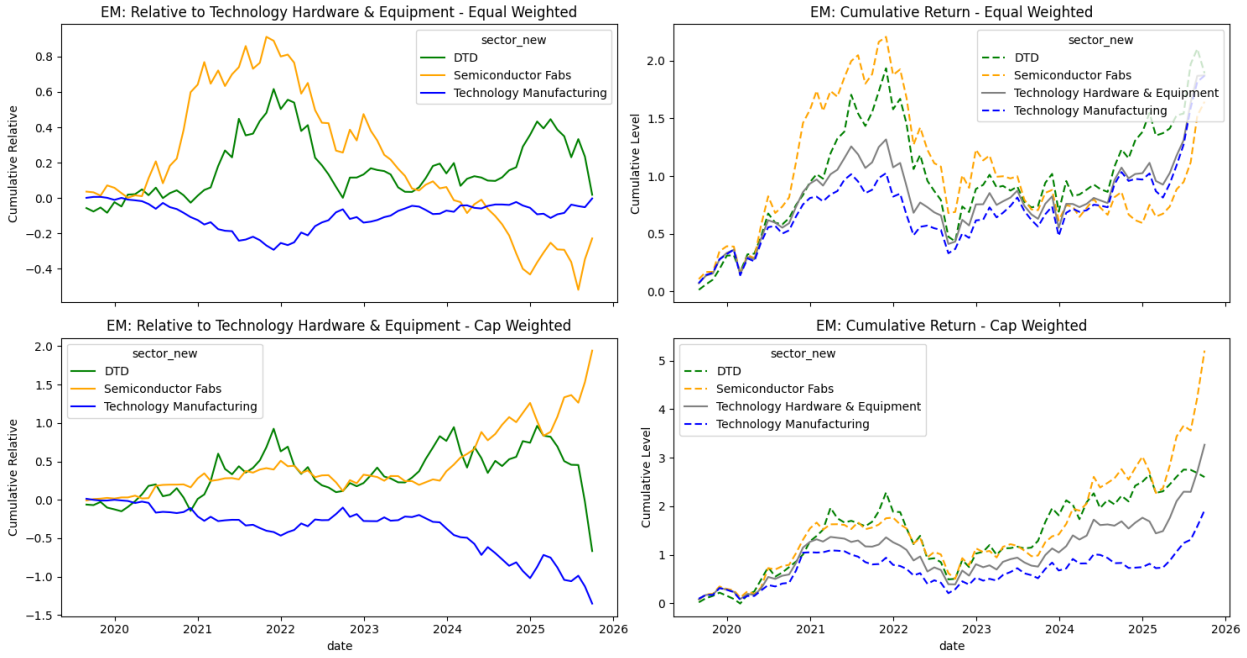
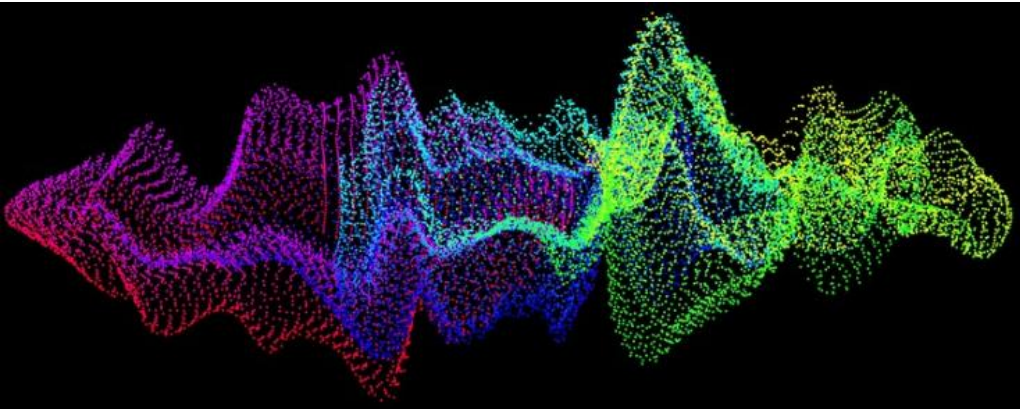


Figure 9. Universe: MSCI Emerging Markets. Source: Osmosis IM, FactSet. Time period: 2019-08-31 to 2025-09-30. There is sufficient data coverage in EM in this time period. Data coverage in EM prior to this date is considered inadequate. The top-right panel shows the cumulative equal-weighted return of the three subsectors (post-split) alongside the Technology Hardware & Equipment sector (status quo) since 2017-12-31. The bottom-right panel presents the cumulative market-cap-weighted return over the same period. The top-left panel displays the cumulative equal-weighted return of each subsector relative to the current Technology Hardware & Equipment sector, while the bottom-left panel shows the cumulative market-cap-weighted return relative to the sector. In EM, both Semiconductor Fabs and DTD have outperformed, while Technology Manufacturing has lagged, as shown by the cumulative market-cap-weighted returns in the bottom-right and bottom-left panels.

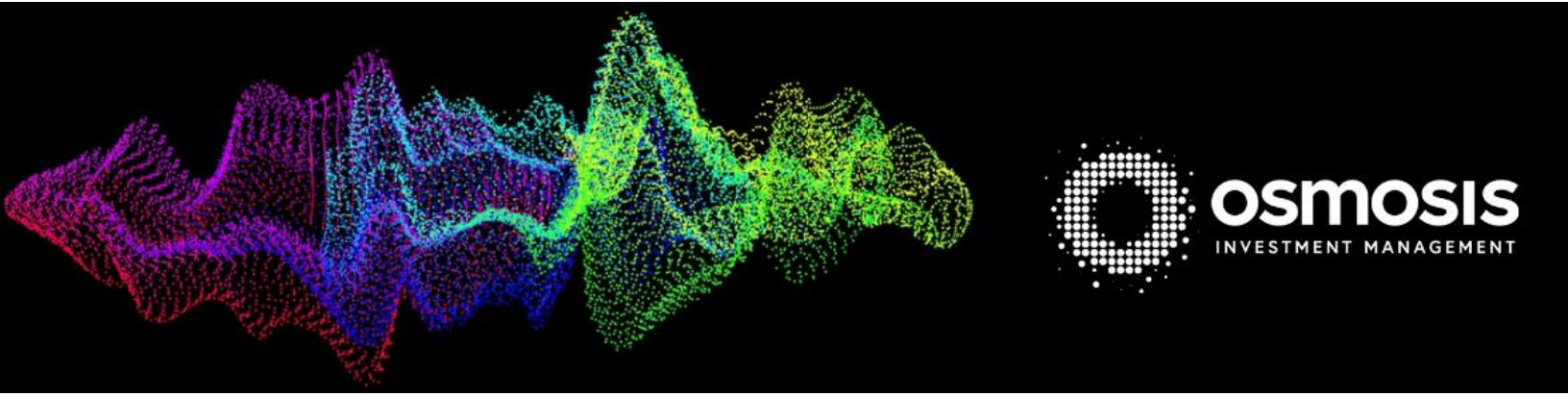


In DMs, subsector performance within Technology Hardware & Equipment has diverged sharply. Relative to the overall sector, DTD companies have performed exceptionally well, driven primarily by names such as *Nvidia* and *AMD*. In contrast, Semiconductor Fabs and Technology Manufacturing companies have underperformed.

As previously discussed, DTD companies have consistently received positive RE scores, while Semiconductor Fabs have consistently received negative RE scores. As a result, the long-standing structural tilt toward asset-light DTD business models effectively became a *permanent bet* that coincided with strong relative performance in the past. Similarly, the systematic underweight to DM Semiconductor Fabs proved beneficial, as these companies materially lagged the broader Technology Hardware & Equipment sector.

It is important to emphasise that these observations are entirely backward-looking. The relative outperformance of DTD versus Fabs in DM reflects realised outcomes over the past cycle but does not imply that this relationship will persist. The analysis is not intended to time a shift in subsector leadership, nor to suggest that DTD companies will continue to outperform Fabs in DM, or vice versa in EM. This analysis is intended to strengthen the model of Resource Efficiency by increasing the efficacy of corporate comparisons and removing permanent sectoral bets. Our belief is that Resource Efficient companies will outperform their Resource Inefficient peers over the long run, however future performance will depend on a range of cyclical, structural, and competitive factors that may evolve materially from historical experience.

Overall, the proposed re-classification has materially different implications in Developed versus Emerging Markets, reflecting distinct historical performance dynamics. In both regions, however, these effects are derived from backward-looking outcomes, and there is no presumption that future subsector trajectories will mirror those observed historically.



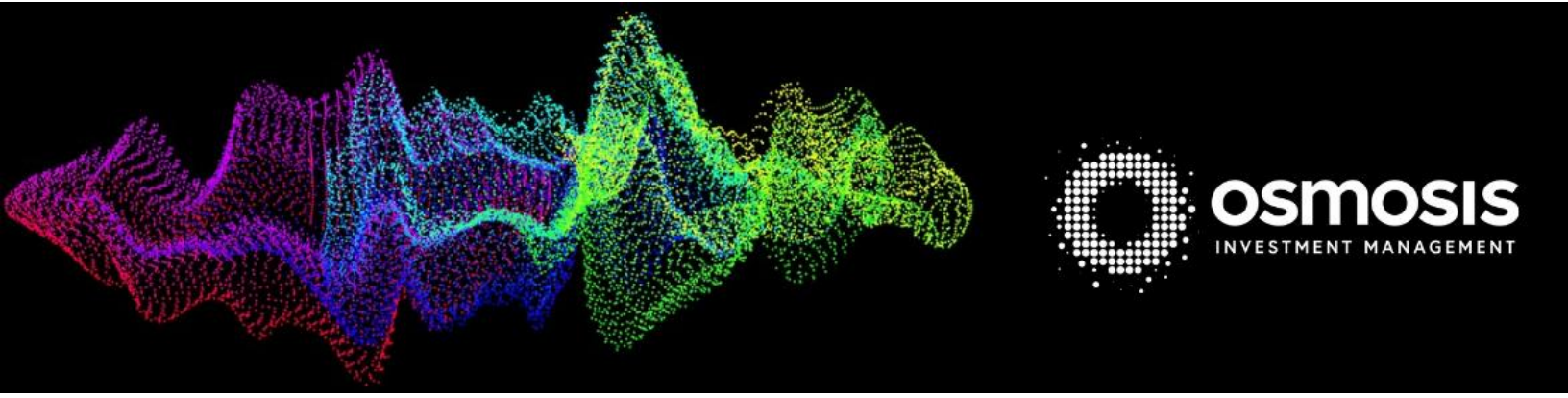
What are the implications of the sector split at the portfolio level?

Adjusting for sub-sector allocation effects translates directly into back-tested portfolio outcomes.

Allocation–selection attribution makes this clear:

- In DM, the majority of active return differential following the sector split is attributable to DTD allocation effects.
- In EM, the revised classification produces an uplift, driven predominantly by Semiconductor Fabs allocation effects.

Having run back-testing on the Core Strategies, on the single-stock level, the impact of the sector split is concentrated in a small number of names, most notably Intel and TSMC. Both stocks were penalised by the previous model specification, an effect that was magnified by increasing market concentration. As a result, these two companies have been dominant drivers of the difference in return outcomes. Correcting this bias materially changes how the model treats structurally important semiconductor firms, reducing unintended tilts and enabling more like-for-like economic comparisons within the sector.



DM Return Attribution – May 2017 – Sep 2025

DM strategy post sector-split analysed against DM strategy pre-sector-split.

Total Active	**-0.17%**
Allocation	**-0.28%**
Allocation - DTD	-0.24%
Allocation - Semiconductor Fabs	-0.05%
Allocation -Technology Manufacturing	0.02%
Allocation - others	-0.01%
Selection	**0.12%**
Selection - DTD	0.04%
Selection - Semiconductor Fabs	0.04%
Selection - Technology Manufacturing	-0.01%
Selection - others	0.05%

Table 1. Universe: MSCI World. Source: Osmosis IM, MSCI Barra. Time Period: 31st May 2017 to 30 September 2025. The time period chosen relates to the inception of the Core strategy. Portfolio returns maybe decomposed into allocation and selection returns. Allocation measures the impact of being overweight or underweight in sectors relative to a benchmark. Selection measures the ability to choose stocks within a sector relative to the benchmark.

EM Return Attribution – August 2019 – Sep 2025

EM strategy post sector-split analysed against EM strategy pre-sector-split.

Total Active	**0.25%**
Allocation	**0.19%**
Allocation - DTD	-0.43%
Allocation - Semiconductor Fabs	0.48%
Allocation -Technology Manufacturing	0.14%
Allocation - others	0.00%
Selection	**0.08%**
Selection - DTD	0.03%
Selection - Semiconductor Fabs	-0.03%
Selection - Technology Manufacturing	0.29%
Selection - others	-0.21%

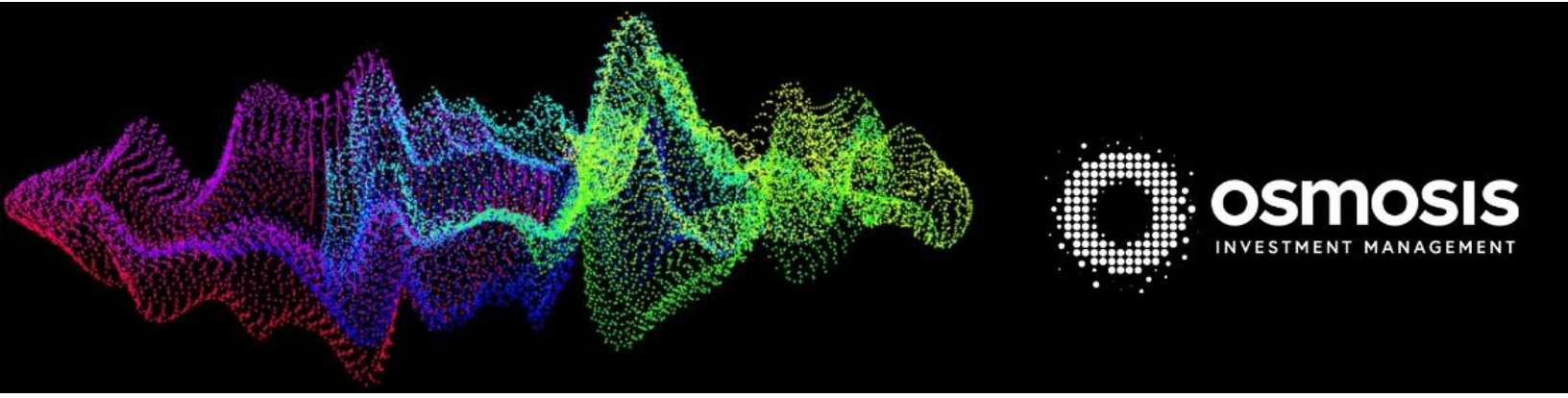
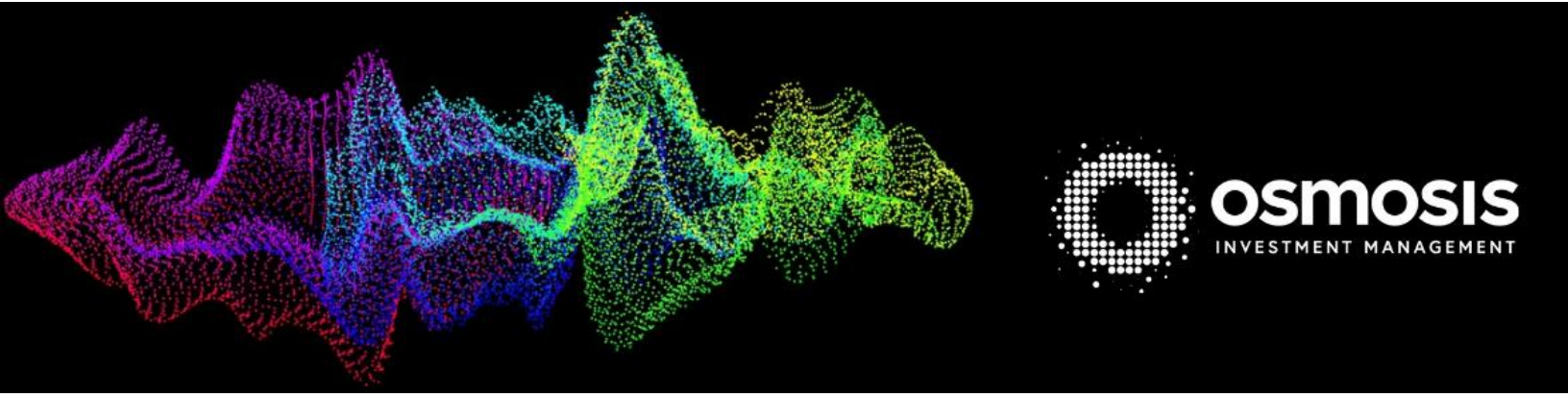


Table 2. Universe: MSCI Emerging Markets. Source: Osmosis IM, MSCI Barra. Time Period: 31 August 2019 to 30 September 2025. The start date is exogenously determined by the environmental data availability for companies in the index. Portfolio returns may be decomposed into allocation and selection returns. Allocation measures the impact of being overweight or underweight in sectors relative to a benchmark. Selection measures the ability to choose stocks within a sector relative to the benchmark.

Conclusion

The refined Technology Hardware & Equipment sector split removes structural biases, enabling fair comparisons across Semiconductor Fabs, DTD, and Technology Hardware Manufacturing. Historical performance highlights differences between DM and EM, but there is no expectation that these trends will continue. This re-classification is a principles-driven adjustment to increase economic comparability, but not to predict future subsector outcomes. This is a model improvement, which further refines our Osmosis Sectors and is designed to strengthen our Resource Efficiency signal through increasing the granularity of corporate comparisons, with the aim of positioning portfolios for more robust returns over future market cycles.



None of the company examples referred to above are intended as a recommendation to buy or sell securities. The company examples are being shown have been selected to be included in this presentation based upon an objective non-performance basis and to provide an example of the MoRE analysis. The company examples may or may not be held in Osmosis' portfolios as of the date of this presentation. The information does not constitute an offer or solicitation for the purchase or sale of any security, commodity or other investment product or investment agreement, or any other contract, agreement, or structure whatsoever.

The investments set forth above should not be considered a recommendation to buy or sell any specific securities. There can be no assurance that such investments will remain in the Osmosis Core Equity Strategies. The sector and factor returns are attribution showing the excess return of the strategy in relation to the benchmark return. Attribution is gross of all fees and expenses. Past performance is not an indication of future performance. Source: Osmosis UK.

* The Kruskal–Wallis H test is a non-parametric statistical test used to assess whether there are statistically significant differences between the distributions (typically medians) of three or more independent groups. The test ranks all observations across groups and evaluates whether the rank sums differ more than would be expected by chance.