Emerging Market Insights

The next era of sustainable opportunity – December 2024

Contents

Introduction

At the start of 2023, Osmosis embarked on an extensive Emerging Markets (EM) research project driven by the compelling opportunity to reshape perceptions of sustainable investment in these fast-growing economies, which now account for half of global GDP. The prevailing belief had long been that environmental data and reporting in the EM was too patchy and inconsistent to meet rigorous investment standards. Our goal was to challenge this assumption, and investigate whether we could evidence a sustainable alpha signal comparable to that which we have identified in the developed markets (DM). Recognising the scale of the challenge, we hired a dedicated team of analysts to collect, clean, standardise and contextualise publicly-available corporate environmental data from the EM.

I am pleased to introduce this collection of Emerging Markets Insights, which provide a snapshot of the work our team of EM specialists have done in analysing this new dataset. Our mandate was clear: replicate our tried-and-tested approach from the DM, adapting it to the specific nuances of the EM while maintaining the same high standards of research we deliver in the DM.

Several findings within these Emerging Markets Insights challenge long-held assumptions about EM data quality. As you will read, environmental disclosures in emerging economies now rival, and in some instances surpass, that of DM, with many EM jurisdictions introducing regulations as stringent as, or even exceeding, western frameworks. Crucially, the data is at a stage where we can leverage our DM expertise to construct portfolios designed to target better risk-adjusted returns while delivering meaningful environmental impact versus the benchmark.

From both an environmental and a financial perspective, there are compelling reasons to take a whole-world approach to sustainable investment. Increased globalisation of supply chains has led to the 'outsourcing' of emissions to emerging regions, shifting them off corporate balance sheets, but not off the planet. When resource intensive industries in emerging economies, such as power-hungry semiconductor fabrication plants in Taiwan or the far-reaching electric vehicle supply chain, use resources wastefully, the impact reverberates worldwide. Addressing sustainability throughout these global supply chains is essential for driving meaningful, system-wide change.

Just as in the DM, our research shows companies that effectively manage their carbon emissions, water usage, and waste generation tend to deliver greater shareholder value. As resource scarcity intensifies, the importance of using resources efficiently will increase, and the gap will widen between companies that are sustainability leaders, and those that lag behind. This dynamic is particularly critical in the EM, which already shoulder a disproportionate share of climate impacts and are less equipped to cope with the challenges ahead.

For investors, the opportunity is twofold: potential for stronger returns and real-world impact. EM companies, starting from high emissions baselines, can unlock substantial cost savings and competitive advantages simply by using resources more efficiently both now, and as scarcity increases. Furthermore, the EM's exposure to heavy industry and resource intensive manufacturing processes means each incremental step towards efficiency yields material reductions across carbon, water, and waste. Investors who prioritise sustainability in these regions can drive important real-world progress while positioning their portfolios for growth in a resource-constrained future.

By validating data reliability and taking a highly risk-controlled approach to portfolio construction, we hope to encourage greater capital flows into sustainability-focused EM investments. This goal aligns with our broader mission: to show that sustainability can be a strong driver of financial returns.

If you have any questions regarding anything you read in these Emerging Markets Insights or would like more information on our range of EM products. I would be delighted to hear from you.

Best regards,

Jamie Padkin, CFA
Head of Emerging Markets Research

osmosis
INVESTMENT MANAGEMENT

Emerging Markets Insights: Regulatory Rigour & the Rapid Growth of Environmental Disclosure

December 2024

Regulatory Rigour & the Rapid Growth of Environmental Disclosure

Key takeaways

- Climate change, coupled with increasing environmental degradation, is prompting regulators in emerging markets to swiftly implement sustainability reporting mandates.
- Contrary to perception, some emerging market jurisdictions have sustainability disclosure requirements that are more advanced than their developed market peers.
- China and India, once struggling with lower environmental disclosure rates, have now enacted legislation mandating the release of material environmental information.
- Certain historical and regional contexts, such as those in Taiwan, Brazil and South Korea have led to high environmental disclosure rates without regulatory mandates.

Figure 1: Source: Osmosis IM, November 2024

Emerging markets (EM) environmental disclosure regulations are exceeding expectations.

Historically, EM environmental data was perceived as lacking transparency and regulatory rigour. However, Osmosis research demonstrates that in some EM regions, environmental disclosure mandates are more robust than certain developed market counterparts, like the USA.

Recognising that climate-related risks can significantly impact a company's operations and bottom line, EM regulators have acted to swiftly implement sustainability disclosure requirements. These mandates push companies to measure and transparently disclose their environmental impact. While global environmental reporting standards originated in developed markets, it's notable that countries like South Africa were pioneers; the Johannesburg Stock Exchange led the way with mandatory environmental data disclosure in the form of integrated reporting as early as 2010.

Figure 1 highlights the growing coverage of climate disclosure mandates across EM, with many key countries and regulators significantly enhancing their ESG transparency efforts. Countries like India and Malaysia have already implemented mandatory environmental reporting requirements, while others, including China and South Korea, have adopted mandates that will be implemented in upcoming years.

Regulation has rapidly improved disclosure in India

Thanks to mandatory environmental disclosure requirements, India has caught up to and in some cases, overtaken its EM peers. The Securities and Exchange Board of India (SEBI) now requires the top 1,000 listed companies to disclose ESG data in a standardised format, enabling easier environmental performance comparison.

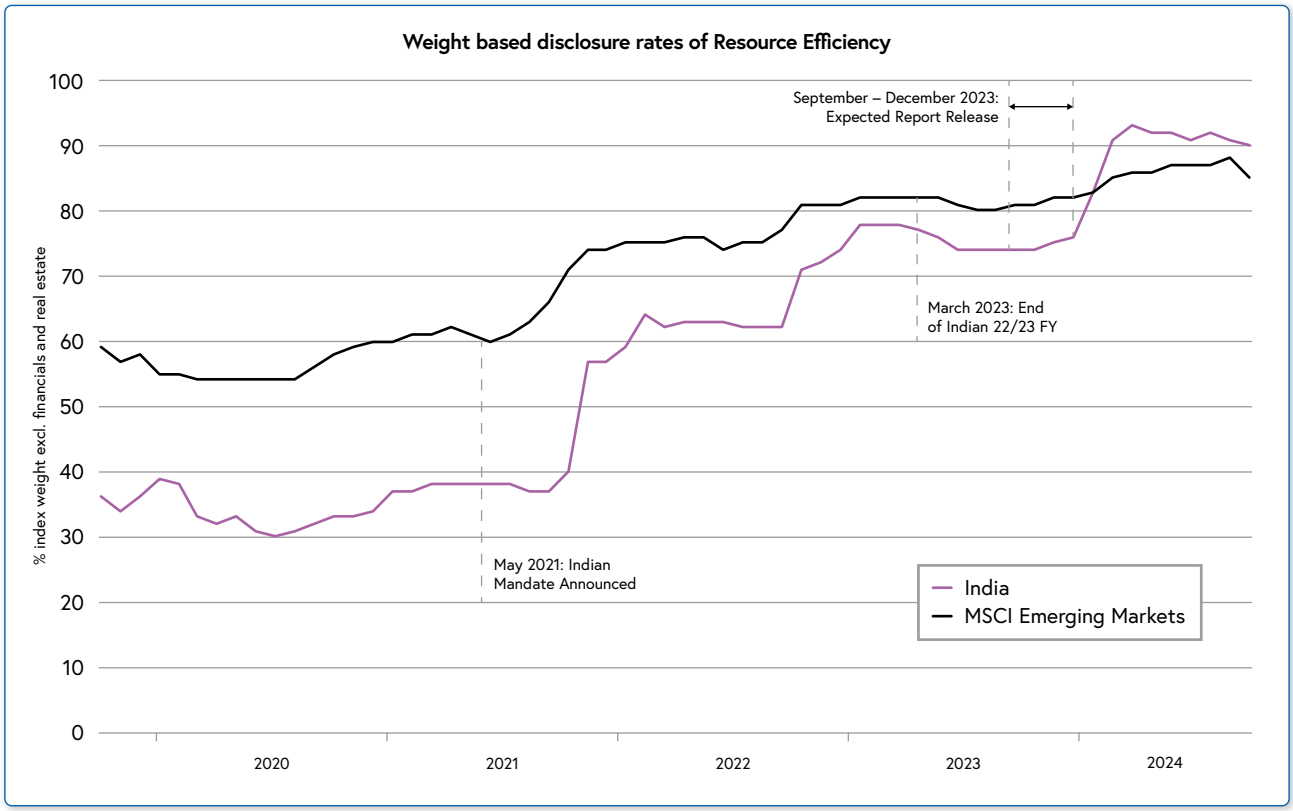


Figure 2: Source: Osmosis IM, September 2024. Disclosure means at least two of three metrics of carbon, water or waste are disclosed

Historically, India has lagged behind EM countries like Taiwan in both disclosure rates and quality. However, mandatory disclosure, announced in May 2021 and implemented for the 2022-23 financial year, significantly boosted Indian reporting by weight, as illustrated in Figure 2.

Figure 2 compares Indian companies disclosing data on at least two of Osmosis' environmental metrics- carbon emissions, water withdrawal and waste generation- against overall EM rates. To receive a Resource Efficiency (RE) score and an active portfolio weight, entities must disclose at least two of these metrics.

Historically, India lagged from a water and waste disclosure perspective, but weight-based rates rose ~50% between 2020 and mid-2024, overtaking the overall MSCI EM rates in early 2024. India has now surpassed the overall EM weighted disclosure rate, in full RE reporting and across all three environmental metrics. While SEBI states non-compliance may result in penalties and fines, full weighted disclosure is yet to be achieved but is expected to improve as regulations become stricter.

Could this trend be replicated in China?

As Chinese regulators have announced new climate disclosure requirements, we expect to see an upward trend in Chinese reporting rates, similar to what has been observed in India. Since 2018, Chinese companies have been encouraged, but not required, to disclose ESG information. Any environmental data provided by Chinese firms also primarily focused on air and water pollutants, rather than emissions, waste generation, and water withdrawal, restricting environmental comparisons with entities in other markets.

However, Chinese disclosure rates have significantly increased in recent years, driven by, and in preparation for, the introduction of new mandatory reporting requirements. In February 2024, the three main stock exchanges in mainland China announced that large listed companies would be required to disclose ESG information aligned with global markets starting in 2026. Whilst disclosure rates have been generally low for Chinese companies, there were exceptions. Many publicly traded Chinese firms opted to list as H-shares on the Hong Kong Stock Exchange (HKEX) to attract foreign investment. Since 2016, the HKEX has required listed companies to publish annual ESG reports with specified mandatory disclosures. We expect to see Chinese disclosure continue to rise in line with this new legislation.

But legislation is not the only factor increasing disclosure rates

In some countries, companies have disclosed pre-regulation. Taiwan mandated disclosure in 2022, requiring listed companies to disclose ESG metrics annually. However, high reporting rates amongst Taiwanese entities were common prior to the legislation even being announced. Figure 3 below illustrates Taiwan's weight-based disclosure rate of over 90% since early 2020. High standards of reporting, in both quality and rates, have long been common in Taiwan due to market best practice of adhering to globally recognized sustainability frameworks, such as the GRI, SASB, and TCFD.

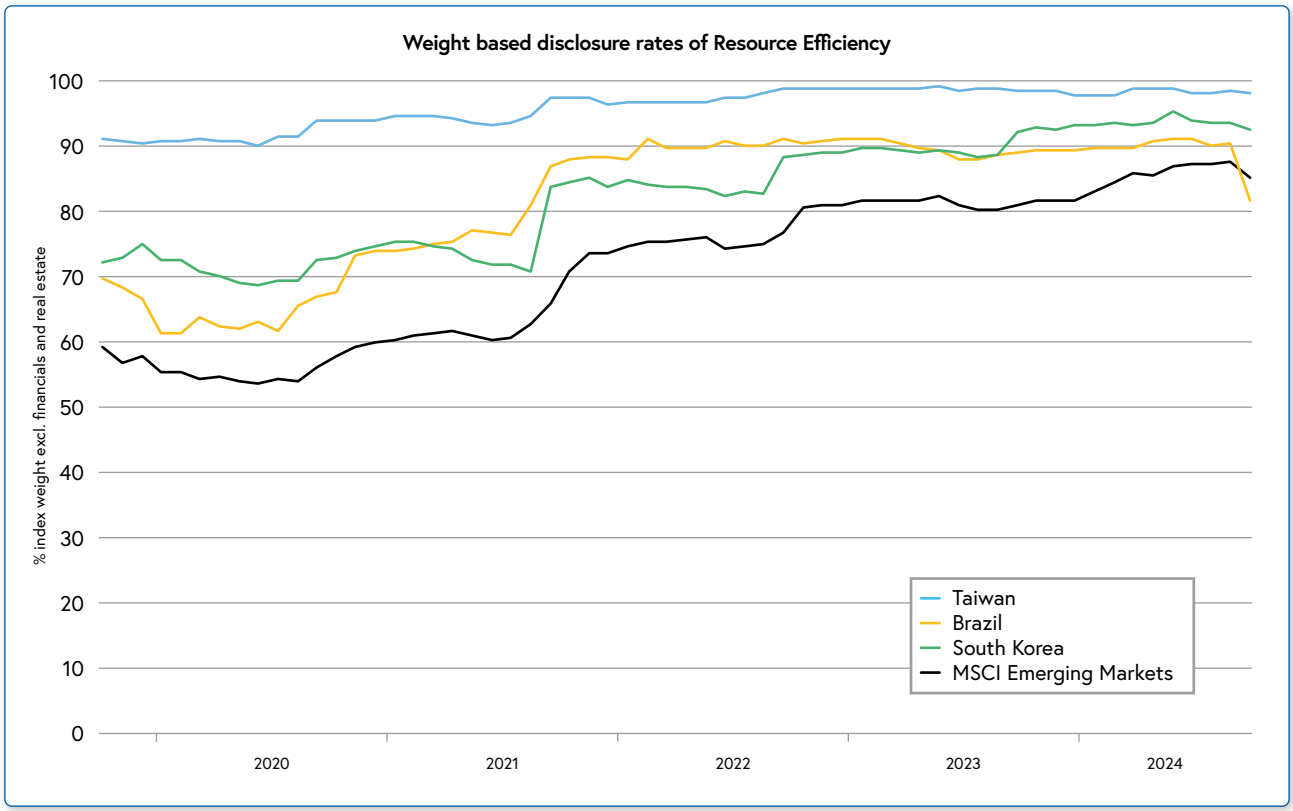


Figure 3: Source: Osmosis IM, September 2024. Disclosure means at least two of three metrics of carbon, water or waste are disclosed.

Similarly, Brazil and South Korea have been slower than India to implement disclosure regulations, but already have high reporting rates. Since early 2020, their weighted disclosure rates have consistently outperformed the overall MSCI EM Index, even with disclosure remaining voluntary, illustrated by Figure 3.

Despite this, regulations have recently passed in both countries that will be implemented in upcoming years. In South Korea, mandatory ESG disclosure will be introduced by the end of year 2025 for all entities on Korea Composite Stock Price Index with assets over two trillion Korean won and all remaining listed entities by 2030. In Brazil, entities will be required to provide annual sustainability and climate disclosures, starting January 2026, and the Brazilian Securities and Exchange Commission recommends that entities follow the new International Sustainability Standards Board (ISSB) disclosure standards.

Across both markets some regions have some catching up to do.

Despite progress in environmental disclosure across EM, regions like the Middle East lag, mirroring recent trends in certain developed market regions. The UAE is the only EM country in the Middle East to have implemented any level of mandatory sustainability report, and even then it is limited. The UAE's neighbours Qatar, Saudia Arabia and Kuwait are even further behind, having only issued sustainability reporting guidelines without any mandatory requirements. Whilst Qatar's primary stock exchange announced that reporting material ESG metrics will eventually become mandatory, it remains to be seen when this legislation will be adopted.

When evaluating environmental data availability from EM entities, investors must consider the regulatory context of climate disclosure mandates and compare them with those in developed markets. It is important to remember that developed countries, particularly the U.S., have faced significant challenges in implementing such regulations. For instance, the climate disclosure rules proposed by the SEC in early 2022 were only adopted at the start of this year, and had to be significantly scaled back, covering only Scope 1 and 2 emissions for certain entities. This more lenient approach contrasts with the recommendations of globally recognized frameworks and is a far cry from the original, more prescriptive proposal, which still did not encompass broader environmental issues such as waste and water.

Emerging market disclosure regulations beat some developed countries, but not all.

The EU is undoubtedly the global lead for environmental reporting regulations. Although some developed market countries fall short in regards to environmental disclosure, the strongest framework is the EU's EFRAG Corporate Sustainability Reporting Directive (CSRD). As of November 2024, there are four EU member states with entities in the MSCI EM Index: the Czech Republic, Greece, Hungary and Poland.

Approved in November 2022, the new EU CSRD has a greater reporting scope than other frameworks. It encompasses 10 sustainability topics, such as climate change, water & marine resources, and biodiversity and covers over 1,000 data points, where material, on a comply or explain basis. Furthermore, the EU standards also demonstrate a significant advancement in the scope of covered entities, with certain EU and non- EU organizations required to report under the framework or face significant penalties and fines.

A positive outlook, and not finished yet.

The advanced nature of these EM regulations may reflect the recognition by local regulators of both the climate risks and the opportunities tied to foreign investment. Given the already rapid increase in climate disclosures in these markets, it will be exciting to see the efficacy of upcoming mandates in China, South Korea and Brazil and how the global regulatory landscape continues to evolve.

Emerging Markets Insights: Emerging & Developed Sustainability Disclosure Rates Have Reached Parity

December 2024

Now on Equal Footing: Emerging & Developed Sustainability Disclosure Rates Have Reached Parity

Key takeaways

- Environmental disclosure in the MSCI Emerging Markets index has caught up to the MSCI World
- Disclosure rates in the EM are growing at a faster rate than their DM peers
- LATAM and APAC ex. China are leading the green transparency charge in the EM
- In 15 sectors, we see equal or higher disclosure rates in the EM than the DM
- Larger EM companies tend to disclose better than smaller companies
- China is no longer a laggard and now rivals the United States in disclosure

NB: Figures referred to throughout this piece are Market Capitalisation weighted and data is as of December 2024, unless specified otherwise. Developed Markets (DM) refers to the MSCI World, and Emerging Markets (EM) refers to the MSCI EM (Emerging Markets).

Emerging market disclosure rates are on par with the developed markets

Over the last 5 years, emerging markets have experienced a remarkable transformation, now surpassing the environmental reporting rates of developed markets. Less than a decade ago, only a few emerging market companies disclosed environmental data.

92% of companies in the MSCI Emerging Markets Index are now considered to be "disclosing", meaning they report on at least two of the three environmental metrics Osmosis considers – carbon emissions, water withdrawal, and waste generation.

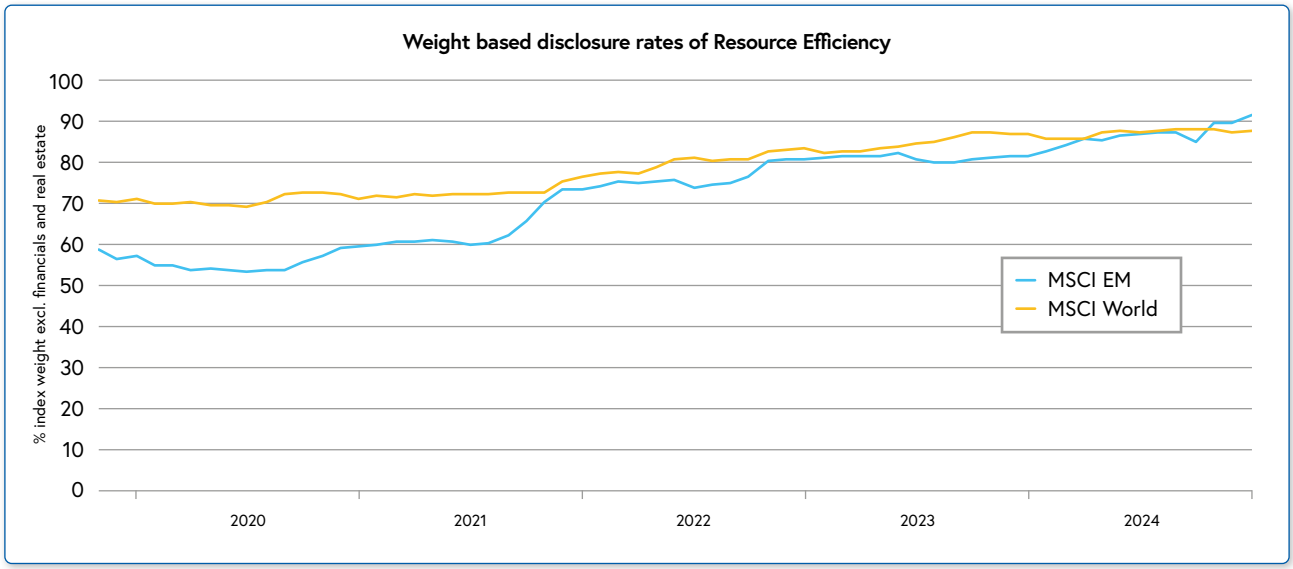


Figure 1: Source: Osmosis IM, December 2024. Disclosure means at least two of three metrics of carbon, water or waste are disclosed.

What's more, EM environmental disclosure is increasing faster than in the DM. Over the past five years the EM has seen disclosure rates of carbon emissions, water withdrawal, and waste generation rise by roughly 30%. This impressive growth, albeit from a lower baseline, is double the rate seen in the DM. EM disclosure rates across all three environmental performance indicators now sit between 88-92%. Further, the EM now has a higher rate of water and waste disclosure than we see in the DM.

Strong sectoral disclosure rates

In 15 out of 31 sectors, EM disclosure rates are either on par or better than those in the DM. Only one sector has a disclosure rate lower than 50%. In the EM sectors that lag, we don't see clear sector intensity patterns. Both asset-intensive and asset-light sectors appear among those that have achieved similar disclosure levels to the DM.

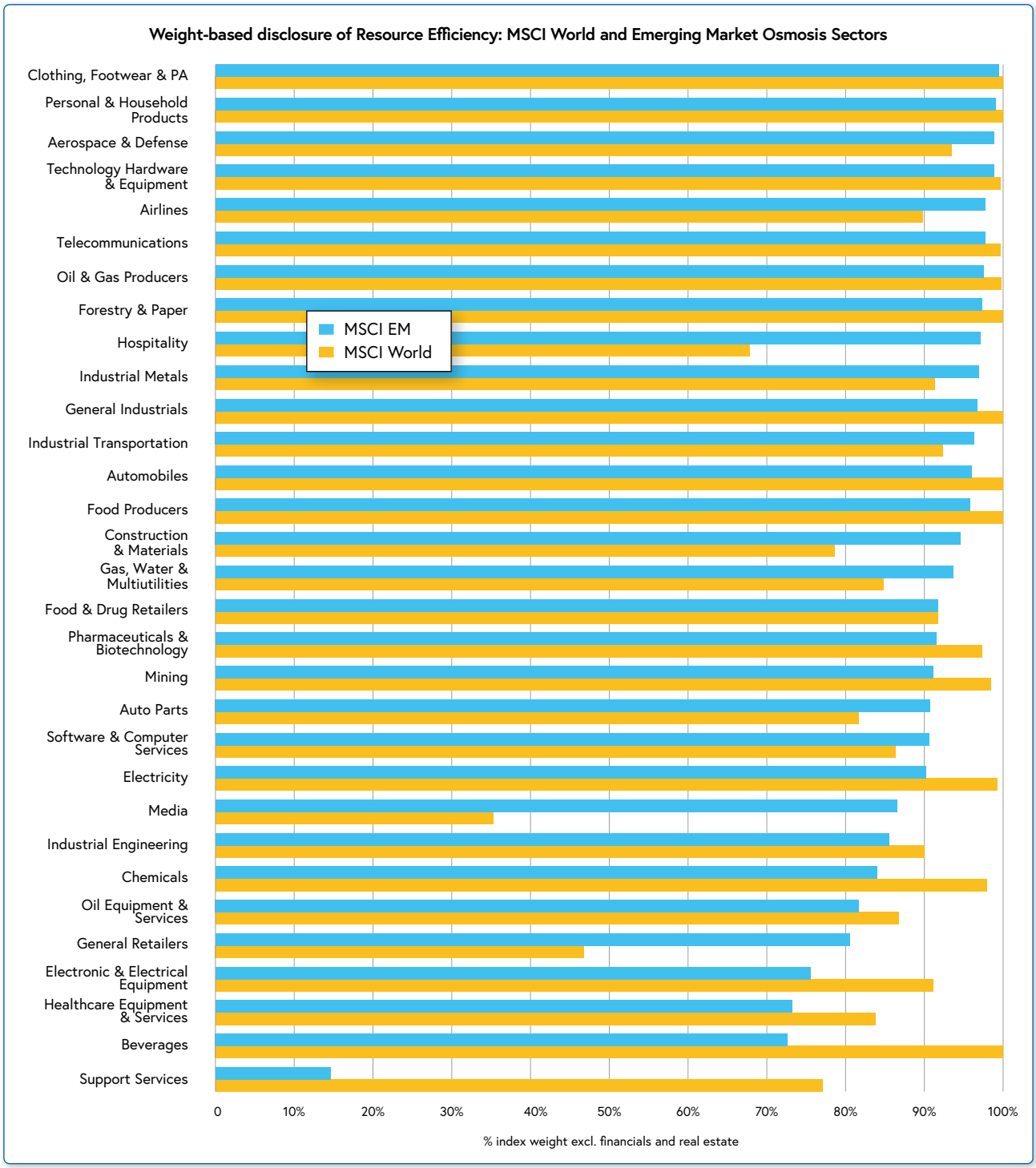


Figure 2: Source: Osmosis IM, December 2024. Disclosure means at least two of three metrics of carbon, water or waste are disclosed.

Strong disclosures globally, led by LATAM and APAC ex. China

Taiwan, South Korea, India and Brazil are leaders in global environmental disclosure growth. These countries are some of the largest constituents of the index and have all reached strong levels of disclosure. India's disclosure growth is particularly noteworthy, almost tripling over the last five years. Environmental data from these countries tends to be structured and granular, which increases our confidence in its accuracy and reliability, and in Brazil and South Korea we see strong adherence to internationally recognised frameworks. One of the contributing factors to the quality and level of disclosure is the presence of governmental and bourse-mandated environmental disclosure regulations in EM countries, which are often more rigorous than their DM counterparts.

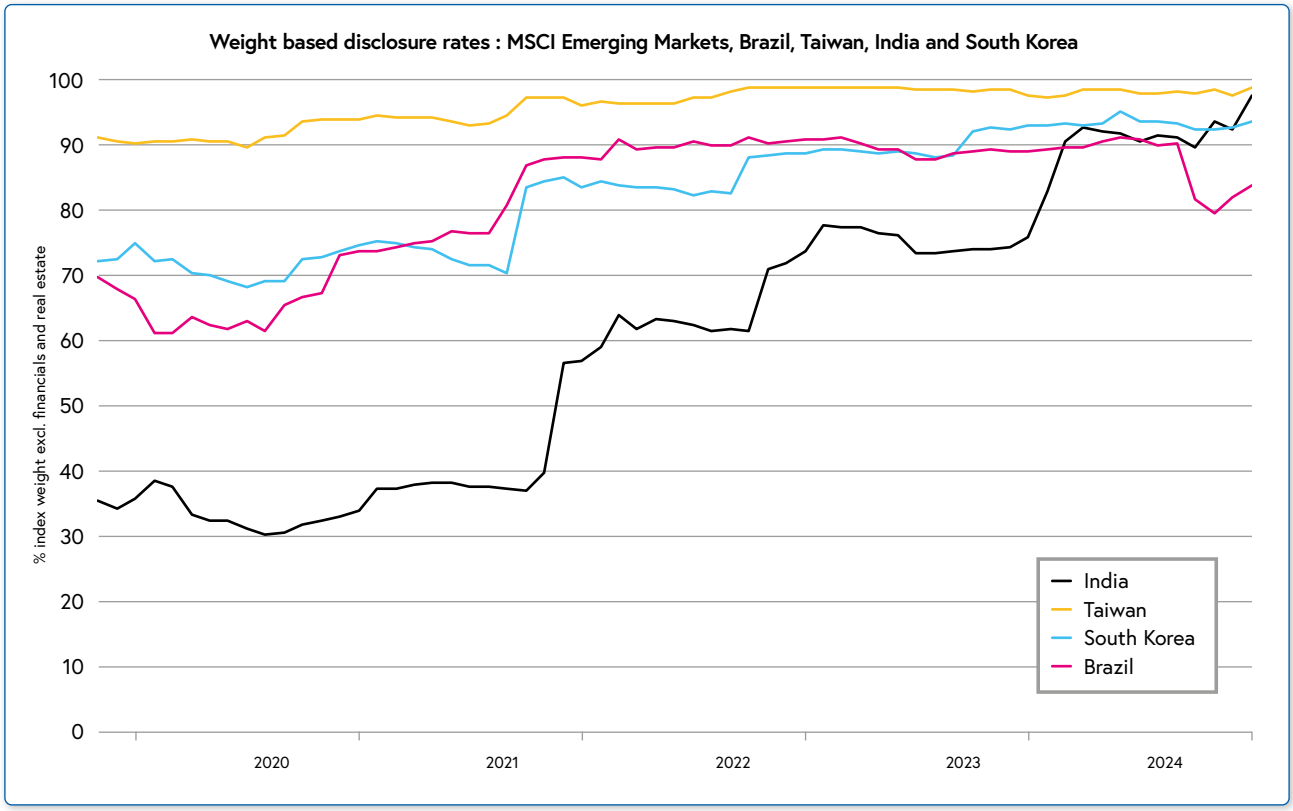


Figure 3: Source: Osmosis, 2025. NB: Brazil's decline in disclosure in September 2024 was caused by index reconstitution involving a large non-disclosing inclusion alongside smaller disclosing exclusions. Disclosure means at least two of three metrics of carbon, water or waste are disclosed.

Large disclosure growth observed on a country-basis

Many EM countries have caught up with their DM counterparts over the past five years. In total, 15 countries have achieved 100% disclosure, seven of which are in the EM. The countries with the largest growth in disclosure over the period tend to be in EM, which can be seen by the differences in disclosure rates between EM countries in the two figures below. Countries that have reached 100% disclosure in the last five years include Chile, Colombia, the Philippines and Peru. Notably, Colombia achieved this milestone without any mandatory ESG requirements.

Despite initially being a regulatory leader, South Africa now has the lowest EM disclosure rate at just above 60%. Nonetheless, it is encouraging that all countries now have disclosure rates exceeding 60%.

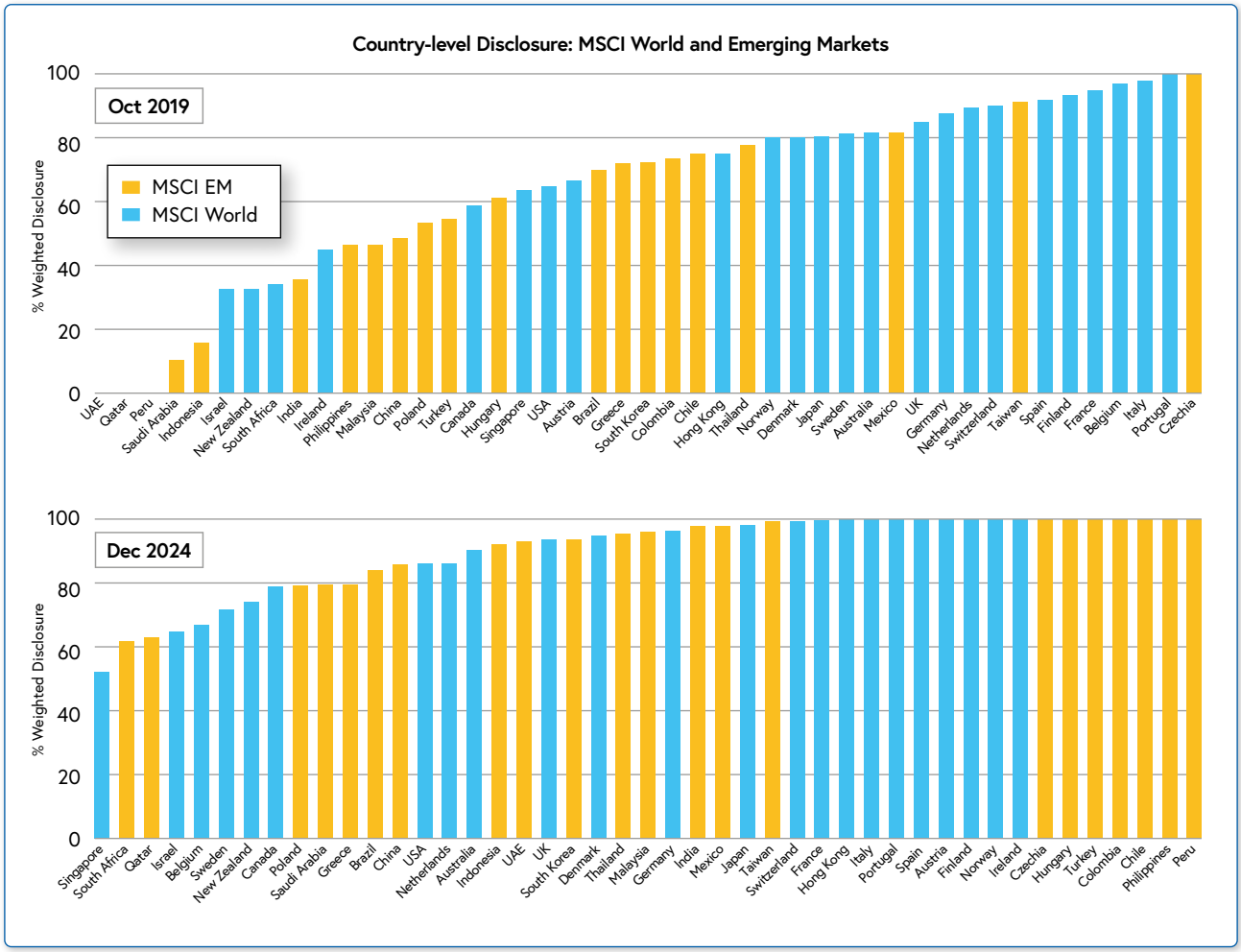


Figure 4: Source: Osmosis IM, December 2024. Disclosure means at least two of three metrics of carbon, water or waste are disclosed.

EM disclosure is correlated with company size

A positive relationship between company size and disclosure status is observed. In the DM, disclosure rates are largely consistent across the index regardless of company size, reflecting a broader commitment to transparency. In contrast, EM environmental disclosure is more related to market capitalisation; larger companies tend to disclose environmental information. For the largest third of companies we see a disclosure rate above 90%, for the middle third roughly 80%, and for the smallest third of companies this is closer to 50%. One explanation for this is that disclosure regulations are often introduced for the largest companies first.

China's environmental disclosure is now on par with the United States

China, the largest EM economy, has historically been a significant laggard with regard to environmental disclosure. This has changed over the last five years following impressive year-on-year growth in disclosure. As of December 2024, China's disclosure rate reached 86% which puts it on par with its DM counterpart, the United States. China announced in 2024 that large-cap companies traded on its Shanghai and Shenzhen exchanges are required to disclose environmental data by 2026, which we anticipate will further bolster disclosure rates.

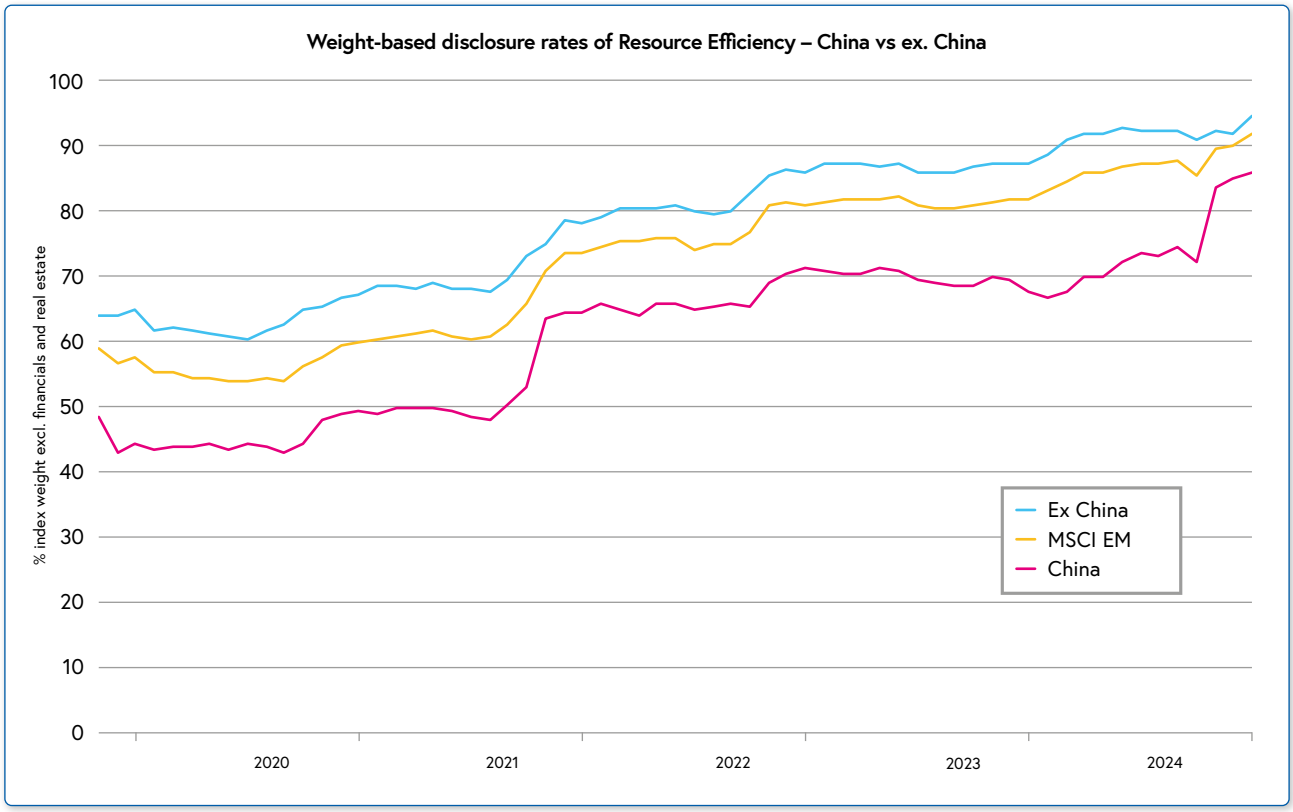


Figure 5: Source: Osmosis IM, December 2024. Disclosure means at least two of three metrics of carbon, water or waste are disclosed.

Looking ahead

We are encouraged by strong growth in EM disclosure rates, which recently overtook the MSCI World. We anticipate continued growth in the EM, particularly in the smaller companies within the Index. Strong regulatory tailwinds are a contributing factor to this trend, and there are still regulations that are yet to come into force (see Regulatory Rigour and the Rapid Growth of Environmental Disclosure for more details). Another contributing factor is engagement efforts from investors, and we continue to engage to improve both the quality and quantity of data disclosed. The higher quantity of data we have, and the better quality the data is, the more effectively we can make corporate sustainability comparisons, and the better we can deploy our Model of Resource Efficiency (MoRE).

Emerging Markets Insights: Strengthening Data through Engagement

December 2024

Strengthening Data through Engagement

The mutually beneficial outcome between investors and investees through engagement efforts should not be underestimated. Stewardship is therefore embedded into Osmosis' investment strategy, and is guided and supported by an active engagement programme. Osmosis finds that investors' engagement efforts can greatly contribute to an improvement in the quality of data disclosed by companies and is a key element of long-term value creation.

Key takeaways

- **Engagement efforts**. In 2024, Osmosis engaged with 315 emerging market companies for the clarification and refinement of their disclosed data, promoting better sustainability reporting and to address specific issues through collaboration.
- **Engagement and data quality**. Sustainability reporting mandates increase disclosure levels, but we find that direct engagement plays a vital role in the quality of environmental data disclosed.
- **Measurement and continuous development of engagement strategy**. To achieve an effective engagement, measurement is necessary. Osmosis is continuously reviewing its engagement strategies, aiming to enhance the success of individual and collective forms of investor dialogue.

How does Osmosis define engagement?

At Osmosis, active engagement serves as one of the three core pillars of our investment philosophy. As a sustainable investment manager, we believe our responsibility extends beyond just delivering financial returns to our clients. We are therefore committed to fostering well-functioning markets by promoting sustainable corporate practices, and engagement is one of the key methods we employ to achieve this goal.

Given the importance of corporate environmental data in our investment approach, our primary engagement focus is to enhance transparency in non-financial disclosures. Over the past two years, as part of our in-depth research into Emerging Market (EM) data, we have been evaluating entities' sustainability metrics and encouraging companies in these markets to adopt more comprehensive and comparable sustainability reporting. We believe that companies that disclose their environmental footprint are more likely to take proactive steps to measure, manage, and reduce their impact. As such, our engagement goals in EM centre on improving the clarity and quality of data collection in order to advance corporate sustainability reporting practices, through both individual and collaborative engagement practices. Outside of this, we are also involved in engagement campaigns on broader ESG issues.

Are engagement efforts leading to better data quality?

Within a dynamic and evolving regulatory landscape, engagement can help improve data quality over time. Osmosis finds engagement with EM entities to be especially important given that environmental reporting practices are less established in some countries. On the whole, however, we have been impressed with corporate efforts to upgrade disclosure transparency and standardise their reporting methods, thereby ensuring data quality. This was evidenced through different constructive dialogues with corporates during the year; see case studies below.

Case study: Strengthening reporting

Issue:

A South Korean company from the automobiles sector disclosed inconsistent water metrics in its 2024 Sustainability Report. The total sum of tap water and groundwater withdrawals did not add up to total water withdrawals in 2023 and was not comparable to previous reporting years. This also made the data incomparable to its peers and therefore not fit for use in portfolio construction.

Outcomes and next steps:

The company highlighted to us that while it has historically provided figures separated by water sources, 2024's data was aggregated due to changes in its internal data management standards. Upon reviewing our suggestions, the firm has agreed to revert to the previous standardised reporting method for clarity. The outcomes of this engagement will be reflected in the next reporting period.

Case study: Data clarification and refinement

Issue:

We reached out to a Chinese company from the electronic and electrical equipment sector regarding water management metrics. The firm did not disclose water intake by water source; therefore, we asked if they could provide us with the breakdown by water source to take granular values for our model.

Outcomes and next steps:

The company explained that all water extraction comes from a single source: municipal water. It also confirmed that this detail will be clarified in future sustainability reports. Outcomes of this engagement will be reflected in the next reporting period.

Increased scrutiny allows investors to make more informed investment decisions

Osmosis believes that increased scrutiny of corporate reporting can lead to better data quality. Our team of environmental researchers offer extensive expertise, ensuring a deep understanding of corporate environmental disclosures and enabling us to identify both errors and gaps in the data. After identifying errors we reach out directly to companies, generally leading to productive conversations and the subsequent correction of reporting errors. Such dialogue improves the data quality that we feed into our Model of Resource Efficiency (MoRE), ensuring our investment decisions are conducted on high quality information, as well as encouraging best disclosure practices in the market.

It is vital that we feel confident with the accuracy and robustness of the data held in our model. Therefore, before launching our Emerging Markets Strategy, we focused on issues that presented themselves during the validation process, corporate engagement and subsequently on data refining. Some of the issues encountered included organisational and operational boundary reporting, definitions of key environmental performance indicators, data increase and/or decrease over time, reports missing, business models, time-lag data, and lack of granularity in the data disclosed. If we find that a particular company's data does not fit industry trends, it becomes part of an active and ongoing engagement process to sustain the accuracy and consistency of our model, MoRE.

Case study: Carbon data clarification

Issue:

A Chinese company from the electronic and electrical equipment sector has stopped disclosing emissions by scopes (location and market-based) in its 2023 Environmental, Social and Governance Report. We reached out to them trying to understand the reason why they stopped disclosing granularly by scopes, since in the previous 2022 ESG Report it was included.

Outcomes and next steps:

The company clarified to us that the change was due to the implementation of new processes to strengthen its verification and certification of greenhouse gas emissions in that year. The company had engaged with a third-party certification body to verify their emissions data for the past three years. This further improved the scope of the company's greenhouse gas inventory and standardised its calculation methods, as they work to rely on verified data and set more scientific carbon targets and pathways.

Outcomes achieved through engagement

Osmosis is increasing its regional, geographical and sectoral engagement efforts. Our engagement process is not run on a strategy or product level, we involve all entities of the MSCI Emerging Markets Index in our programmes.

In 2024, our environmental research team engaged with a total of 315 companies from the EM. 82% of our engagement effort was directed to the Asia-Pacific region, followed by EMEA and the Americas, shown in Figure 1. We contacted corporates from 21 countries out of the 24 countries from the Index. China, India, South Korea and Taiwan stand out as main countries for our engagement efforts as shown in the Figure 1, reflecting their importance within the Index by count and weight.

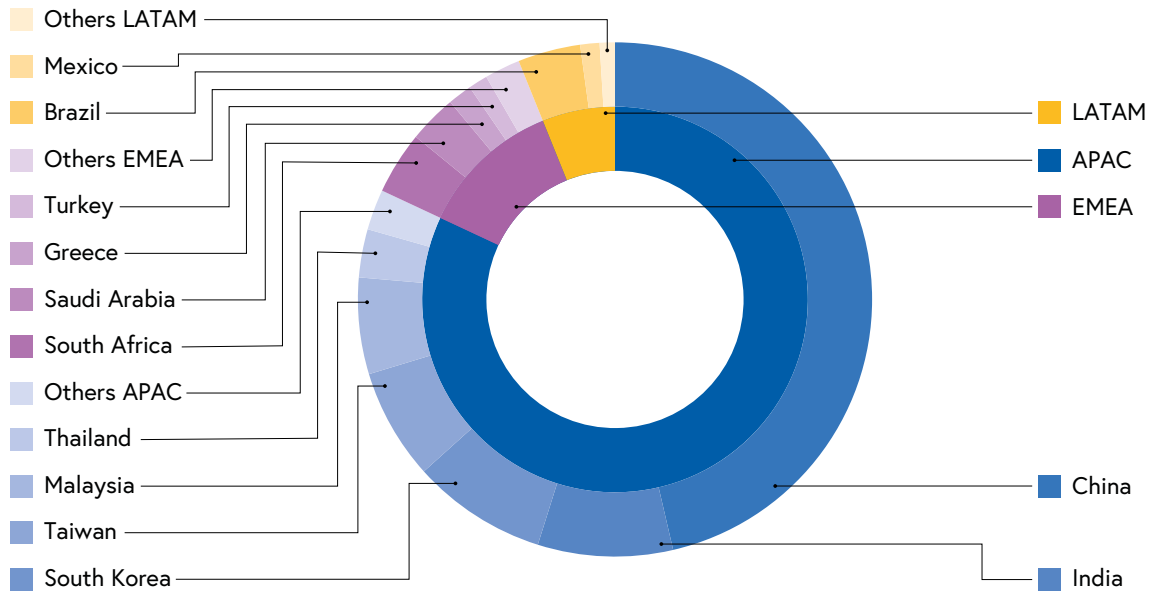


Figure 1. Geographical engagement efforts. Data as at end December 2024.

Our whole economy approach means that we engage with entities across all GICS sectors except for financials and REITs, as illustrated in Figure 2 below. The materials, consumer discretionary, energy, and industrial GICS sectors had the highest number of engagements as of the end of December 2024. This is notable due to these sectors being 'heavier', in general emitting high levels of carbon and consuming high quantities of water in their operations, of particular relevance in the construction & materials and chemicals Osmosis sectors (sitting within GICS materials). The consumer discretionary GICS sector generates particularly high quantities of waste, largely driven by contributions from the beverages Osmosis sector.

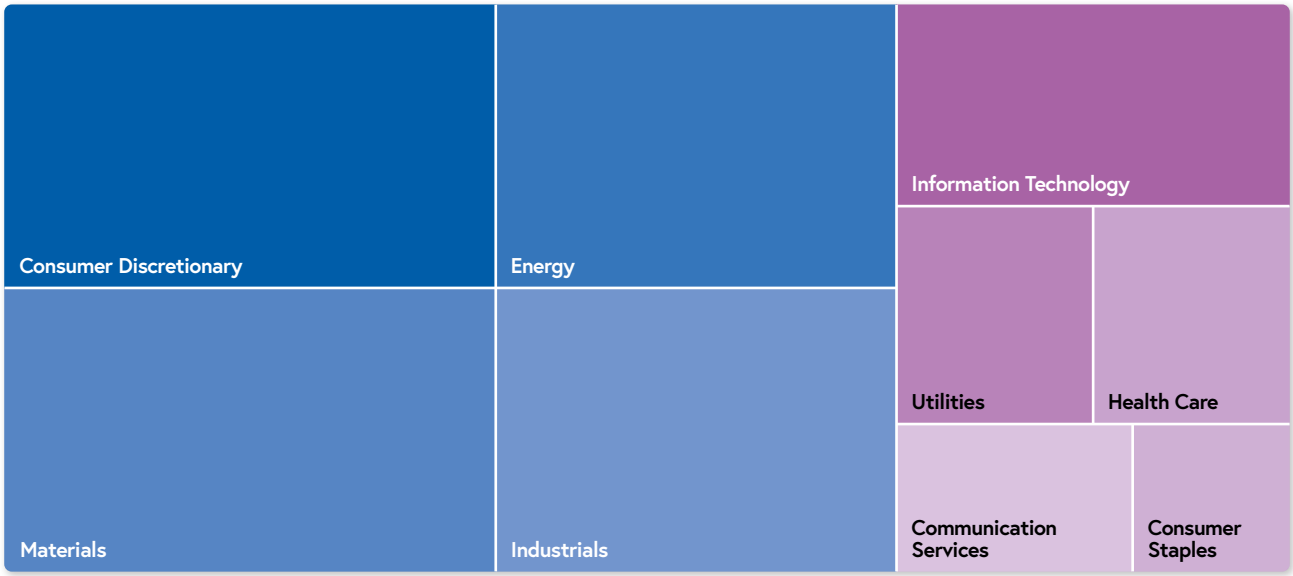


Figure 2: Sectoral engagement efforts. Data as at end December 2024.

The power of joining forces to achieve meaningful impact

Osmosis works in collaboration with key organisations in the responsible investment community. The United Nations Principles of Responsible Investment, Climate Action 100+, the Carbon Disclosure Project and the Oxford Martin Principles are some of the campaigns we actively cooperate with in both developed and emerging markets. Our joint objectives include:

- Supporting a global network of investor signatories in incorporating ESG factors into investment decisions;
- Climate-conscious engagement with highly polluting sectors;
- Ensuring the largest corporate carbon emitters take required action on climate change;
- Incentivising corporations to disclose their impacts on material environmental topics.

In 2024, as part of the annual CDP Non-Disclosure Campaign, Osmosis, as a lead investor, engaged with a total of 11 companies from the EM: five companies from China, four from South Korea, two from India. The campaign targeted high impact companies that failed to disclose information regarding environmental issues in previous years and invited signatories to directly engage with companies to obtain relevant climate, water and forest data. **In total, three recipients responded** to the questionnaires that Osmosis sent out. With the data received, the CDP was able to add relevant water and climate data points on several new companies and we were able to inform and update our model.

Osmosis also directly targets decarbonisation within the EM, demonstrated through our engagement with a total of 72 companies for the Oxford Martin Principles program, which ran from January to December 2024 and seeks climate-aware engagement with highly polluting sectors, including oil & gas, industrial metals and mining, as well

as the chemicals sector. We will continue targeting companies within this group, as EM have greater sectoral intensities, partly due to a larger dependence on fossil fuels, and therefore greater potential for environmental footprint savings. We believe that over the longer term, systematically engaging with corporates in highly polluting sectors is a better solution than divesting, and supports the much needed transition to a lower carbon and more sustainable economy.

In December 2024, we launched an investor-driven Non-Disclosure + Campaign to address incomplete and/or inadequate environmental data disclosures at the world's leading corporations. We are planning to launch the same campaign to target the largest companies from the EM that have not previously reported data on either carbon, water or waste.

Our engagement through a thematic lens

Viewing our engagement by theme allows us to identify specific areas of focus. The theme 'water' was one of the main topics of our engagement program this year, as observed in Figure 3 below. Osmosis considers corporate water management to be a material issue for our MoRE, and as a result we seek to improve corporate disclosure of water-related metrics across high-impact industries. In certain sectors, such as tech hardware, where water consumption in data centres has spiked dramatically in the last few years, we have seen an increase in the amount of water required to maintain daily business operations. A holistic view of water impacts by sector is therefore important and allows us to understand how companies define their water withdrawal, water consumption, water usage, water reused/recycled as well as help us identify opportunities and trends within particular industries.

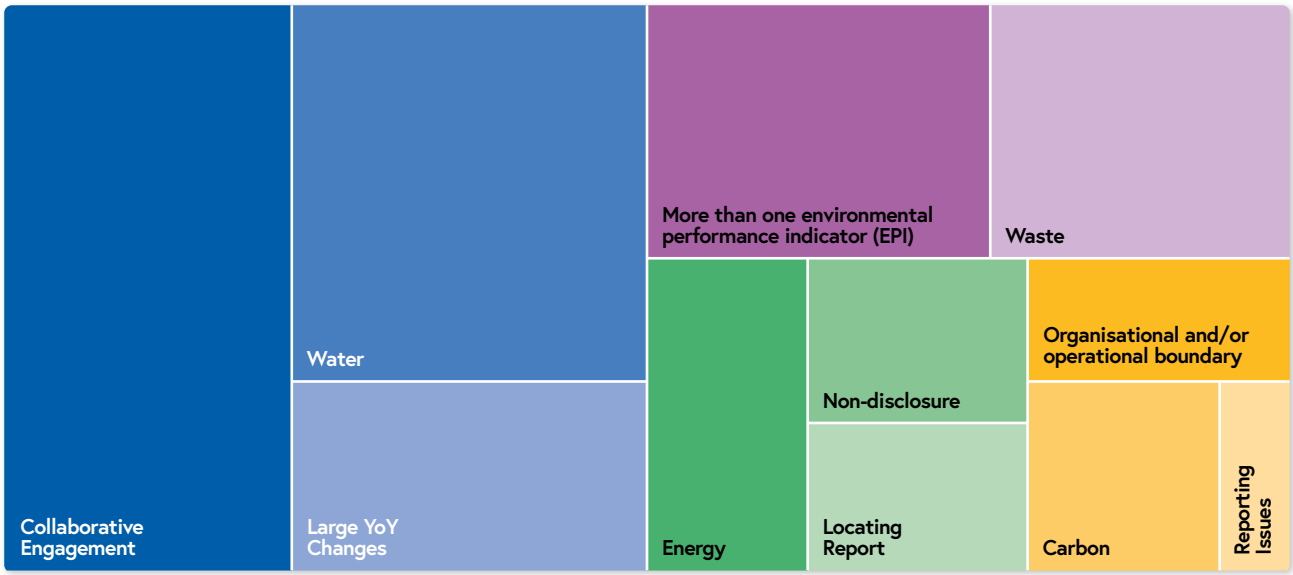


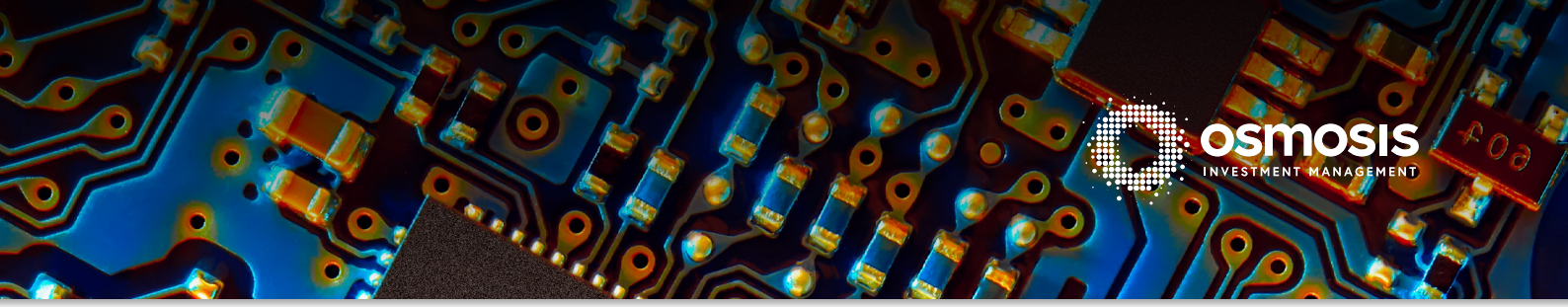
Figure 3: Engagement efforts by themes. Data as at end December 2024.

Leveraging expertise for effective engagement in the EM

Expert knowledge and experience of EM is important for successful engagement. As a firm we continue to work as a team to balance individual, collective and thematic engagements, as well as refine and improve our engagement programme policies, objectives and accountability mechanisms. This approach allows us to prioritise engagement issues in line with our objectives and to measure our progress to effectively deliver engagements across different markets, geographies and economic sectors.

Emerging Markets Insights: Index Overview – Emerging vs Developed Markets

December 2024



A Comparative Analysis of Sectoral and Regional Dominance in Emerging and Developed Markets

Key takeaways

- Both the DM and EM indexes are heavily dominated by a single region: Asia-Pacific (APAC) in Emerging Markets (EM) and North America in Developed Markets (DM).
- Information technology is the leading sector in both EM and DM, reflecting its global influence.
- Although regions outside of APAC in EM and outside of North America in DM account for much less of their respective indexes, they still have distinct sector contributions.
- EM are more concentrated in resource-intensive sectors (e.g., energy, materials), with companies often operating more resource-heavy business models compared to their DM counterparts.

This analysis is based on the weighted contributions to the MSCI Emerging Market and World indexes as of end December 2024. All weightings and insights exclude financials, REITs and tobacco companies.

Geography

The MSCI Emerging Market and MSCI World indexes both contain 23 countries across three regions. In both indexes we see strong heterogeneity in weighted regional exposures.

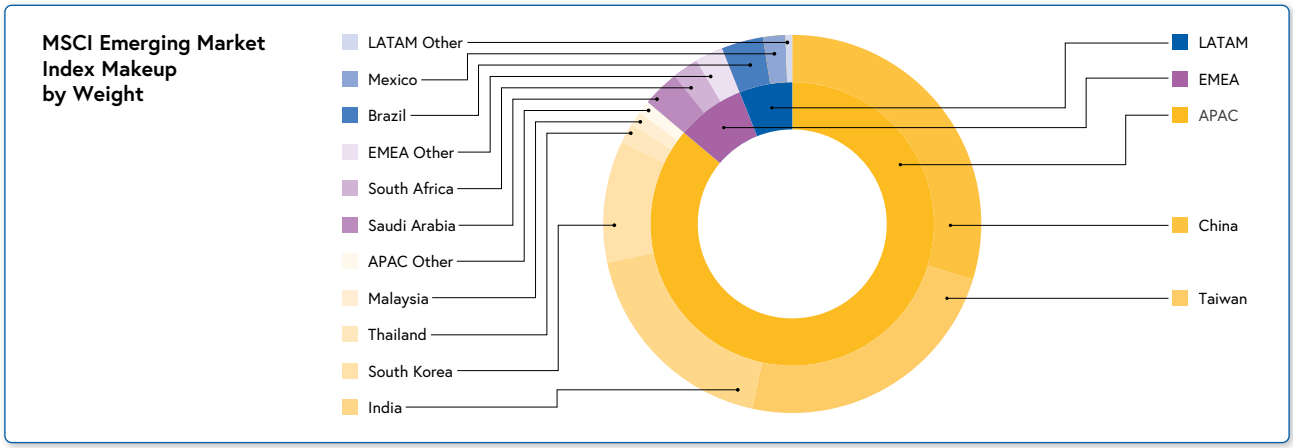
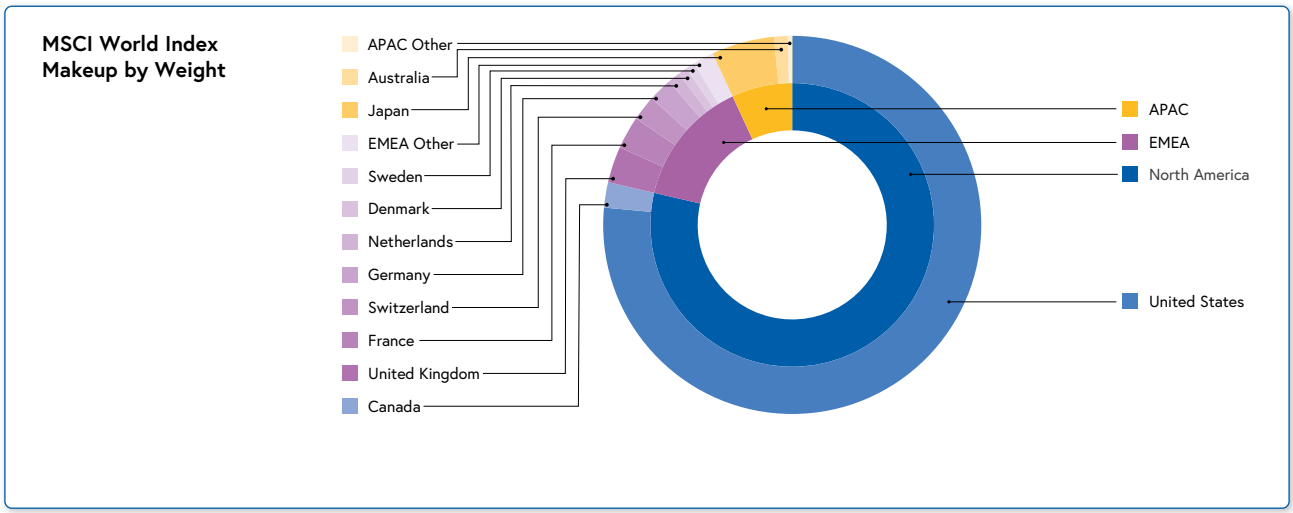


Figure 1: Osmosis IM. Data as at 31 December 2024.



In the EM index, APAC dominates with over 85% of the total weight and in DM, North America accounts for almost 80% of the whole index. The weighted dominance of APAC in the EM index is driven by the significant contributions from China, which accounts for almost one-third of the total weight. Taiwan, India and South Korea follow closely behind, with their combined weights accounting for over half of the whole index.

In contrast, the DM is more heavily skewed towards one country: the U.S., which accounts for over double China's respective contribution. While China leads the EM index, its influence is considerably less than the dominance of the U.S. in the DM index.

GICS and Osmosis sector comparison

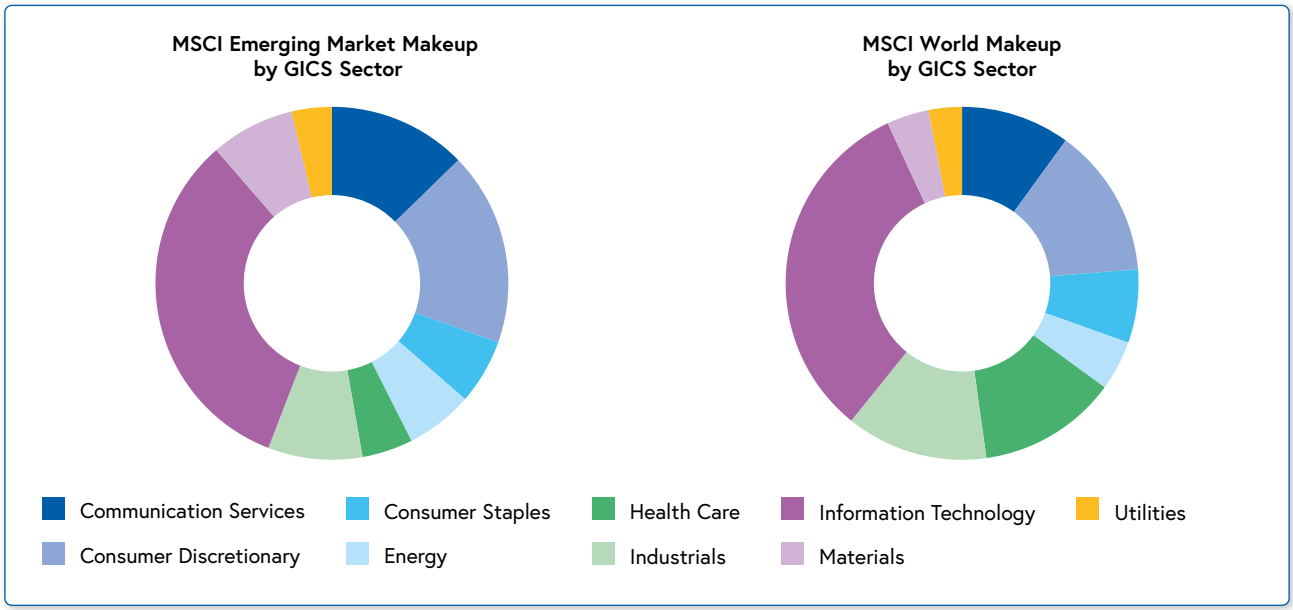


Figure 3: Osmosis IM. Data as at 31 December 2024.

When comparing sectors between EM and DM, it is evident that EM is more concentrated and dominated by specific sectors. The Herfindahl-Hirschman Index (HHI), which measures market concentration and competitiveness, reveals that EM's HHI value is over 1.8 times higher than DM's. There are however notable similarities in which sectors dominate the EM and DM. Under the Global Industry Classification Standard (GICS), both indexes are led by the information technology (IT) sector, comprising over 30%. Notably, utilities is the smallest sector in both EM and DM, with weights in both indexes falling between 3-4%.

From an Osmosis sector classification perspective, of which there are 32 excluding financials and real estate, both indexes also share a similar sector dominance. In EM, technology, hardware and equipment (THE) leads at almost 30% of the index weight, followed by software & computer services and general retailers. Similarly, DM is also led by THE, though lower at less than 20%, with software & computer services and general retailers again being the second and third largest sectors. This comparison highlights the global dominance of the technology sector across both EM and DM.

Within the EM index other significant contributors include more industrial sectors such as automobiles, oil & gas producers, and mining. These heavier sectors account for over 10% of the EM index, almost twice the weight they hold in DM. In contrast, DM has higher allocations in less resource-intensive sectors such as media, hospitality, and support services, representing over two times their contribution in the EM. Overall, EM exhibits a tilt toward heavier industrial Osmosis sectors.

Business model comparison

Additionally, within sectors, EM companies lean towards heavier business models. Within the THE sector, EM companies tend to have more integrated business lines and are often involved in multiple stages of the production process, from design to manufacturing and assembly. These EM THE companies therefore tend to lean more towards resource-intensive and manufacturing activities. In contrast, whilst some DM firms do engage in manufacturing activities, they proportionately lean more towards less-intensive activities such as design, testing and distribution. Furthermore, it is notable that key players within the DM THE sector, such as Apple Inc. and NVIDIA Corp., tend to outsource manufacturing tasks to large EM firms, such as TSMC and Foxconn.

Key differences in business models can also be identified in other sectors, making EM firms more resource-intensive. In the oil & gas producers sector within DM, no companies focus exclusively on coal; however, such firms are present in the EM index. These companies engage in activities such as coal mining, distribution, refining, or integrated operations that combine mining with coal-powered electricity generation. It is unsurprising that such firms are predominantly located in the APAC region given that China, India, and Indonesia were the world's largest coal producers in 2023. Such companies also tend to underperform across all environmental metrics compared to more traditional oil & gas producers.

More intensive EM business models are also seen within Osmosis' construction & materials sector, where there are comparatively higher proportions of cement companies. This is notable because cement production is highly carbon intensive due to the chemical reaction that occurs when limestone is heated, which releases emissions.

GICS and Osmosis sector by region comparison

Whilst both EM and DM indexes are heavily weighted toward IT, EM's concentration is driven by APAC and DM's by North America.

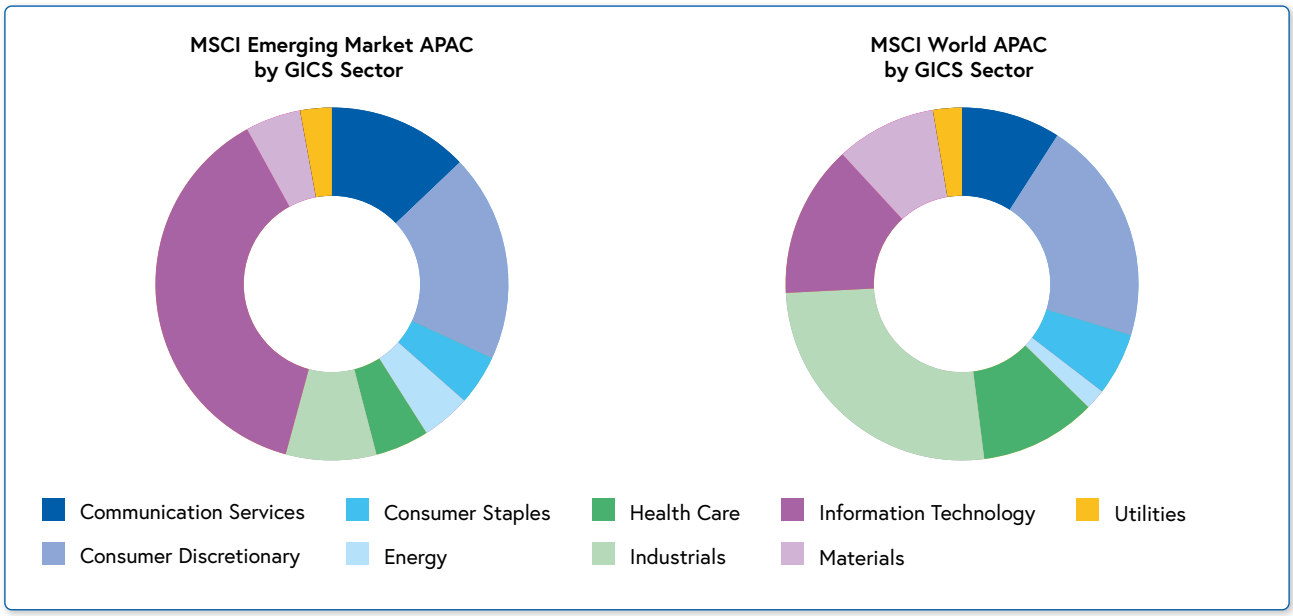


Figure 4: Osmosis IM. Data as at 31 December 2024.

China is the largest single-country contributor to the EM index, led by the communication services and consumer discretionary sectors. Regionally, APAC dominates overall contributions, particularly in IT, which accounts for a third of the EM index. While APAC IT and China are dominant, Taiwan's IT sector contributes more significantly than China's. As a result, when APAC is evaluated excluding China, half of its index contribution comes from IT alone. Likewise, in the DM index, North American IT accounts for nearly 30% of the total index weight, mirroring the influence of APAC IT in the EM index. However this dominance is largely driven by the Index's largest contributor, the U.S.

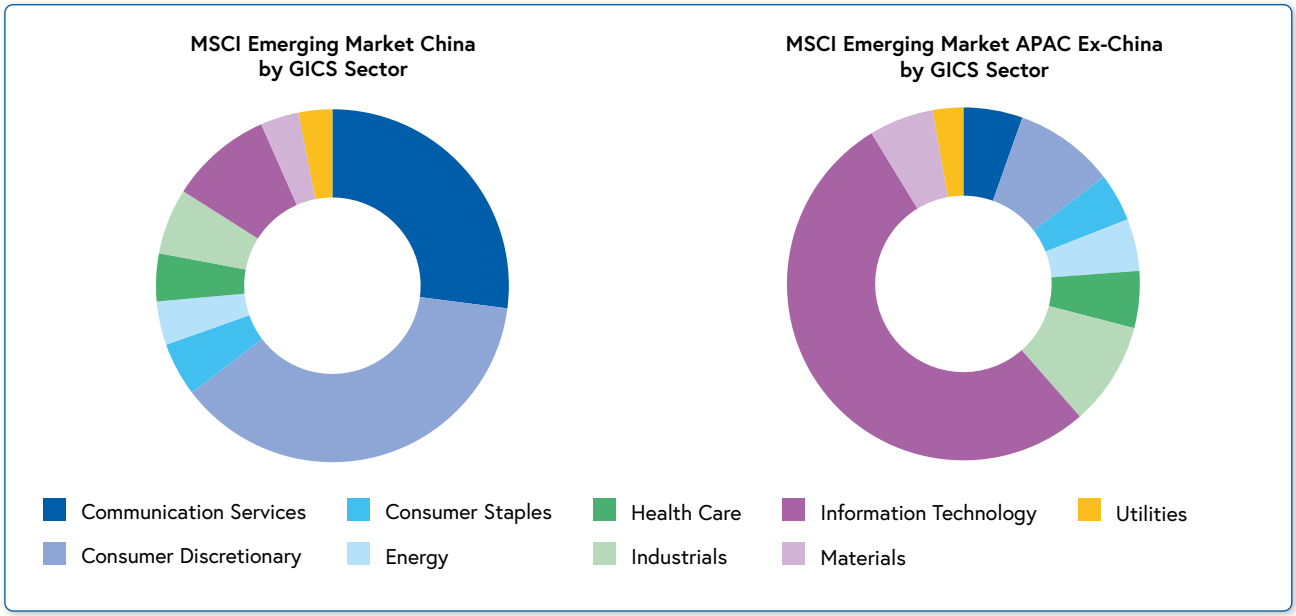
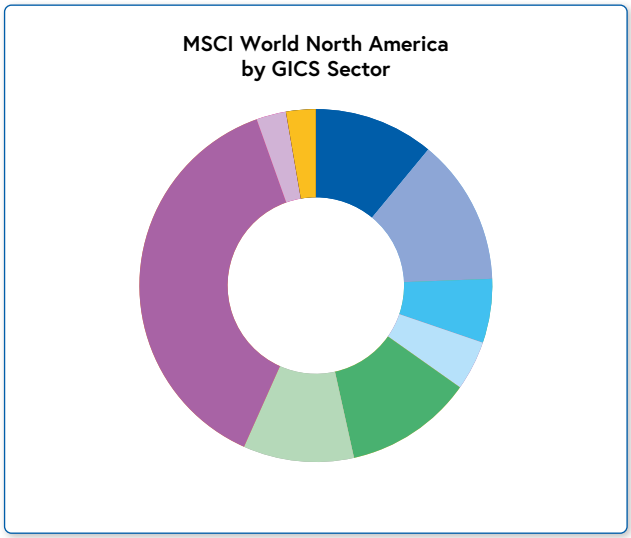


Figure 5: Osmosis IM. Data as at 31 December 2024.

From an Osmosis sector classification perspective, the technological dominance of APAC is also evident, with the entire 28% weight of the THE sector attributable solely to EM APAC companies. In contrast, North America showcases its tech leadership in the DM index, where the combined weight of the software & computer services and THE sectors accounts for over one-third of the index.

Within APAC in both indexes, consumer discretionary accounts for over 15% of the region's weighted contributions. Due to variations in regional weighting, EM APAC's contribution to the EM index is significantly larger than DM APAC's share in the DM index. The dominant sectors also diverge as DM APAC leans more towards the industrial sector. Osmosis classifications mirror this distinction, with EM APAC's strength concentrated in THE, while DM APAC emphasises electronics, electrical equipment, and automobiles.



The EMEA region exhibits more notable differences between DM and EM. In DM, over 40% of EMEA's weighted contributions are led by the industrials and health care sectors, with Osmosis classifications highlighting pharmaceuticals & biotechnology and clothing as key industries. In EM, EMEA's index weight is primarily driven by the materials, and communication services sectors, which make up almost 40% of the region's contribution. Osmosis classifications reinforce this trend, showing that EM EMEA's largest contributions come from mining and oil & gas, indicative of its reliance on resource-intensive industries.

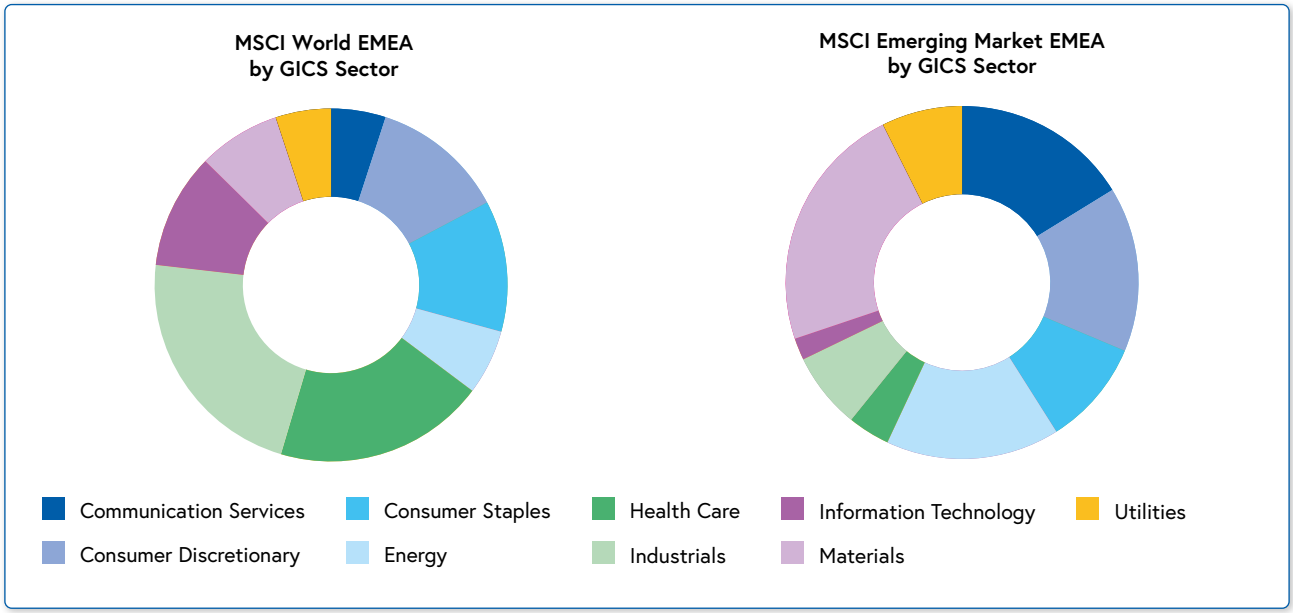
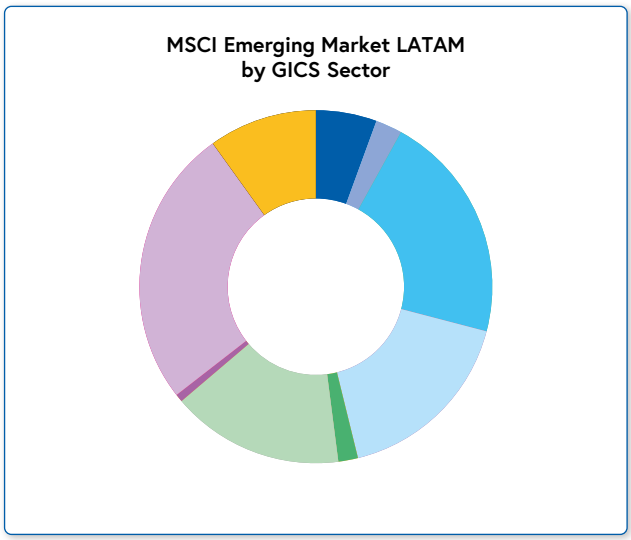


Figure 6: Osmosis IM. Data as at 31 December 2024.

EM LATAM's largest contributions stem from the materials, energy, and consumer staples sectors. Osmosis classifications align with this observation, with mining and oil & gas standing out as the dominant contributors. LATAM's mineral-rich geography plays a critical role in shaping its economic landscape, although its overall impact remains modest compared to the technology-driven weight of APAC.



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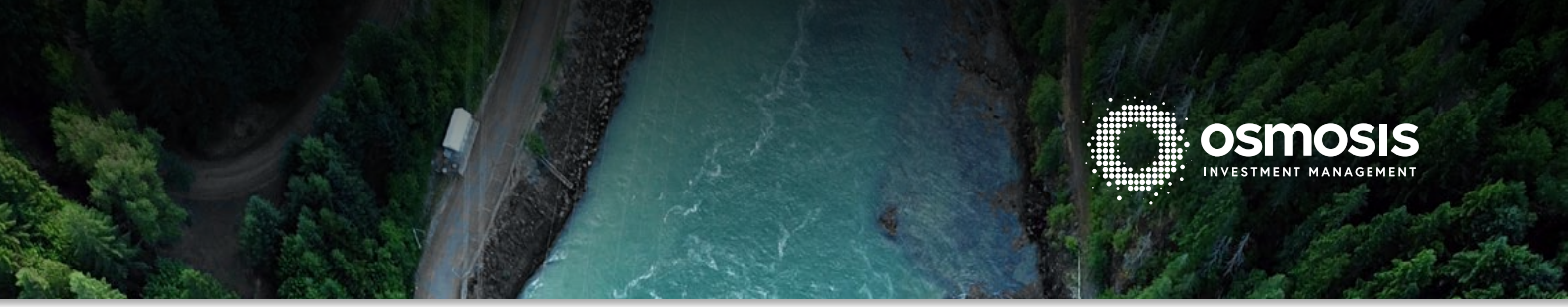
INVESTMENT MANAGEMENT

The Emerging Market Energy Landscape: Pathways, Pitfalls & the Importance of Resource Efficiency

December 2024



The Emerging Market Energy Landscape: Pathways, Pitfalls and the Importance of Resource Efficiency

Key takeaways

- Global emissions continue to rise, largely driven by the power sector's combustion of coal.
- We see heterogeneity in the 'dirtiness' of electricity grids across the Emerging Markets (EM). Asia-Pacific (APAC) is comparatively more coal dependent, Latin America (LATAM) is generally a lot cleaner, and Europe, the Middle East and Africa (EMEA) sits in the middle.
- China is central to global decarbonisation. It is still the largest coal consumer in absolute terms, but is rapidly expanding its renewable generation capacity.
- The carbon intensity of grid electricity directly impacts corporates through their Scope 2 carbon emissions. The dirtier the energy, the greater the importance of using it efficiently.

The emerging market energy landscape

Electricity grids worldwide vary significantly in their energy mix, with EM typically relying more heavily on dirty, high-emission energy sources. Osmosis finds that within the EM energy landscape APAC stands out as the region that has the 'dirtiest' electricity generation, followed by EMEA, while LATAM demonstrates the 'cleanest' electricity generation. Looking beyond the broad regional patterns however, some countries have managed a swift uptake in renewables, whilst some are still highly reliant on 'dirtier' fuel types for power generation.

Coal is largely responsible for driving grid emissions in many EM countries. Coal, as the most carbon-intensive fossil fuel, remains the largest contributor to global emissions, emitting more than oil, gas or any other petroleum product. Increasing coal consumption accounted for ~80% of the global increase in emissions in 2023, mostly from electricity generation. Whilst some EM countries are making strides towards phasing out coal, particularly in LATAM, large economies like China and India are still heavily reliant on it.

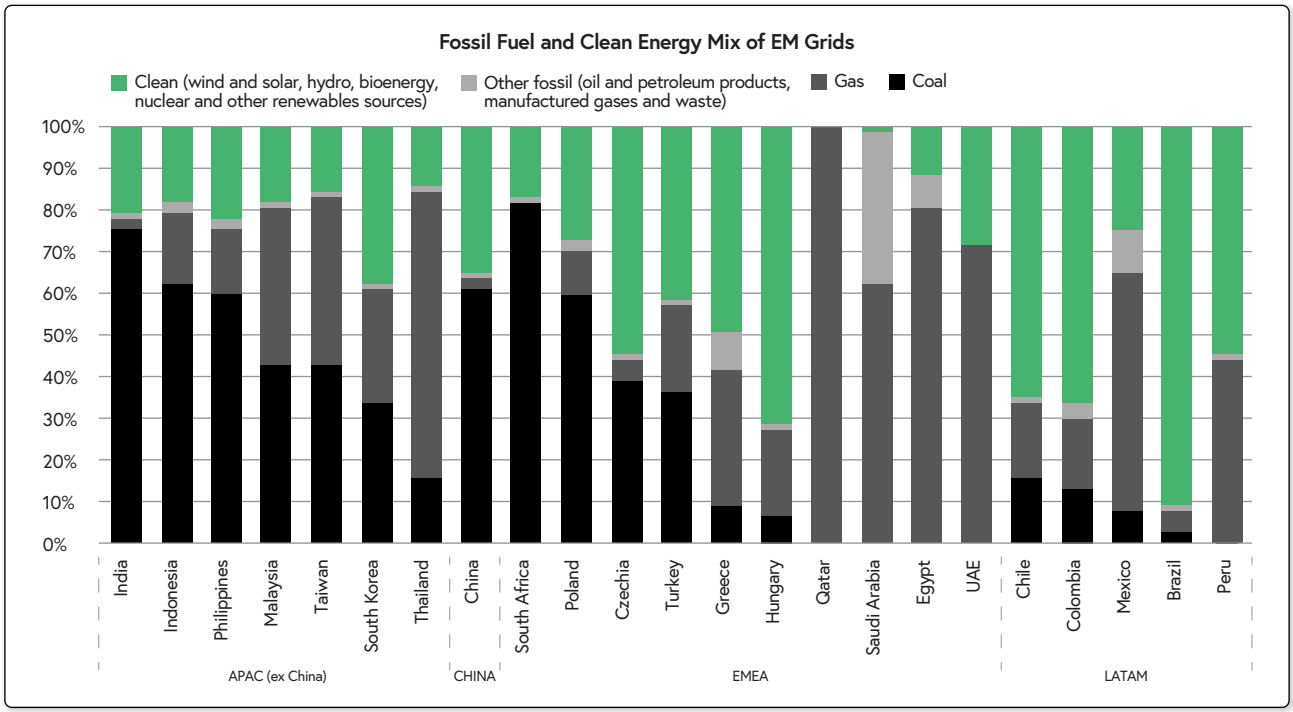
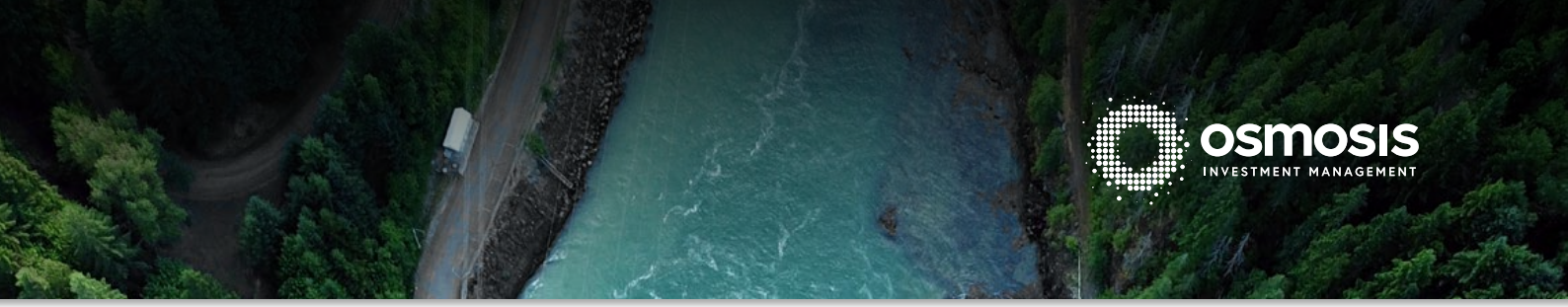


Figure 1: Ember, 2023



Latin America continues to be a renewable energy leader

LATAM's notable success is fuelled by its use of clean electricity, with the region holding the highest global share of renewables in its energy mix. This is led by Brazil, which has the least carbon-intensive electricity mix in the EM. The country shaped its electricity mix with hydropower sources that now supply ~60% of the national electricity generation. However, the impacts of climate change and reliance on hydropower have posed major challenges to their electricity generation and transmission, with dry spells leading to issues such as blackouts and electricity consumption regulations, among other government interventions to curb electricity demand.

As a result, Brazil is quickly diversifying its electricity mix to include other renewable sources. The country's share of electricity generated from hydropower decreased from 87% in 2000 to 60% in 2023, due to a rise in biofuel use and the expansion of wind and solar power generation. Wind and solar energy, in particular, saw significant growth, with their share doubling from 10% in 2019 to 20% in 2023. The share of total clean energy, which includes wind, solar, hydro, bioenergy and other renewables, remained stable at around 90% from 2000 to 2023. The country has already exceeded its 2030 renewable energy share of generation targets, is on track to hit its renewable capacity targets, and is considered a global leader in renewable electricity.

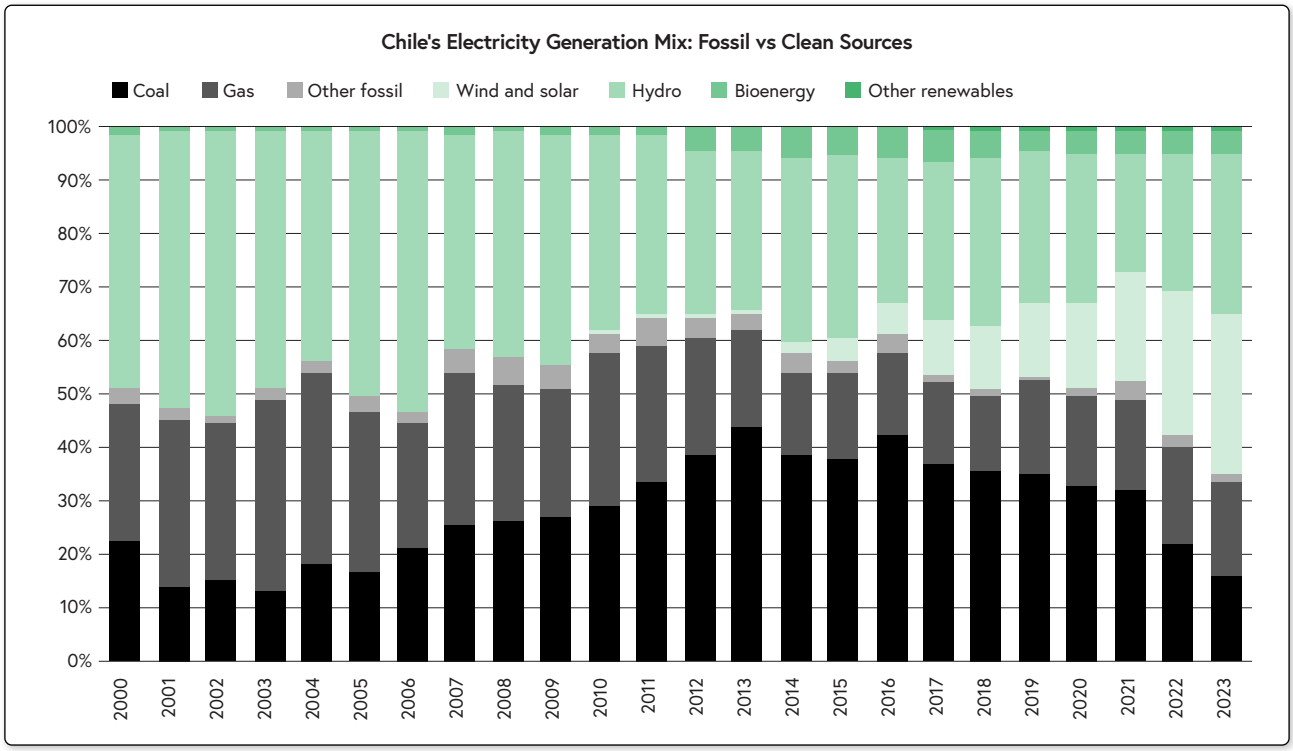
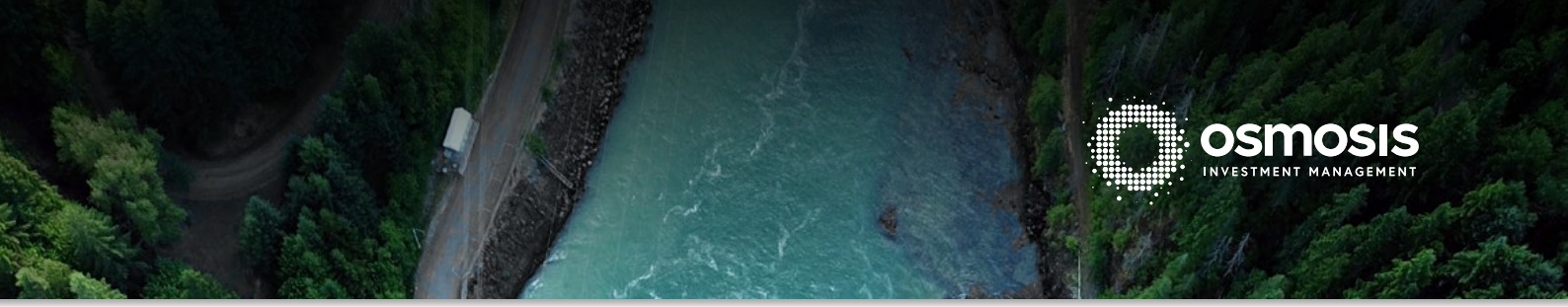


Figure 2: Ember, 2023

Chile is also making strides towards the low-carbon transition. In 2022, for the first time, electricity generation from renewable sources surpassed fossil fuels in Chile. Over the last decade the country has successfully diversified its electricity generation. Fossil fuel use, mainly driven by coal, peaked at 65% of all electricity generation in 2013, but by 2023, 65% was being generated from clean sources.

The path towards decarbonising Chile's electrical grid presents an interesting case, demonstrating how the country has diversified and decarbonised its national electrical system without depending on traditional transition fuels, such as gas and other fossils. The rapid development of wind and solar sources provide a positive outlook for Chile's goal of generating 70% of its electricity from renewable sources by 2050.



China is moving in the right direction, but still has some way to go

Achieving global decarbonisation is essential, and China is at the crux of the transition. China's electricity demand is by far the largest of any EM country – almost five times larger than second place, India – and coal continues to dominate its energy mix. That said, rapid deployment of clean energy has reduced the share of coal in its electricity mix from a peak of 80% in the early 2000s to a record low of 53% in 2024. While coal's share in electricity generation has declined, absolute coal consumption continues to rise, and depending on how quickly the energy transition evolves, is expected to plateau by 2027.

China is rapidly diversifying its power sources and accelerating the installation of renewable energy infrastructure. In 2024, it added 277GW of solar power and 80GW of wind power, a 25% increase from 2023 and hitting 2030 targets of 1,200 GW ahead of schedule. To aid this shift, the country has confirmed that from 2026 onwards, it will move away from controlling energy consumption per unit of GDP and focus on controlling absolute carbon emissions. It is also becoming by far the largest manufacturer and provider of clean technology in the world, with its share of global manufacturing of solar panels at 80% and battery cells at 85%. This is reflective of a shift in focus towards the green 'new three industries' of lithium-ion batteries, photovoltaics and electric vehicles.

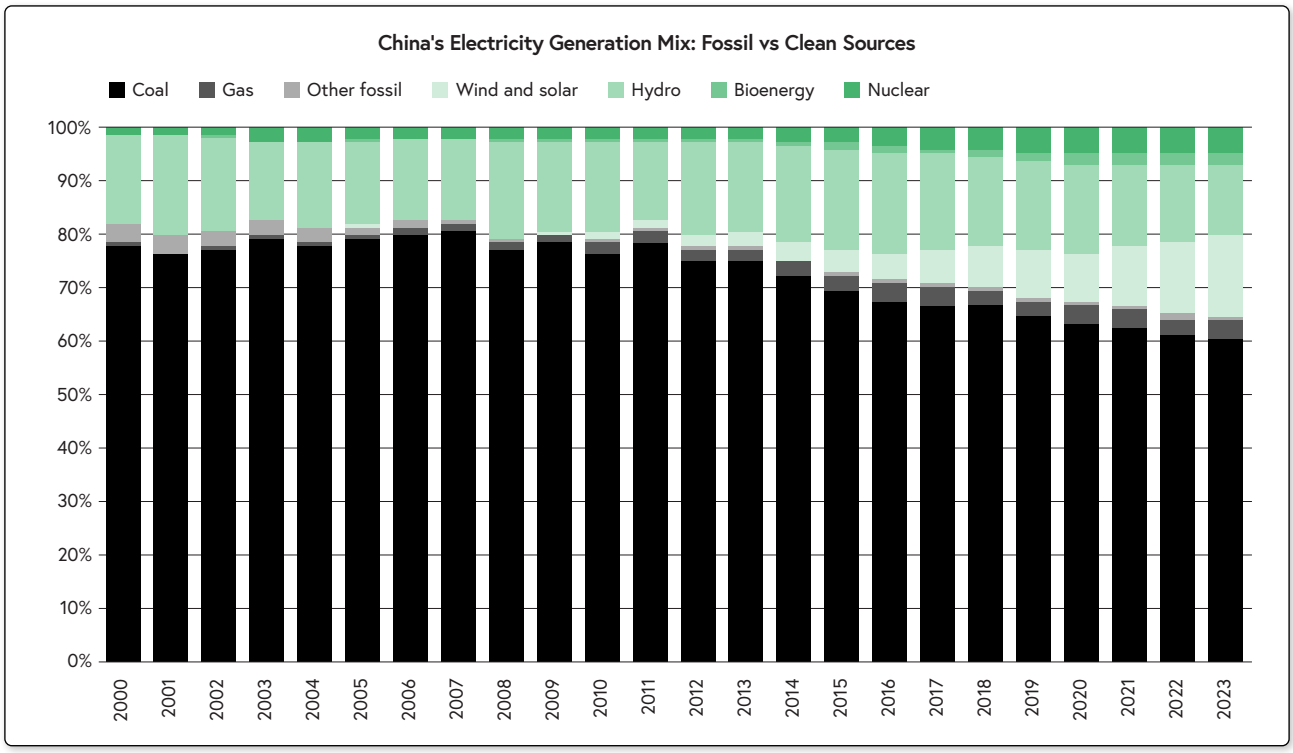


Figure 3: Ember, 2023

China has recently taken a major step towards reorienting its energy policy, introducing a market-oriented energy reform that will allow it to move from a fixed-price system to one in which markets decide clean power prices. All new projects completed after June 2025 will face electricity payments based on market-driven bidding. This shift could bring multiple benefits, from greater technological development, increased clean energy capacity, and boosted efficiency in electricity distribution, to potential investment attraction, cost reduction, and greater stability for renewable energy providers in times of uncertainty.

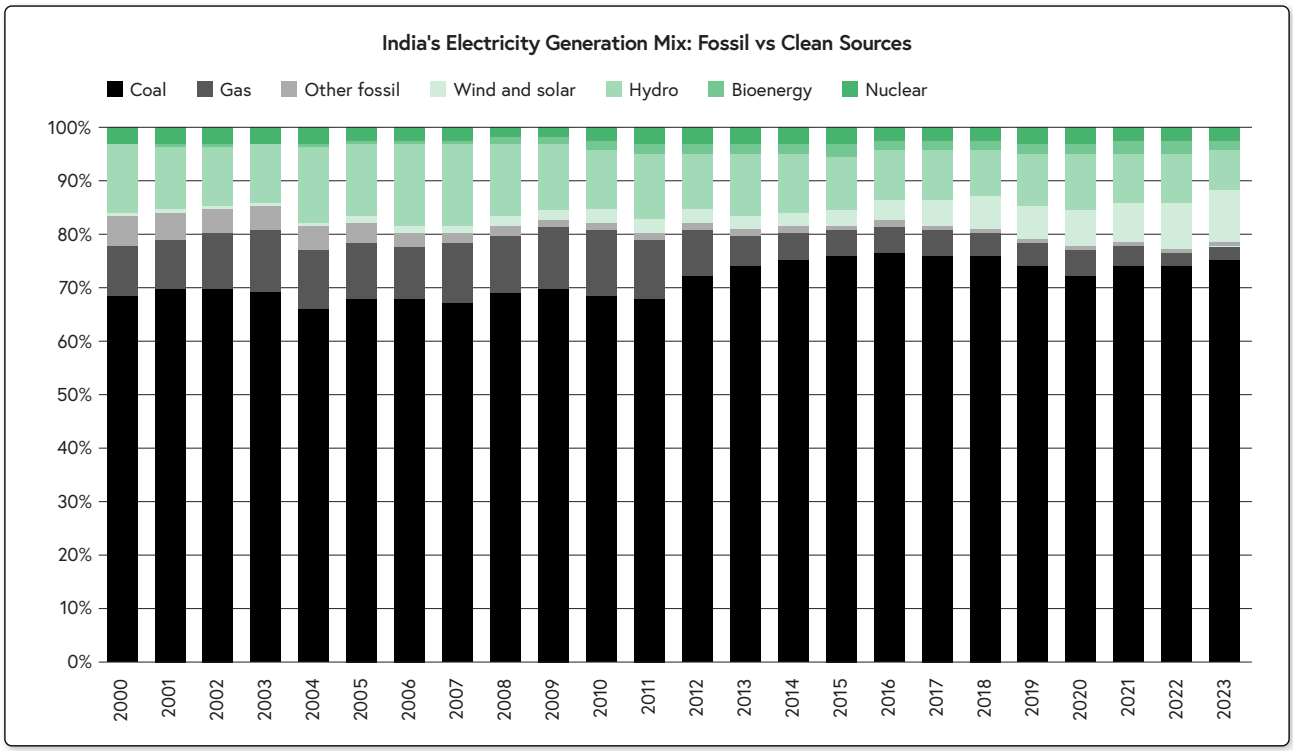


Figure 4: Ember, 2023

Asia ex-China is less proactive in its transition

The addition of renewables in other APAC countries is underway, but not at the necessary pace. After China, India was the EM country that added the most net renewable electricity capacity in 2023 and 2024. Yet, it is the APAC country with the highest share of fossil fuels in its electricity generation mix and still uses considerable amounts of coal. India has slightly increased the share of renewables in its electricity mix, yet overall it remains stable and will likely remain so through 2025. Major efforts are needed to accelerate the decarbonisation of its electricity system for it to achieve its ambitious target of 500GW of non-fossil capacity by 2030.

Given emissions in EM APAC are particularly 'dirty' and strongly driven by coal, rapid change is of vital importance. Indonesia recently pledged to phase out all coal plants and to develop more than 75GW of renewable energy capacity by 2040, but given that in 2023 coal consumption accounted for 62% of its power mix it still has a large hill to climb. Indonesia's energy transition will require massive efforts and reforms in policy, infrastructure, subsidies and global finance to achieve the transition and meet its ambitious climate goals.

The oil and gas powered Middle East

When looking at the total share of fossil fuel energy generation, Middle Eastern countries unsurprisingly stand out as being heavily reliant on oil and gas. Early Organisation of the Petroleum Exporting Countries (OPEC) members Qatar and Saudi Arabia have over 98% of their electricity grid system powered by oil and gas. Furthermore, Saudi Arabia has the highest average rate of fossil fuel subsidies of all EM countries. Subsidies on high-carbon products hinder the decarbonisation of industries, and phasing them out is beneficial to encourage the competitiveness of low-carbon alternatives. The United Arab Emirates (UAE) became the first country in the region to remove fossil fuel subsidies, representing an important step for the reform in oil-rich countries. Saudi Arabia similarly aims to reduce fossil fuel subsidies by 2030.

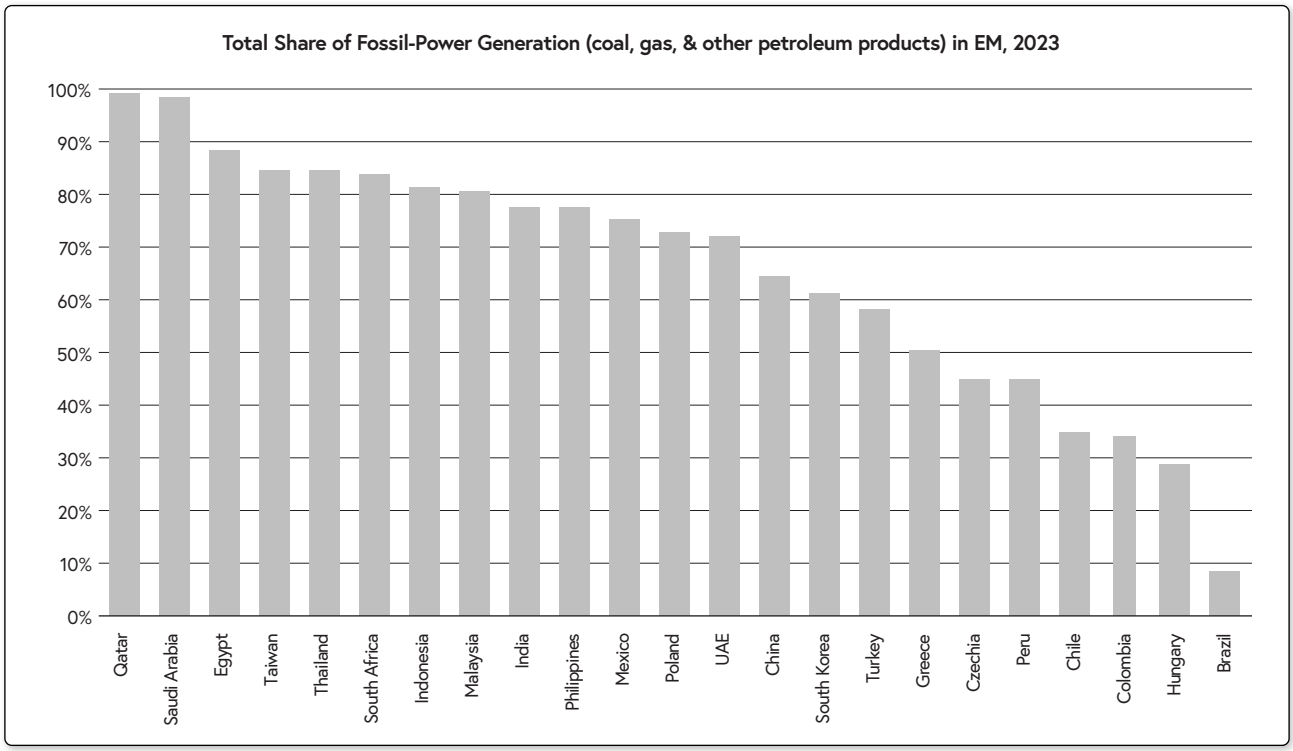


Figure 5: Ember, 2023

Grid electrification will require major structural change, causing knock-on effects across the economy

One of the biggest challenges of global electrification lies in expanding and modernising power grids to incorporate renewable energy. The International Energy Agency (IEA) estimates that by 2040 more than 80 million kilometres of power grids will be needed to meet national climate goals. This will require huge investment efforts, and we observed that financing in power grid infrastructure started to pick up in 2024. Europe, the United States, China, India and some countries in LATAM, such as Brazil, are already taking the lead. China's State Grid, the world's largest state-owned electric utility, is currently building massive ultra-high voltage (UHV) transmission lines to transmit clean electricity over long distances from renewable sources, although the share of wind and solar power transferred by them is still minimal.

Integrating new renewable capacity into grids and electricity systems is a global problem. Copper demand is expected to double by 2040, due to its excellent electrical conductivity and critical role in electricity grids. This will be significantly influenced by China due to the scale of national electricity demand and sheer volume of grid improvements. LATAM dominates the mining of copper, with Chile and Peru as the biggest players, whilst China leads the smelting and refining of this critical mineral. The copper scrap supply has been cited by some as an opportunity for the energy transition, and Osmosis highlights the importance of Resource Efficiency in the processes: reducing the use of raw materials would generate fewer emissions and less waste.

Scaling up clean energy investments remains essential while bridging the gap. Global investments in clean energy are now more than twice as large as in fossil fuels, although regional imbalances persist. China is a leader in this space and, by the end of 2024, Chinese clean energy investment accounted for more than double that made by the rest of EM ex China – and more than that seen in 'advanced economies' from 2022 onwards, according to the IEA.

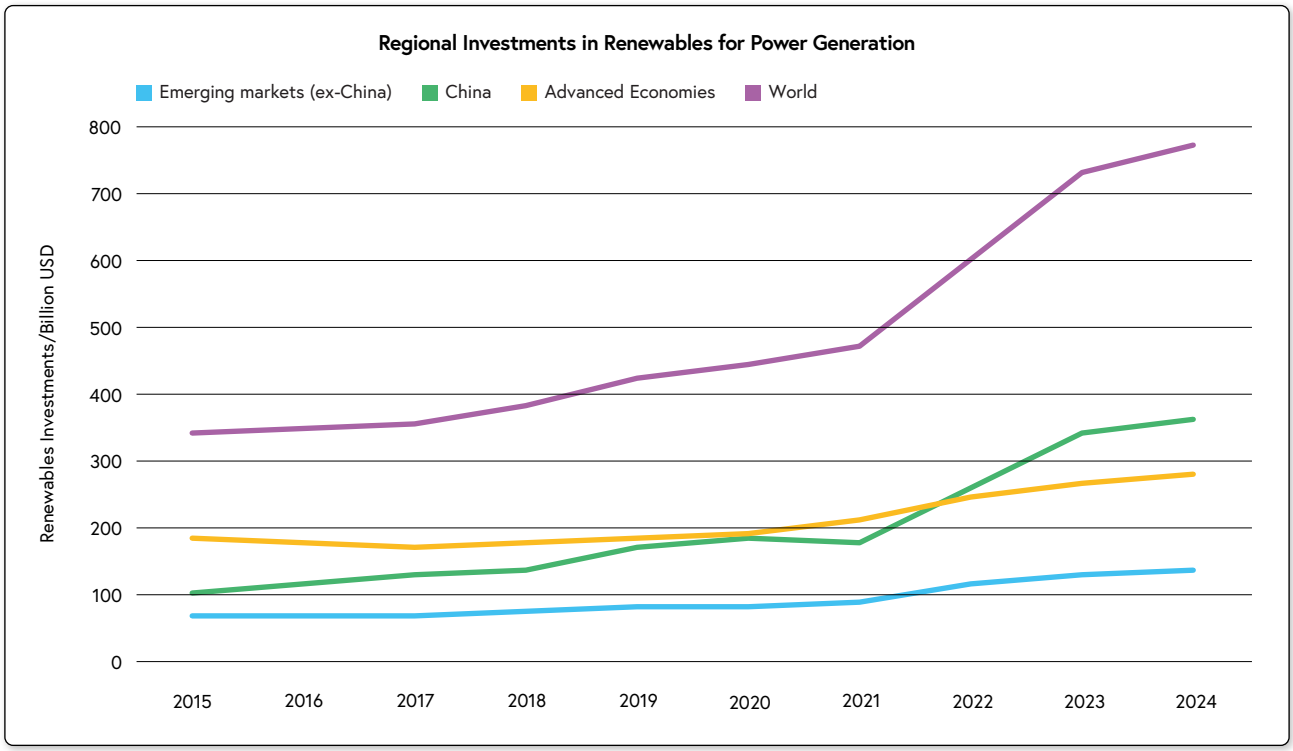


Figure 6: IEA World Energy Investment, 2024

Corporate emission management is particularly important in fossil fuel-heavy grids

For corporations, the efficient use of energy becomes more important when the grid is dirtier. Companies in the EM will buy electricity from their local grid unless they are in the unusual scenario whereby they generate all of their own power. 'Scope 2' emissions are defined as 'indirect' emissions that arise primarily from the purchase of electricity. As such, the dirtier the electricity grids, the higher the Scope 2 emissions attributable to companies. In the developed markets (DM), it is easier for companies to decarbonise their Scope 2 emissions by buying renewable energy certificates, but with less renewable energy flowing into the grids, this is more difficult in the EM. The dirtier the unit of energy being consumed, the more important it is that a company is using this scarce resource efficiently.

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INVESTMENT MANAGEMENT

Comparing Environmental Footprints: Emerging Markets vs Developed Markets

December 2024

Comparing Environmental Footprints: Emerging Markets vs Developed Markets

Key takeaways

- The MSCI Emerging Markets index has a much higher environmental footprint than the MSCI World Index across carbon, water, and waste
- Roughly a third of this intensity increase is attributable to an increased exposure to 'heavier' sectors in the Emerging Markets and two thirds is driven by the companies themselves being more inefficient
- There is a general trend that companies in the Developed Markets design products, and companies in the Emerging Markets manufacture them, making the latter more resource intensive
- For each of the environmental performance indicators—carbon, water, and waste—the greatest difference in footprints between Emerging and Developed markets is seen in the GICS Information Technology sector
- Large footprints provide an opportunity for investors looking for large environmental reductions with relatively low active risk

Emerging markets (EM) offer huge opportunity for environmental impact and footprint reductions. Osmosis finds that across carbon, water, and waste, footprints are larger in the EM than in the developed markets (DM), illustrated in Figure 1. The most notable discrepancy is seen in EM's carbon footprints, which are almost six times higher than those in DM. Waste footprints follow closely, being almost five times as high, while water footprints in EM are more than twice as high as in DM.

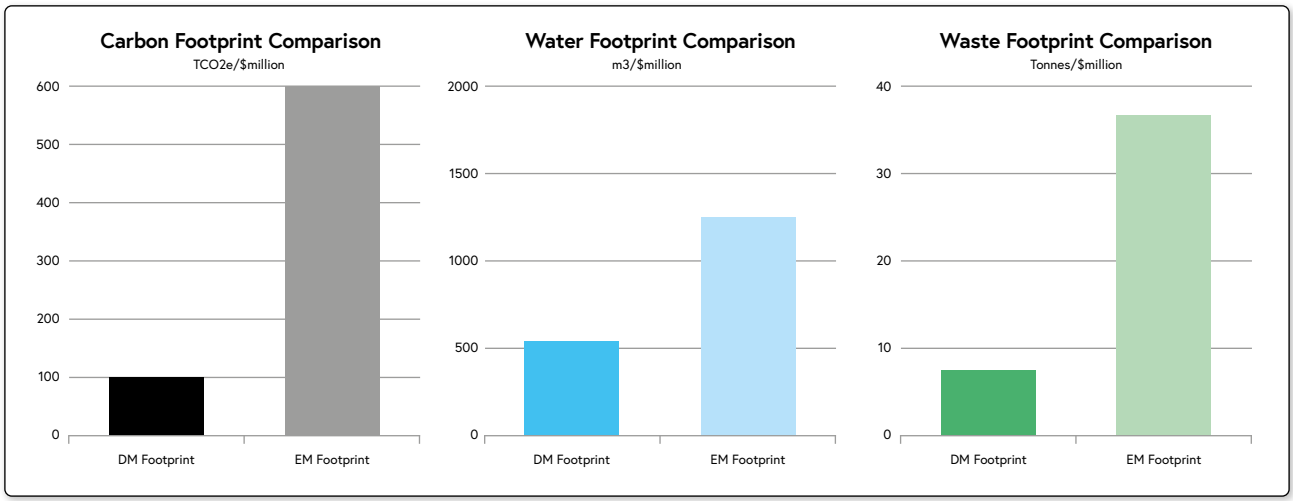

Figure 1: Osmosis IM, December 2024

The key driver of these higher footprints is the intensity of companies' activities rather than the sectoral composition of the index itself, though a lean towards heavier sectors in the EM does play a role. This pattern is particularly evident in water usage, where the EM index demonstrates much higher water intensity at the company level. This piece discusses the differences between the two indexes on a weighted basis, from year end 2024. All analysis refers to Global Industry Classification Standard (GICS) sectors, unless otherwise specified as Osmosis Sectors. Our 34 Osmosis Sectors are constructed in-house, offering a detailed classification which more effectively compares the operational efficiency of companies than 'off the shelf' sector definitions.

Carbon footprint disparities.

Unsurprisingly, the GICS utilities sector is the largest contributor to carbon footprints in both EM and DM, followed by the materials, and energy sectors. The utilities sector alone accounts for approximately 40% of total emissions in both markets, illustrated in Figure 2.

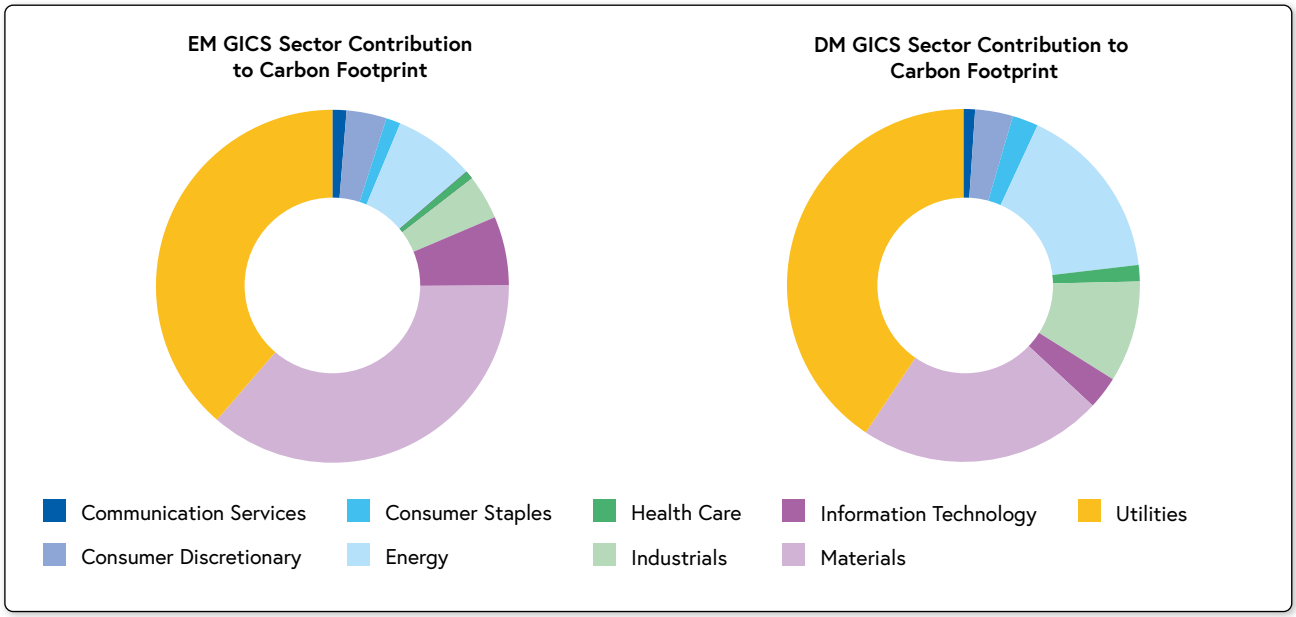

Figure 2: Osmosis IM, December 2024

The EM has a slightly higher weighting to these sectors, indicating a lean towards more carbon-intensive industries. However when looking at the sectors themselves, we see utilities, materials, and energy in the EM are significantly more carbon-intensive than their DM counterparts, with the utilities and materials sectors emitting nearly five times as much, and the energy sector emitting twice as much, as shown in Figure 3 below.

A more detailed breakdown of these heavy GICS sectors into Osmosis sectors further underscores the disproportionate environmental impact of carbon-intensive sectors relative to their index weight. In EM, construction & materials, electricity and gas, water & multi-utilities collectively account for 57% of total emissions while representing only 4% of the total index weight. Similarly in DM, electricity, chemicals, and oil & gas producers contribute 54% of emissions and make up just 6% of the index weight. This highlights how heavy industries have an outsized carbon footprint compared to their representation in market indices.

From an Osmosis sector perspective, these high-emitting sectors are significantly more intensive in the EM. A prime example of this is the construction & materials sector, the single largest contributor to EM's carbon footprint, accounting for nearly 20%. The sector's carbon footprint is fourteen times higher in EM than in DM, primarily due to the higher concentration of cement companies in the EM. Cement companies make up 25% of the sector in EM, compared to just over 5% in DM. Cement production is highly carbon-intensive because of the calcination of limestone and heating processes.

The greatest difference in carbon footprints between GICS sectors in the two indexes comes from the Information Technology (IT) sector, where EM IT companies are nearly 12 times more carbon-intensive than their DM equivalents, illustrated in Figure 3. The primary reason for EM IT emissions being much higher is the outsourcing of manufacturing from DM to EM. DM companies like Apple and NVIDIA tend to focus on design, while production is outsourced to EM manufacturers such as TSMC and Foxconn.

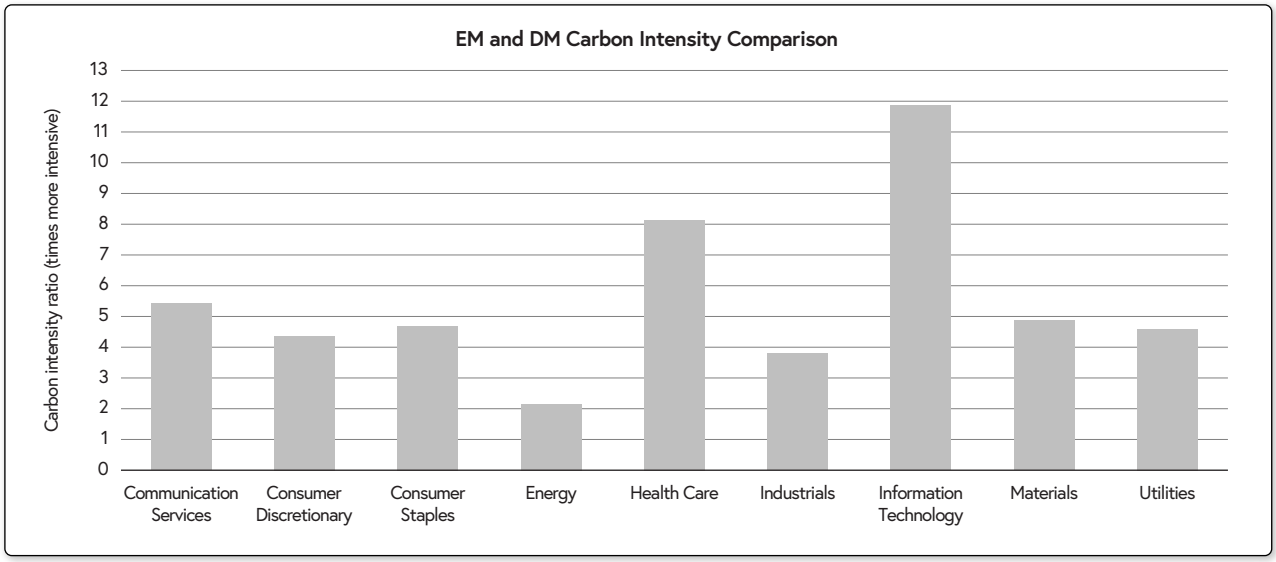

Figure 3: Osmosis IM, December 2024. Sectors are GICS

Water footprint disparities

Water footprint differences are similarly pronounced between indexes, with EM sectors exhibiting far greater water footprints than their DM counterparts. Figure 4 illustrates how the most intensive GICS sectors in EM are IT, utilities, and materials and in DM, it is utilities, materials and consumer discretionary.

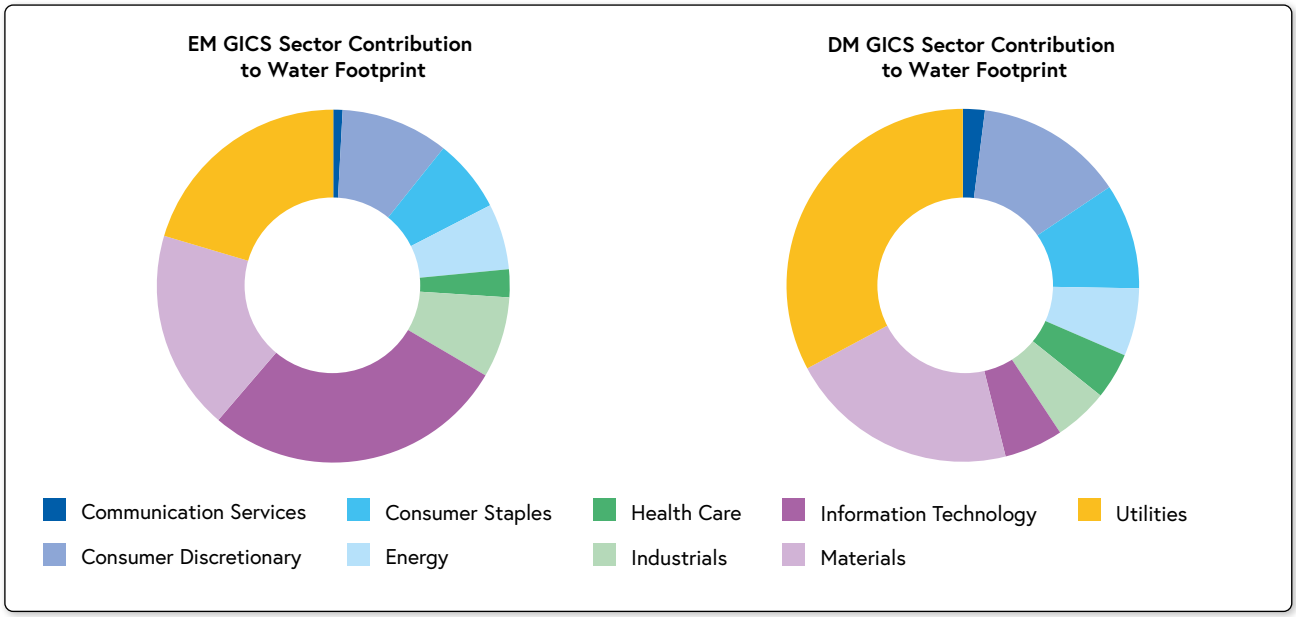

Figure 4: Osmosis IM, December 2024

Despite accounting for a similar sector weight in both markets, the footprint of EM IT is nearly 12 times greater than in DM, shown in Figure 5. The generalisation that DM companies design IT products to be manufactured in the EM is again at play here. The high water usage is partly due to the large quantities of ultra-pure water needed for chip cleaning. As chips can often be smaller than bacteria or a red blood cell, this water is used to rinse chips of residue during the fabrication process.

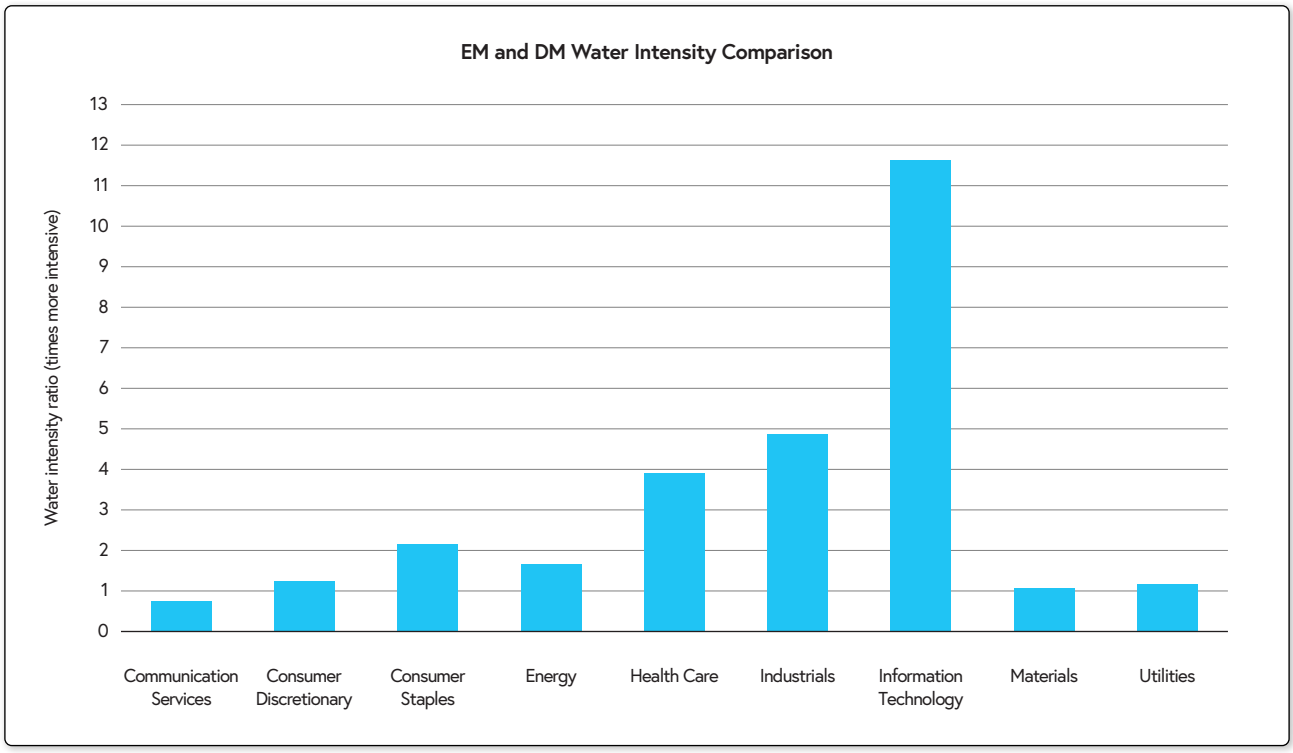

Figure 5: Osmosis IM, December 2024. Sectors are GICS

Waste footprint disparities

EM's waste footprint is almost five times greater than DM's. The largest contributor to EM's waste footprint is the GICS Materials sector, which alone accounts for 55% of the waste footprint in EM, compared to just over 20% in DM, shown in Figure 6. Further, the waste footprint of the GICS Materials sector in EM is over 13 times higher than in DM, even though the sector's weighting is only twice as large. This highlights that while the sector itself is more intensive in EM, the companies within it also exhibit much poorer waste-related performance.

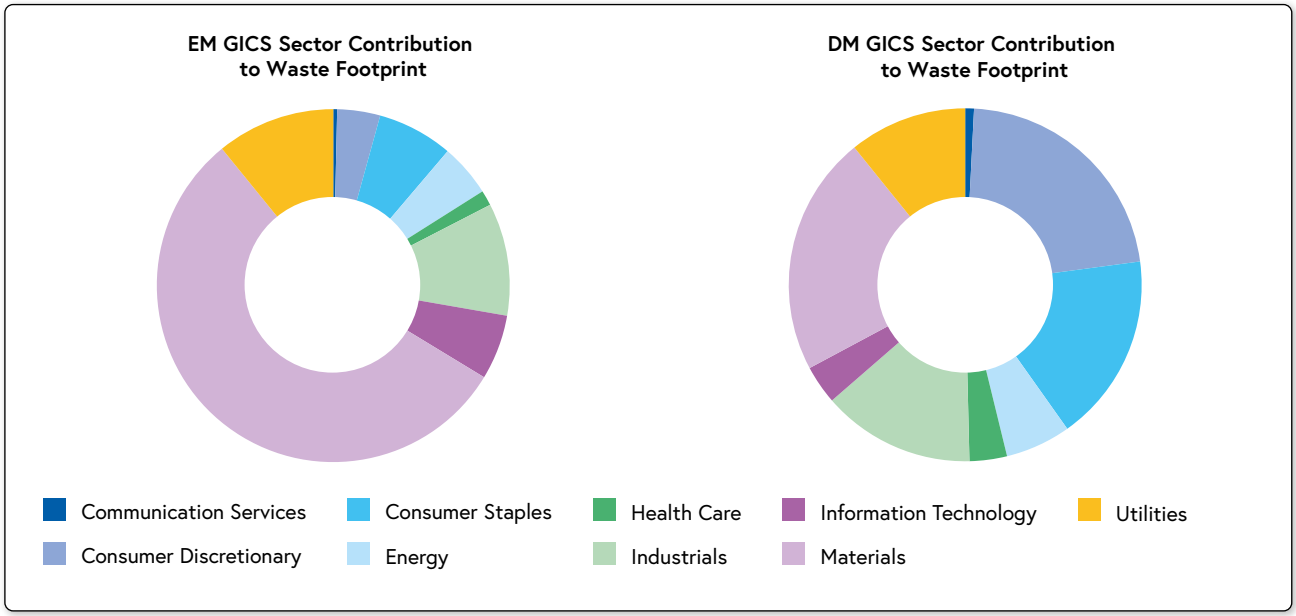

Figure 6: Osmosis IM, December 2024

The larger waste footprints of the GICS Materials sector in EM are mainly driven by the Osmosis industrial metals sector, which is over 20 times more intensive in EM than in DM. While steel-related activities dominate this sector in both EM and DM, EM businesses are significantly more diversified, with greater involvement in more resource-intensive activities such as mining and aluminium production, making the sector considerably more intensive overall. Similarly, the Osmosis mining sector, which contributes to the significant footprint of the GICS Materials sector, is five times more intensive in EM than in DM. While DM companies typically focus on extracting high-value, precious metals like gold and copper, the EM mining sector is more diversified. Additionally, approximately 20% of the EM mining sector is dedicated to coal mining, which results in much higher waste generation due in part to the large volumes of materials processed.

Both the Osmosis mining and industrial metals sectors also hold greater weight in EM, with the EM Osmosis mining sector being more than three times the size of its DM counterpart, and the EM Osmosis industrial metals sector over five times larger. This disparity is partly due to DM outsourcing mining and metal production to EM, where critical mineral reserves are more abundant. A major driver of this trend is the growing demand for critical minerals fuelled by the global energy transition. Lithium, for instance, is a vital element in rechargeable batteries, which power electric vehicles and enable large-scale energy storage for renewable sources like solar and wind. Similarly, copper plays a crucial role in green technologies like solar panels and wind turbines.

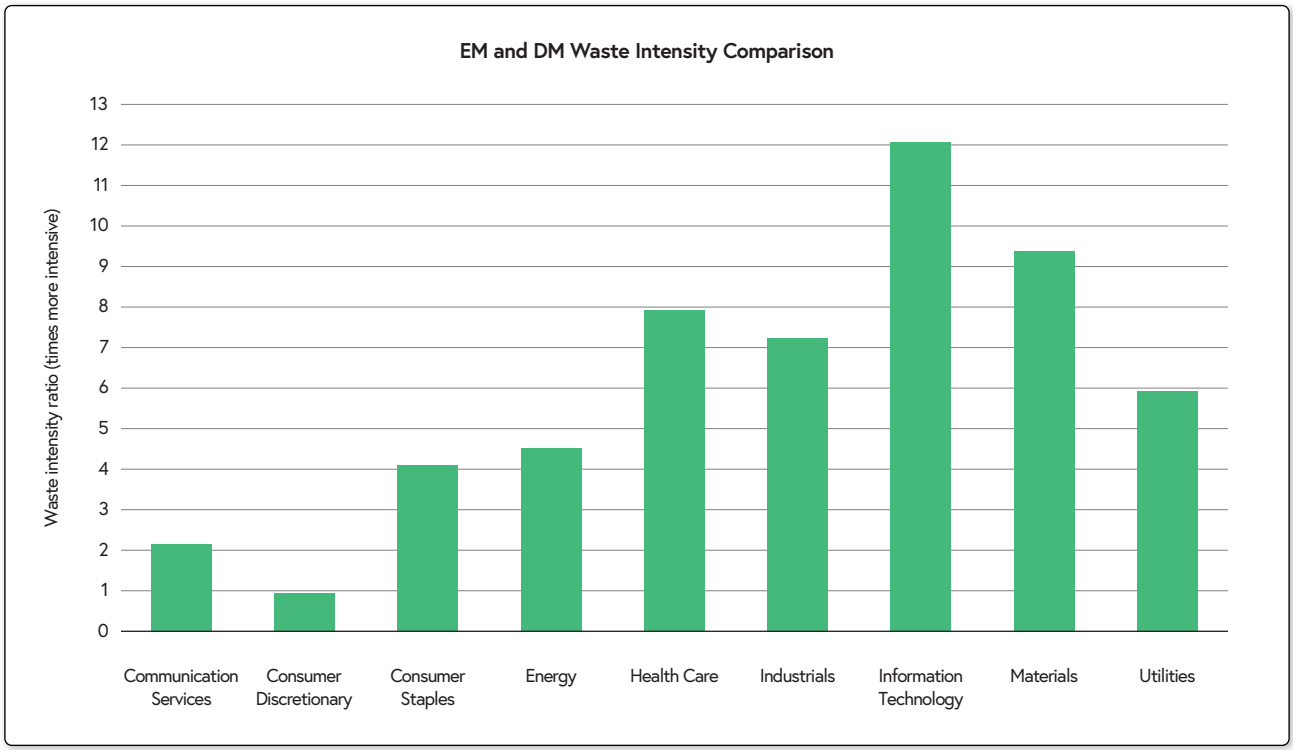

Figure 7: Osmosis IM, December 2024. Sectors are GICS

Among the GICS sectors, the IT sector shows the largest disparity in waste footprints between DM and EM, as illustrated in Figure 7. While waste is less of a concern in IT compared to more intensive sectors like materials, the main driver of the difference, like in carbon and water footprints, is the outsourcing of production by DM IT companies to EM. DM companies typically have lower waste intensities due to a primary focus in IT design activities. The waste output of EM IT is comparatively much more intensive, with the main waste generated in EM IT manufacturing coming from e-waste, such as batteries, as well as scrap and excess material waste from the production of IT hardware, like computers and mobile phones.

Conclusion

Across carbon, water, and waste, EM exhibit higher environmental footprints compared to DM. While sector weightings contribute, with the EM index skewed towards heavier, more resource-intensive sectors, the primary driver is the higher environmental impact of the companies within EM. The greatest disparities are observed in carbon intensity, followed by waste and water footprints. The GICS IT sector, which shows the largest disparities across all environmental footprints, exemplifies how outsourcing production to EM can shift more intensive, environmentally damaging activities to these markets.

The higher footprints in EM present significant opportunities for environmental improvements, with relatively low active risk compared to DM. These findings underscore the importance of EM investment in driving the global transition to a low-carbon economy. Given that the increased footprints are largely driven by DM outsourcing more resource-intensive production to EM, adopting a whole-economy investment approach is essential to addressing these challenges.

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INVESTMENT MANAGEMENT

Quantitative Outcomes of Resource Efficiency in Emerging and Developed Markets

December 2024

Quantitative Outcomes of Resource Efficiency in Emerging and Developed Markets

Key takeaways

- Strong similarities demonstrated between the Resource Efficiency Factor in Developed Markets, and Emerging Markets
- RE identifies a distinct and uncorrelated source of alpha, with Efficient companies outperforming Inefficient companies since 2019, when our Emerging Market dataset begins
- Traditional factor analysis continues to show EM RE are aligned with quality-type characteristics
- Low correlations are observed between the RE factor and standard ratings providers, as well as DM RE
- We see that Efficient companies tend to beat their analyst estimates, and Inefficient companies tend to miss them

Unless otherwise mentioned, throughout this piece EM refers to companies in the MSCI Emerging Markets Index. DM refers to companies in the MSCI World Index. Efficient refers to an equally weighted bucket of the top half most resource efficient companies. Inefficient refers to an equally weighted bucket of the top half most resource inefficient companies.

Our research has concluded that Resource Efficiency (RE) is a factor which identifies high quality companies with strong management teams generating a competitive advantage. We believe that RE captures the intangible value of environmental resilience and mitigates long-term climate change risks.

We first observed these characteristics in the DM, but they are also pervasive in the EM. This is important in two ways. Firstly, it allows us to directly port our DM expertise to the EM and to apply our research to this new market. Secondly, this positive out of sample test of our signal supports the efficacy of our work in the DM.

Resource Efficient companies tend to outperform Resource Inefficient

We have identified a consistent independent alpha signal in the Emerging Markets.

Figure 1 shows the performance of the top third most efficient companies in every sector in green, and the bottom third in purple. Not only do Resource Efficient companies consistently beat Resource Inefficient companies, but they also beat the MSCI Emerging Markets index, whereas the Inefficient companies perform less well financially than the wider index.

When we use the Barra Emerging Markets Equity (EMM1) risk model to attribute the performance difference between efficient and inefficient companies, we see that the 1.4% annualized positive total active return is predominantly driven by the specific component at 2.4%*. This indicates that, in our research environment (before adding risk controls), we are not simply capturing betas from country, industry, or factor exposures; rather, resource-efficient companies themselves are outperforming. In fact, over this period, common factors collectively detracted from total active return by -0.6%*.

Specific return is what we target, and the positive value evidences the RE factor being an independent source of alpha. When we construct portfolios in a risk-controlled fashion, we aim to reduce our exposure to common factors, and maximise our exposure to RE within risk bounds.

*data from 31 August 2019 – 31 December 2024

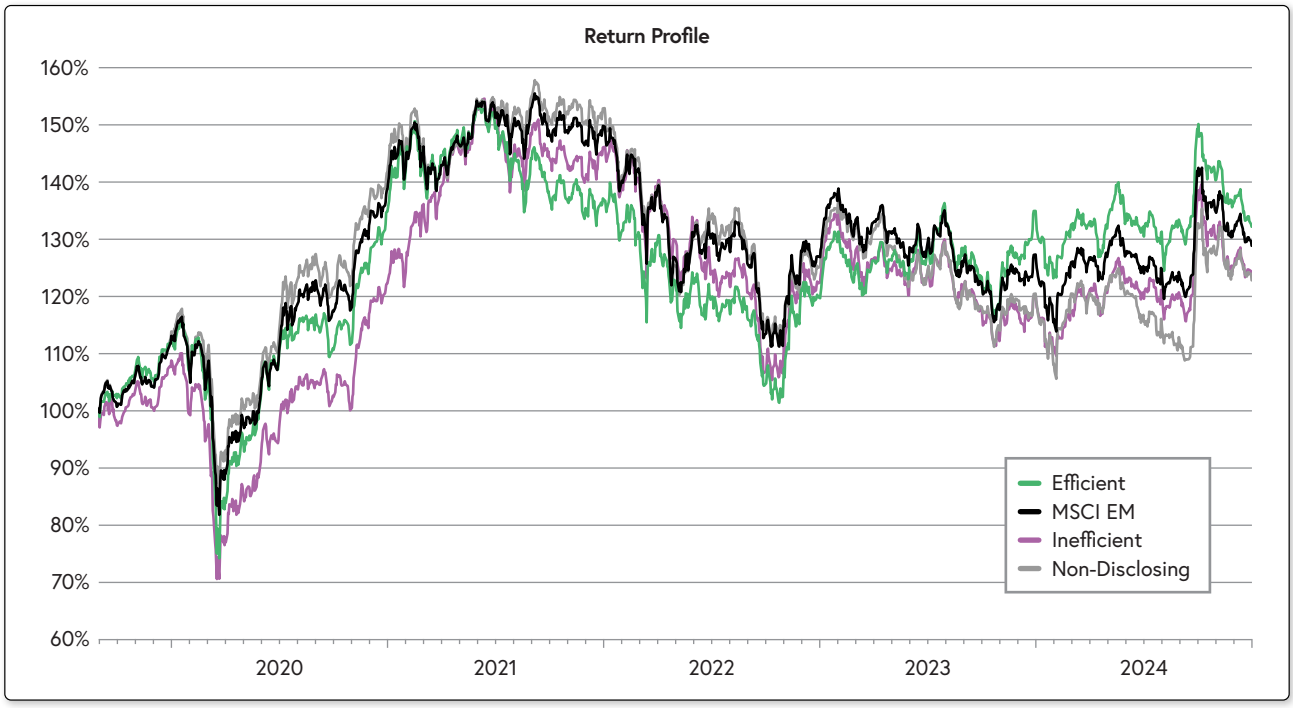

Figure 1 - We analyse gross compounded returns with dividends reinvested of companies in the MSCI Emerging Markets Index (excluding financials & tobacco) during the time period from 31 August 2019 to 31 December 2024. This graph shows the return profiles of companies that are split into three groups: the most Resource Efficient companies (top third in green), the least Resource Efficient companies (bottom third in purple), and the non-disclosing companies (grey) for which we have inadequate Resource Efficiency data. We also show the performance of the MSCI Emerging Markets Index (excluding financials & tobacco). All portfolios are equal-weighted with sector weights forced to be proportional to the benchmark. No representation is being made that an Osmosis strategy will achieve the Efficient performance shown. Source: Osmosis IM, MSCI, Bloomberg, S&P, FactSet. Past performance is not an indication of future performance.

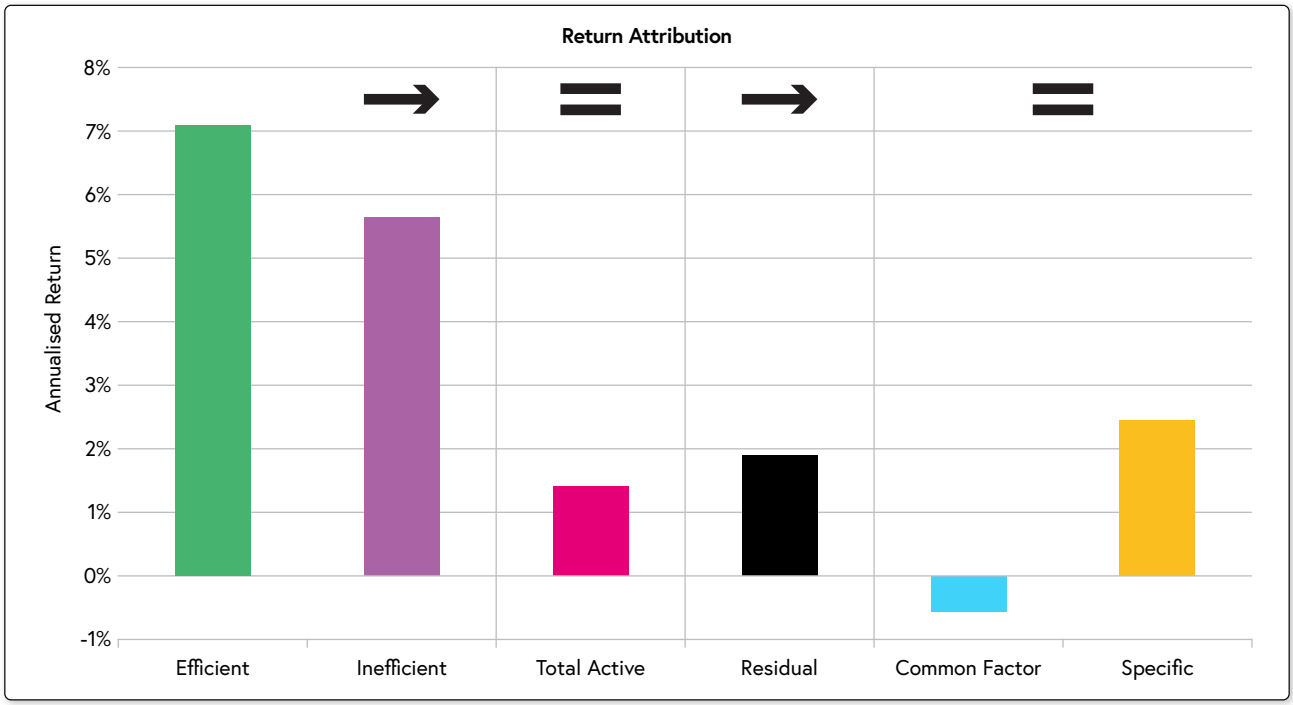

Figure 2 - Note: The analysis uses the MSCI Emerging Markets Index as the starting universe. All portfolios and the index are equal-weighted. Efficient, Inefficient, Total Active, Residual, Common Factor, and Specific returns are calculated using Barra's EMM1 risk model, where Active is the excess of the Efficient portfolio over the Inefficient portfolio, Residual excludes currency effects, and Residual is further split into explainable Common Factors (sector, country, style) and Specific (unexplained). . The Efficient and Inefficient portfolios used in the attribution were constructed based on the most Resource Efficient companies (top third in green) and the least Resource Efficient companies (bottom third in purple) in each Osmosis sector. All return numbers are annualised. Sample period: 31 August 2019 to 31 December 2024. The start date is exogenously determined by the environmental data availability for companies in the index. We analyze gross compounded returns with dividends reinvested. Source: FactSet, MSCI, Osmosis Investment Management.

Factor exposures are similar across both markets

Efficient companies in both DM and EM tend to be more profitable with higher asset turnover.

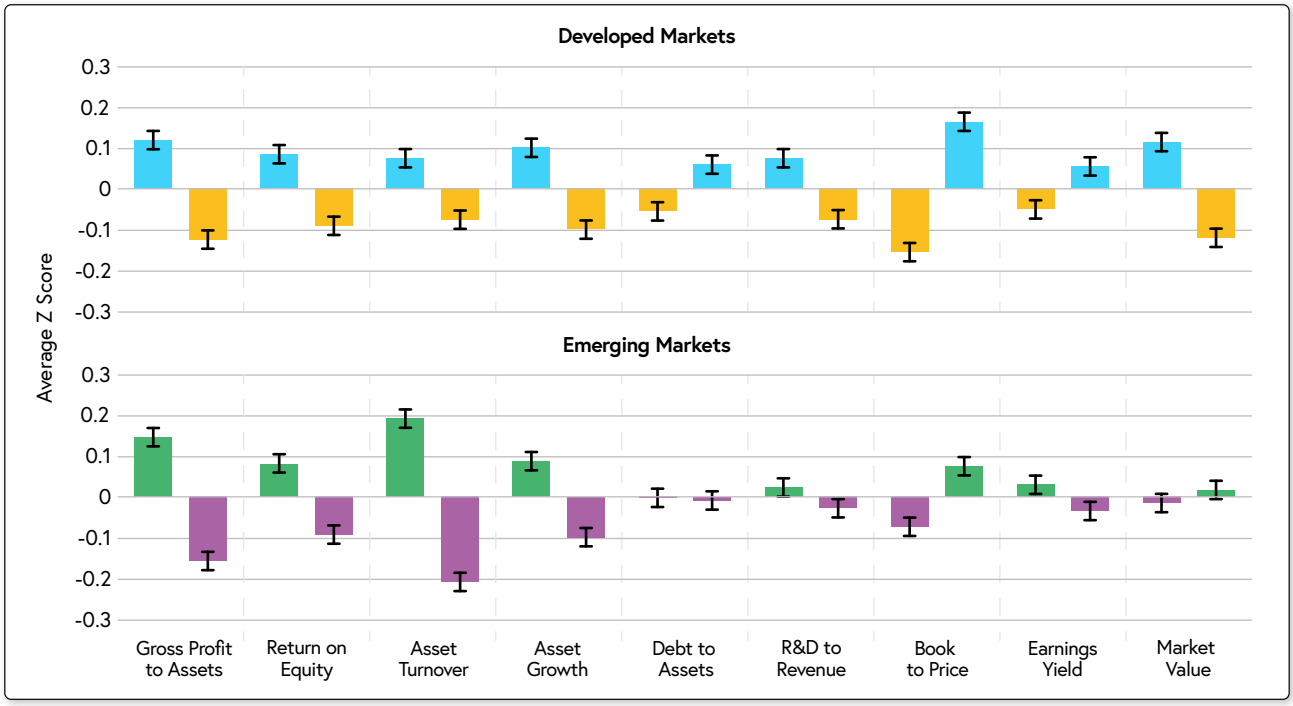

Figure 3-Note: The analysis for the top chart uses the MSCI Emerging Markets Index as the starting universe. The bottom chart uses the MSCI World Index for comparison. Companies in the index are split into two research portfolios using Osmosis' Resource Efficiency score as the sorting variable: the most Resource Efficient companies (top half in blue or green) and the least Resource Efficient companies (bottom half in yellow or purple). We show z-scores that are calculated to show the standard deviations that a company's financial metric is away from the yearly sector mean. The height of the bars shows the average z-score across all companies. The error bars at the top of the columns represent the 95% confidence interval of the mean. Sample period: 31 August 2019 to 31 December 2024. The start date is exogenously determined by the environmental data availability for companies in the index. Source: FactSet, OIM.

Resource Efficient companies tend to exhibit factors associated with quality. In the DM we see that they are typically more profitable, have higher return on equity (ROE) and higher asset turnover (how much they are using their assets to generate sales, or put another way how much they are 'sweating their assets'). We also see that they are underlevered, investing in R&D, and generally more expensive than their inefficient peers.

We see very similar factor exposures in the EM. Although EM RE companies do not currently show the same statistical significance in terms of the leverage, earnings yield or size, there is strong consistency across the other factors.

The pervasiveness of the factor exposures suggests that we are not looking at a separate EM RE factor and DM RE factor. Instead, the evidence suggests that we are identifying the same principles across both markets. RE is thus not an anomaly only observed in the DM, but a fundamental pattern, observable across the world. This allows us to hit the ground running in the EM as it enables us to utilise the research and expertise that we have developed in the DM and apply it here.

This research can also be viewed as an out of sample test for DM RE. We have taken the thesis that we have developed in the DM and directly applied it to the EM. The similarities in the EM reinforces the efficacy of the signal in the DM, where it was originally developed.

Uncorrelated to standard ratings providers

RE is picking up information that is not captured by traditional ratings providers.

RE is an independent and uncorrelated investment signal based on publicly reported, objective, and quantifiable indicators. Our research uniquely focuses on the economic realities of environmental sustainability through objective, reported data. We do not use estimations.

The RE Score and the underlying carbon, water, and waste scores show no correlation to ESG scores from third party data providers. Our belief is that vendors lack a consistent approach to defining, measuring, and weighting sustainability issues amongst each other, resulting in low correlations between their ESG scores, as well as with ours.

Not only do we see low correlations between the RE score and third-party data providers, but we also see low correlations between the active and specific returns from DM RE and EM RE, with correlations of 0.03 and 0.08, respectively. This demonstrates that despite the similarities between the DM RE and EM RE signals, there are still positive diversification benefits to investing in both markets. This is driven by distinct economic environments, regulations, and sector-specific dynamics unfolding at different times.

RE is uncorrelated to ratings providers

	RE	Carbon	Water	Waste	Robeco ESG	MSCI ESG	Sustainalytics ESG	FTSE ESG	Bloomberg ESG	Integrum ESG	Robeco Env	Bloomberg Env
RE												
Carbon	77%											
Water	81%	52%										
Waste	75%	39%	44%									
Robeco ESG	13%	7%	14%	8%								
MSCI ESG	14%	16%	9%	9%	46%							
Sustainalytics ESG	26%	21%	22%	19%	57%	36%						
FTSE ESG	6%	1%	7%	2%	78%	45%	56%					
Bloomberg ESG	16%	14%	16%	7%	59%	35%	41%	57%				
Integrum ESG	18%	10%	20%	6%	30%	20%	25%	34%	25%			
Robeco Env	11%	5%	12%	7%	92%	43%	56%	75%	57%	31%		
Bloomberg Env	24%	27%	22%	11%	51%	29%	36%	50%	74%	20%	50%	

100-90% | 90-80% | 80-70% | 70-60% | 50-60% | 40-50% | 30-40% | 20-30% | 10-20% | 0-10%

Figure 4 - Note: The analysis uses the MSCI Emerging Markets Index as starting universe. We show the correlations between Osmosis' environmental factor scores (Resource Efficiency, Carbon, Water, and Waste) and ESG scores from different data vendors. 'Env' indicates scores that are solely based on the environmental pillar. A higher percentage number indicates a higher correlation between the two respective metrics in question. Sample period: ESG data covers the period January 2024 to December 2024 and corresponding Resource Efficiency data over the same time period. The date is determined by the fact that we use the latest date for which we have Osmosis' factor scores. Source: Bloomberg, Osmosis Investment Management.

Resource Efficient companies are more likely to beat analyst EPS estimates

This differential is consistent across both markets.

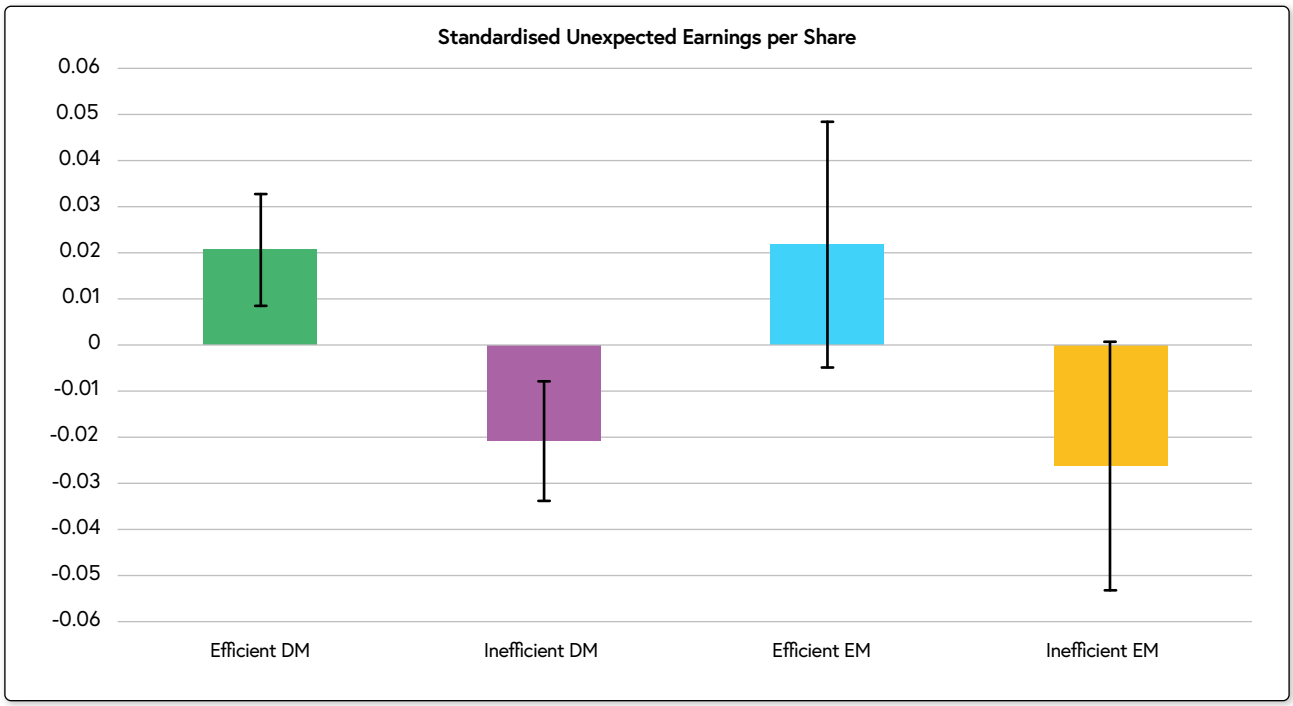

Figure 5 - Note: We analysed the Earnings Surprise of companies that report sufficient environmental data to assess their Resource Efficiency. The analyses use the MSCI World Index and MSCI Emerging Markets Index as starting universes, respectively. Companies in the index are split into two research portfolios using Osmosis' Resource Efficiency score as the sorting variable: the most Resource Efficient companies (DM – top half in green, EM - top half in blue) and the least Resource Efficient companies (DM – bottom half in purple. EM - bottom half in yellow). We show z-scores that are calculated to show the standard deviations that a company's financial metric is away from the yearly sector mean. The height of the bars shows the average z-score across all companies. The error bars at the top of the columns represent the 95% confidence interval of the mean. Sample period for DM: 31/12/2005 to 31/12/2024. Sample period for EM: 31 August 2019 to 31 December 2024. For EM, the start date is exogenously determined by the environmental data availability for companies in the index. Source: FactSet, Osmosis IM.

The alpha that we capture in the DM demonstrates that existing financial characteristics are not able to fully explain the performance differential between Efficient and Inefficient companies.

Studying analyst forecasts, we find that the RE factor serves as an indicator for companies that tend to surprise on the upside versus those that disappoint relative to analyst estimates. While this is not yet as statistically significant in the EM as it is in the DM, we are beginning to see a similar trend emerging. This begins to provide some explanation of how RE is being rewarded by the market.

Conclusion

Our research demonstrates that RE is a distinct and uncorrelated source of alpha, not captured by traditional financial factors or by mainstream ESG ratings. Our RE factor, constructed through rigorous environmental and quantitative research is uniquely driven by our proprietary data and consistently identifies high-quality companies. It acts as an early indicator of strong management teams, and we see this reflected in better fundamentals. Across both DM and EM, RE outperformance is primarily driven by the resource efficient companies themselves, rather than by country, sector, or other common factor betas and we observe that companies scoring highly on RE more often than not exceed analyst forecasts, while the opposite is true for their inefficient peers. By integrating our RE factor into investment portfolios, we seek financial outperformance and see a meaningful improvement in environmental impact.

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INVESTMENT MANAGEMENT

The Vital Role of Emerging Markets in the Whole Economy Approach: Inside the EV Supply Chain

August 2025

The Vital Role of Emerging Markets in the Whole Economy Approach: Inside the EV Supply Chain

Note: This article has been updated to August 2025

Key takeaways

- Emerging Markets are a key driver of both global GDP and greenhouse gas emissions. Excluding them leaves major environmental impacts unaccounted for.
- As Scope 3 data is often unreliable, Osmosis' Emerging Market strategy considers direct supplier emissions, water usage, and waste generation data.
- Focusing just on the largest Developed Market entities ignores heavy impacts from EM suppliers handling high-intensity processes.
- Expanding to the Emerging Markets enables Osmosis to drive change where environmental burdens are greatest.

Osmosis' Whole Economy Approach

Osmosis' whole-economy approach seeks to promote environmental best practices by rewarding sector leaders and penalising laggards across the full spectrum of the market. Rather than excluding emissions-intensive sectors, many of which are essential to the just transition as well as socioeconomic stability, this approach aims to support a smooth transition to a sustainable economy.

Bringing Emerging Markets Into Scope for a Truly Economy-Wide Climate Solution

The country constituents of the MSCI Emerging Market Index represent almost half of global GDP and over half of global emissions. To advance a truly economy-wide solution, Osmosis is bringing emerging market (EM) countries into scope to consider both their economic activities and emissions. EM economies are now responsible for a large share of global manufacturing, and with it a disproportionate burden of emissions and environmental degradation. Developed markets (DM), increasingly "export" their carbon footprint by importing emission-intensive goods from jurisdictions with weaker climate standards, while shifting domestic production towards lower-carbon goods and services (Nielsen et al., 2020). By broadening our universe to include these EM companies, we seek to encourage positive, innovative environmental practices across each region and sector.

Limitations of Scope 3 and the Case for Supplier-Level Environmental Analysis

While Scope 3 emissions are commonly used by investors to account for supply chain emissions, they fail to comprehensively reflect the full environmental impacts of supply chain companies and can also lead to double counting. Unlike Scope 1 and 2 emissions, which can be directly calculated from fuel and electricity use, Scope 3 data relies on multiple external sources and is notoriously difficult to measure, which often renders the data incomplete. According to Boston Consulting Group, fewer than 10% of companies report Scope 3 emissions with accuracy.

Moreover, Scope 3 emissions insufficiently account for absolute water and waste based metrics, meaning that significant environmental impacts across the supply chain remain unaccounted for. As a result, considering the Scope 1 and 2 emissions of supplier companies, as well as their separate waste generation and water withdrawal values, offers a more reliable measure of environmental impact, particularly in sectors with complex global supply chains.

Osmosis observes a consistent trend across sectors: companies in DM largely outsource manufacturing operations to their counterparts in EM. In the technology, hardware, and equipment sector, for instance, DM firms typically focus on product design, such as semiconductors and chips, while EM companies undertake the resource-intensive manufacturing processes. A similar dynamic appears in the food producers sector, where DM companies are primarily engaged in secondary food processing, whereas EM firms are more heavily involved in agricultural production. While this pattern is evident across various sectors, we have chosen to illustrate the use of EM suppliers by DM entities through a short case study which of Tesla and the electric vehicle (EV) supply chain.

Case study: Tesla

Tesla, arguably one of the most well-known EV companies in the world, is headquartered in the United States but has a vast international supply chain. In its 2023 Annual Report Tesla states that its "products contain thousands of parts purchased globally from hundreds of suppliers."

Tesla's supply chain is particularly reliant on EM suppliers, often from China and the broader APAC region. Using Factset data, Osmosis identified that almost half of Tesla's ~220 key suppliers or partners are Chinese entities, shown in Figure 1 below. Whilst five of these entities are in the MSCI World index, 15 are in the MSCI Emerging Market index.

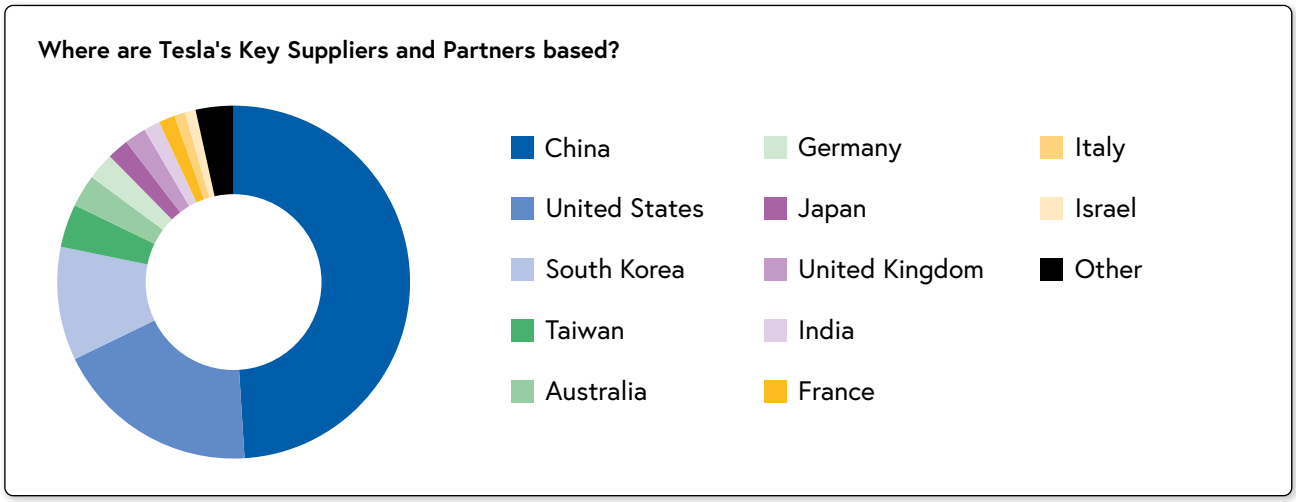

Figure 1: Factset Data, 2024

When analysing Tesla's global supply chain, it is clear that the firm uses materials from suppliers across all stages of EV production. This begins with the sourcing of key battery materials, followed by battery cell manufacturing. Tesla also relies on third-party suppliers for semiconductor fabrication and the production of mechanical parts before final assembly. These processes are often some of the most resource-intensive activities in the supply chain.

Refinement

Tesla relies heavily on outsourcing the refinement of key battery materials to specialised chemical materials manufacturers, particularly in China. While mining of raw materials like lithium often occurs in countries such as Australia and Chile (together responsible for around 70% of global lithium extraction), the chemical transformation of these materials into battery-grade compounds is dominated by China. China currently refines approximately 60% of the world's lithium and is responsible for 90% of global production capacity for battery chemical materials, making it indispensable to the EV supply chain.

With nearly 40% of the 61 suppliers providing refined materials for Tesla's EV batteries being Chinese entities, they source key battery materials and components from several major Chinese suppliers in the MSCI EM index. Ganfeng Lithium (Ganfeng), the world's largest producer of lithium metals and China's top lithium compounds manufacturer, primarily supplies Tesla with lithium hydroxide, a vital product in EV batteries. Similarly, Zhejiang Huayou Cobalt (Huayou) provides Tesla with ternary precursors essential for lithium ion batteries. Both of these materials are essential for achieving higher energy density in batteries, which in turn contributes to longer ranges for EVs.

When examining the most recent sustainability reports of both Ganfeng Lithium and Zhejiang Huayou Cobalt, similarities emerge, particularly in the environmental impact of their mineral-to-chemical refining stages. In terms of waste generation, both companies attribute large amounts of their solid waste to activities that remove impurities and by-products. As for carbon emissions, the refining processes at both firms are highly energy-intensive, requiring sustained high-temperature chemical reactions which in turn generate significant greenhouse gas emissions. For Ganfeng, refining is also the primary driver of high water usage.

due to processes like leaching, crystallization, and washing. Huayou also highlights that its use of hydrometallurgy, which relies on aqueous solutions to extract metals, contributes significantly to water use.

Furthermore, the environmental intensities of both companies are markedly higher than Tesla's across all three key performance indicators. In terms of water withdrawal, both Ganfeng and Huayou report intensities that are both roughly 60 times greater than Tesla's. For carbon emissions, Ganfeng's emissions intensity is more than 65 times higher, while in terms of waste generation, Huayou's intensity exceeds Tesla's by over 50 times. These impacts are not properly considered by looking solely at Tesla's direct reporting.

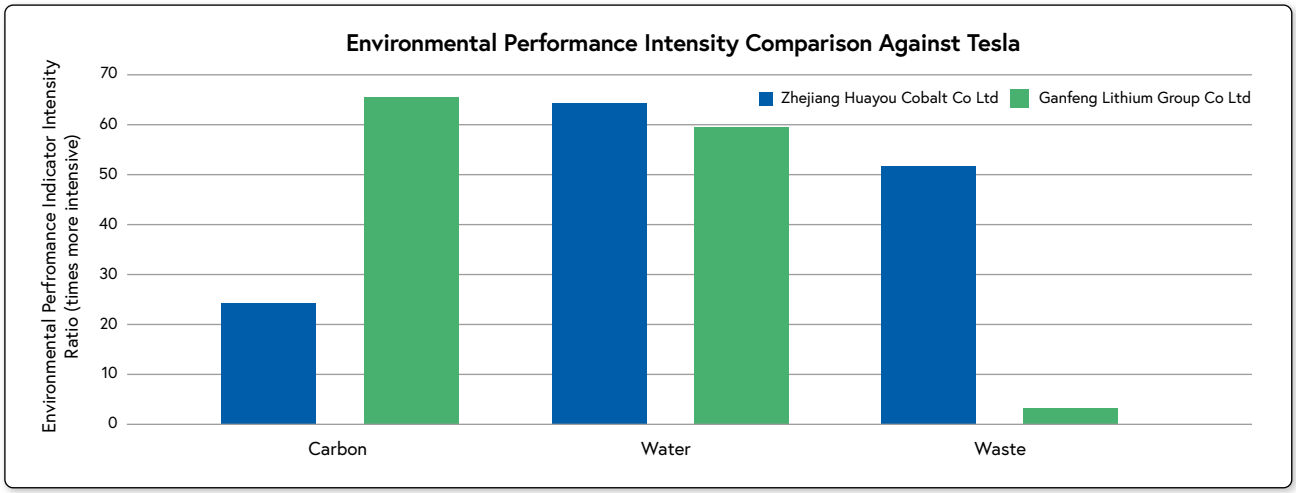

Figure 2: Osmosis IM, May 2025

Batteries

As batteries are central to powering EVs, their efficiency and longevity are critical. One of the most significant players in Tesla's supply chain is Contemporary Amperex Technology Co. Limited (CATL), the world's largest EV battery producer, involved in lithium mining and electric vehicle battery manufacturing. CATL and Tesla work together to develop fast charging battery technology and the former is a key supplier of batteries to Tesla's Shanghai Gigafactory.

The Shanghai Gigafactory is of particular note as it is one of the only wholly owned foreign automakers in China, as previously foreign firms were only allowed to have such facilities through joint ventures. The facility has the capacity to produce over 950,000 vehicles annually and functions as a key distribution hub for the growing Asian EV customer base. It also plays a strategic role, given Tesla's reliance on suppliers across China and the broader Asia-Pacific region. Several of these suppliers, also listed in the MSCI Emerging Markets Index, maintain direct supply relationships with the facility.

South Korea also plays a crucial role in Tesla's battery supply strategy, through its partnerships with LG Chem and LG Energy Solution. LG Chem, initially brought on to supply batteries for the Shanghai Gigafactory, has since expanded its role to support production in Berlin. Meanwhile, LG Energy Solution, a dedicated battery manufacturer subsidiary of LG Chem and also an MSCI Emerging Market constituent, entered a six-year agreement with Tesla in 2024. This partnership is focused on supplying battery components and jointly advancing Tesla's 4680 battery technology, which promises faster charging, improvements in vehicle range and overall efficiency.

A review of these companies' sustainability reports reveals that their environmental impacts closely mirror those of firms focused on battery materials refinement. For CATL, the primary sources of carbon emissions stem from its high energy consumption in the systems used for electrode production and cell assembly. Waste generation is mainly driven by scrap metals and production materials as high precision requirements result in large by-products, while water usage is predominantly linked to equipment cleaning and purification processes, and leads to CATL having an intensity based footprint almost 1800 times higher than that of Tesla.

Semiconductors

Tesla's supplier network for semiconductors plays a critical role in enabling its advanced self-driving and power management capabilities. While Tesla manufactures some of its own chips, it relies heavily on a network of key semiconductor partners to support its Full Self-Driving (FSD) initiatives and battery systems. Notably, NVIDIA, a major U.S.-based chip designer, collaborates with Tesla on autonomous vehicle technology by supplying AI-focused chips that process sensor data to power autopilot and self-driving functions.

Although NVIDIA designs the chips, it outsources manufacturing to companies like Taiwan Semiconductor Manufacturing Company (TSMC) and SK Hynix in South Korea, both of which are identified by Bloomberg as key suppliers, and both contribute significantly to the environmental footprint due to their manufacturing operations. The environmental footprint of semiconductor manufacturing is exceptionally large. In addition to the significant carbon emissions driven by high energy consumption, certain production processes, like etching, release greenhouse gases with extremely high global warming potential (GWP). Moreover, the manufacturing process requires vast amounts of ultra-pure water for chip cleaning leading to large water usage, which itself is also highly energy-intensive to produce.

Mechanical Part Manufacturing

Whilst Tesla does have its own mechanical part manufacturing capabilities, it also includes partnerships with major global players like Samsung Electronics and Huayu Automotive Systems for these processes. Samsung Electronics, based in South Korea, is one of the world's largest appliance and consumer electronics companies, and contributes mechanical parts to Tesla's operations. Beyond manufacturing, it was announced in late July 2025 that Samsung Electronics won an 8-year, $16.5bn contract to produce Tesla's next generation of custom artificial intelligence chips for Tesla's new manufacturing facility in Texas, part of the $40bn investment Samsung has made in the plant. In addition, Samsung has partnered with Tesla on its SmartThings Energy platform, allowing users to monitor energy production and consumption. Tesla and Samsung Electronics are also exploring further collaboration in green technologies, including vehicle automation and energy management systems.

Meanwhile, Huayu Automotive Systems, also a key supplier to Tesla's Shanghai Gigafactory, provides a wide range of mechanical and interior components, such as doors, seats, and battery boxes. The company has made substantial investments in mainland China and Hong Kong, establishing dedicated facilities to serve Tesla's production needs.

Entities involved in mechanical part manufacturing typically have substantial environmental footprints. A major contributor to waste is the large volume of scrap metal generated, particularly from aluminium, steel, and iron, during cutting, casting, and machining processes. Greenhouse gas emissions are also significant, as key operations such as welding are highly energy-intensive, relying heavily on electricity and fossil fuels. Additionally, water usage is considerable, driven by the use of cooling water, as well as by surface treatment processes like rinsing.

Uncovering hidden supply chain impact

For Tesla, outsourcing critical processes such as material refinement, semiconductor manufacturing, and mechanical component production enables cost reduction and access to high-quality materials. While Tesla discloses data on its direct emissions, water withdrawal, and waste generation, many of the most environmentally intensive stages of production, particularly refinement and semiconductor fabrication, are carried out by third-party suppliers in regions with less stringent environmental regulations. Accounting for only Tesla's direct environmental impact does not accurately reflect the activities of its many suppliers.

As the world transitions towards a low-carbon economy, it is increasingly important to adopt a more comprehensive approach to environmental responsibility by including the upstream impacts of outsourced activities. As a focus on the direct environmental impacts of DM entities alone fails to account for the footprint of overseas suppliers, Osmosis' expansion into the EM allows us to begin to account for the companies that shoulder the largest burden of emissions and environmental degradation across the entire economy. By broadening our universe to include these EM companies, we seek to encourage positive, innovative environmental practices across each region and sector. Expanding the whole-economy solution to a global economy solution takes these environmental impacts into account.

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The MSCI World Index captures large and midcap representation across 23 Developed Markets countries. With 1,645 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in each country.

The MSCI Emerging Markets Index captures large and mid cap representation across 24 Emerging Markets (EM) countries. With 1,440 constituents, the index covers approximately 85% of the free float-adjusted market capitalization in each country.

CFA
The Chartered Financial Analyst ("CFA") designation is issued by the CFA Institute. CFA candidates must meet one of the following requirements: (1) undergraduate degree and four years of professional experience involving investment decision-making, or (2) four years qualified work experience (full time, but not necessarily investment- related). To receive the CFA designation, candidates must complete the CFA Program which is organized into three levels, each requiring 250 hours of self-study and each culminating in a six-hour exam. There are no ongoing continuing education or experience thresholds necessary to maintain the CFA designation. More information about the designation is available at https://www.cfainstitute.org.

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