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Evaluating the Consistency of Companies' Decarbonisation Targets in Critical Sectors

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Abstract

This study examines the consistency of corporate decarbonisation targets by comparing target-based projections with recent historical emission trends and capital expenditure-based (CapEx-based) projections across eight climate-critical sectors: Airlines, Aluminium, Automobiles, Cement, Electricity, Oil and gas, Shipping, and Steel.

The analysis combines company-disclosed information with a unique dataset of estimated emissions based on current and planned investments, benchmarked against the International Energy Agency's Net Zero Emissions scenario. Results reveal an important ambition-credibility gap: although corporate targets may approximate scenario-consistent pathways, and ambitious targets are associated with more rapid decarbonisation, they appear highly ambitious relative to both recent historical performance and CapEx-based projections. This gap is particularly pronounced in absolute emissions, as many firms reduce emission intensity while sustaining or expanding production, thereby limiting the aggregate climate impact of target achievements.

Key Takeaways

- Corporate emission reduction targets often approximate net-zero-consistent trajectories but remain substantially more ambitious than both recent historical performance and CapEx-based projections.

- The ambition–credibility gap is particularly pronounced in absolute emissions, where many firms reduce carbon intensity but sustain or expand production, limiting the aggregate climate impact of their targets. Misalignments are most severe in steel, oil and gas, and shipping, while electricity and automobiles display partial convergence with scenario pathways.

- Investors should anchor stewardship strategies to capital-expenditure plans, and regulators should mandate standardised disclosure of historical intensity trends and sector-specific physical indicators.

Keywords: Corporate decarbonisation targets, Sustainable investment, Transition pathways, Portfolio alignment

JEL codes: G11, G23, Q54.

Introduction

Introduction

The credibility of corporate decarbonisation strategies and targets is a central concern for both public authorities and financial institutions. For policymakers, corporate decarbonisation constitutes a key lever both for achieving nationally determined contributions (NDCs) under the Paris Agreement and for establishing competitiveness across existing and emerging clean technologies. Firms contribute to national climate objectives through both their direct emissions and the downstream effects of their products and services, notably by decarbonising energy systems, industrial processes, and transport infrastructures.

In parallel, investors - whose capital is indispensable to financing the low-carbon transition - are increasingly required to consider corporate emission-reduction targets in their investment decisions. In the European Union, this integration is encouraged through enhanced transparency obligations on the environmental performance of financial products (Regulation (EU) 2019/2088, the Sustainable Finance Disclosure Regulation), the classification of environmentally sustainable activities (Regulation (EU) 2020/852, the EU Taxonomy), and the introduction of climate benchmarks requiring explicit decarbonisation trajectories (Regulation (EU) 2019/2089, the EU Benchmark Regulation). More recently, the European Banking Authority's (EBA) near-final Pillar 3 disclosure framework on ESG risks has extended this logic to the banking sector. The framework mandates large credit institutions to disclose Performance, Exposure, and Impact (PEI) indicators that quantify their financed emissions, sectoral exposures, and the alignment of counterparties' transition plans with reference to climate scenarios (EBA, 2022).

Despite these converging regulatory and market incentives, a widening gap persists between collective climate commitments and actual emission trajectories. Global greenhouse gas emissions reached 57.4 billion tonnes of carbon dioxide-equivalent ($GtCO_2e$) in 2023, a record high. To align with a 1.5 °C pathway, emissions must decline by 42% by 2030 relative to 2019 levels. Yet, under current policies, 2030 emissions are still expected to be around 55 $GtCO_2e$, even assuming full implementation of all unconditional NDCs. This trajectory would result in an estimated global average temperature rise of about 2.6–2.8 °C by 2100, with profound consequences for the sustainability of human and non-human life. Expressed in cumulative terms, the remaining carbon budget consistent with a 50% probability of staying below 1.5 °C is now estimated at 200 $GtCO_2e$, equivalent to approximately five years of current global emissions at current rates, while the 2°C budget amounts to about 900 $GtCO_2$, corresponding to about 18 years (UNEP, 2024).

At the corporate level, a growing body of evidence reveals that announced net-zero pledges generally fall short of credible, science-based mitigation strategies. As shown by Hausfather and Peters (2021), corporate commitments tend to lack near-term milestones, rely excessively on future technological breakthroughs or offsets, and omit clear disclosure of Scope 3 emissions. Detailed analyses by Arnold and Toledano (2021) further indicate that among major emitters across seven hard-to-abate industries, fewer than half have set short-term emission-reduction targets, only one-third disclose absolute (rather than intensity-based) goals, and barely 17% integrate decarbonisation criteria into capital-expenditure planning. Moreover, the widespread use of offsets and unverified carbon-capture

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strategies enables firms to appear on track toward "net zero" without materially reducing their operational or value-chain emissions.

These shortcomings raise a central question: how credible are corporate decarbonisation targets when confronted with observable evidence on past performance and investment behaviour? Addressing this question requires bridging the gap between corporate disclosure and real-economy indicators of transition readiness. This paper seeks to quantify the credibility of corporate decarbonisation targets by jointly considering three complementary dimensions: (i) recent historical emission performance; (ii) target-based projections derived from disclosed corporate commitments; and (iii) CapEx-based trajectories inferred from asset-level data on current and planned capital expenditures.

The analysis reveals two main trends. The first is a significant overall ambition–credibility gap between company pledges and what either historical trends or forward-looking investment plans imply. The second is differences in the size and significance of this gap across firms within a given sector.

While many targets appear consistent with net-zero pathways in terms of emission intensity, they are rarely matched by corresponding capital reallocation, and absolute emissions frequently remain off-track due to sustained or rising output. The discrepancy is most pronounced in the steel, oil and gas, and shipping sectors, while the electricity and automobile sectors show partial convergence with scenario benchmarks.

Two key implications follow. The first is that neither companies' targets nor historical performance are reliable indicators of future investment in decarbonisation overall. The second is that they are better indicators for some companies than others: intra-sector variation in the ambition-credibility gap shows that some firms' investment plans more closely reflect their commitments, while for others they are highly divergent.

For investors and lenders, this means that while emissions target-setting can be a signal of the intention to decarbonise, robust and credible alignment assessment requires a critical evaluation of the firm's realistic mitigation strategies. Engagement should therefore move beyond target validation to systematically challenge the alignment between decarbonisation objectives and capital-expenditure trajectories. For regulators, credibility assessment hinges on standardised disclosure of multi-year historical data and harmonised definitions of physical intensity metrics among critical sectors, ensuring consistent treatment of scopes, greenhouse gases, and production measures.

The rest of this paper is structured as follows. Section 1 describes the data sources, sample construction, and empirical framework. Section 2 presents cross-sector and sector-specific results comparing historical, target-based, and CapEx-based trajectories. Section 3 concludes by discussing implications for investors and policymakers and outlining avenues for further research.

1. Data and Model

1. Data and Model

This section sets out the empirical framework used to assess the consistency of corporate decarbonisation targets. Subsection 1.1 describes the company-level data sources and sectoral scenario benchmarks. Subsection 1.2 details the construction of the sample of 160 firms. Subsection 1.3 outlines the statistical procedures used to compare emissions trends derived from targets, historical performance, and investment plans.

1.1 Data

Company data

The empirical analysis integrates four complementary sources for companies. Historical absolute emissions are compiled at the company level for 2019–2023 using Asset Impact's company-level dataset, which is constructed bottom-up from asset-level capacity and activity; and that of ISS, which relies on reported emissions. Historical emissions intensities over the same period are obtained from Asset Impact and Moody's datasets, expressed as emissions per unit of physical output. Target-based projections combine absolute-emission targets from ISS climate data with intensity trajectories from Moody's Temperature Alignment dataset, which extrapolates future intensities from stated reduction targets.

CapEx-based projections are produced by Asset Impact from forward-looking asset-level capacity, activity, technology choices, and announced capital expenditures. This forecasting methodology, which varies in its specifics by sector, takes an evidence-based approach by integrating only confirmed actions – such as asset retirements or capacity additions – into its projections. For instance, if a power generation utility sets a target of 6 GW of new solar capacity by 2028, but the evidence shows only 2 GW is under development by 2029, Asset Impact's projections reflect the latter figure and timeline, which is updated over time in response to updated information. Activity data is subsequently transformed into absolute emissions by applying models resolved at the asset level, then used to derive sector-level physical emissions intensities. This yields prospective activities, emissions and intensities implied by the existing and planned physical asset base, independently of corporate pledges.

Scenario

Sector-specific benchmarks are derived from the International Energy Agency (IEA) Net Zero Emissions by 2050 (NZE) scenario, as presented in the World Energy Outlook 2023 (IEA, 2023). The NZE scenario charts a pathway to limiting global warming to 1.5°C, requiring global emissions to decline by roughly 45% by 2030 relative to 2010 levels. It specifies sectoral decarbonisation rates and technology deployment pathways across electricity generation, transport, industry, and heavy materials, and serves as the reference point for assessing the ambition of corporate trajectories.

1.2 Sample Construction

The sample comprises the 20 largest listed producers by sectoral output across eight carbon-intensive industries: airlines, aluminium, automobiles, cement, electricity, oil and gas, shipping, and steel. The share of global production represented by these companies is detailed in Table 1. Note that while

1. Data and Model

this may well introduce a sample bias weighted towards larger companies, the purpose of this analysis is not to conduct robust statistical inference testing, nor are the source datasets suitable for this purpose given the differences in the approaches they use.

Table 1: Sectors covered in this analysis

Sector	Emissions (scope)	Activity Unit	No. of companies	Share of global activity in sample
Oil and gas	CO_2e (1+2+3)	TJ	20	42%
Electricity	CO_2 (1)	kWh	20	15%
Cement	CO_2 (1)	t cement	20	25%
Steel	CO_2 (1+2)	t steel	20	26%
Aluminium	CO_2 (1+2)	t aluminium	20	48%
Automotive	CO_2 (3 downstream)	pkm	20	82%
Shipping	CO_2 (1)	tkm	20	43%
Airlines	CO_2 (1)	pkm	20	70%

Notes: Activity units are defined as follows. TJ (terajoules) denotes the quantity of energy produced (upstream oil and gas sector). kWh (kilowatt-hours) refers to electricity generated. t cement, t steel, t aluminium indicate one metric tonne of cement, crude steel, and primary aluminium produced, respectively. pkm (passenger-kilometres) represents one passenger transported over one kilometre (automotive and airlines). tkm (tonne-kilometres) denotes one tonne of cargo transported over one kilometre (shipping).

When 2030 data were unavailable, 2029 values were used. Historical growth rates are computed as the compound annual growth rate over 2019–2023. For historical series where both Asset Impact and Moody's/ISS data are available, a simple average of the two sources is used. Because Asset Impact's asset-based methodology and ISS/Moody's reporting-based approaches differ significantly in system boundaries, underlying assumptions, consolidation methodologies and coverage, absolute emission levels are not directly comparable. Consequently, this study focuses on emission trends (growth rates) rather than absolute values.

1.3 Statistical tests

Differences in trends between target-based, CapEx-based, and historical projections are evaluated using Wilcoxon signed-rank tests on paired firm-level observations. This non-parametric procedure is appropriate given: (i) the small to moderate sample sizes within sectors; (ii) potential non-normal distributions of firm-level trend estimates; and (iii) the natural pairing of methods within the same firm.

Pairwise hypotheses are specified for each sector and metric (intensity and absolute): targets vs history, and targets vs investments. For each comparison, the null posits a zero median of the paired difference in trends.

2. Results

2. Results

2.1 Cross-Sector Overview

Across the full sample, two consistent patterns emerge. First, target-based trajectories are systematically more ambitious than historical performance. Second, CapEx-based trajectories are consistently less ambitious than targets, suggesting that current capital allocation is insufficient to deliver the announced reductions.

This "ambition-credibility gap" is evident across both absolute and intensity metrics (Table 2a). When restricting the sample to companies with explicit targets, the gap widens further. Firms with targets show significantly steeper reductions in target-based projections relative to historical performance, but CapEx-based projections still lag substantially (Table 2b). This suggests that while target-setting firms appear to be decarbonising more rapidly than their peers, they are not necessarily allocating capital differently or with significantly greater ambition as a result.

Table 2: Average trends by sector
a) All sample (160 firms)

		Absolute Emissions			Intensity Emissions		
Sector	Count	Target-Based	Historical	CapEx-Based	Target-Based	Historical	CapEx-Based
Airlines	20	-2.2%	+7.6%	+1.5%	-2.8%	-0.2%	-0.1%
Aluminium	20	-1.4%	+5.5%	-0.8%	-5.1%	-1.7%	+0.6%
Autos	20	-4.2%	-2.9%	-3.7%	-4.3%	-4.4%	-4.6%
Cement	20	-1.2%	+4.9%	+0.4%	-2.1%	-0.4%	+0.0%
Electricity	20	-4.0%	-3.6%	-2.0%	-8.0%	-2.6%	-2.7%
Oil and Gas	20	-0.7%	+4.6%	+1.4%	-0.6%	-0.3%	+0.0%
Shipping	20	-1.5%	+0.5%	+2.7%	-2.6%	-0.8%	+0.6%
Steel	20	-1.1%	+3.0%	+1.3%	-2.6%	-1.4%	-0.3%
All Universe	**160**	**-2.0%**	**+2.5%**	**+0.2%**	**-3.3%**	**-1.5%**	**-0.7%**

b) Companies with ambitious reduction targets (83 firms)

		Absolute Emissions			Intensity Emissions		
Sector	Count	Target-Based	Historical	CapEx-Based	Target-Based	Historical	CapEx-Based
Airlines	13	-3.4%	+8.1%	+1.6%	-3.7%	-0.8%	+0.0%
Aluminium	10	-2.0%	+0.0%	-0.3%	-5.2%	-2.0%	+0.8%
Autos	16	-4.8%	-3.3%	-4.9%	-5.0%	-3.0%	-5.2%
Cement	13	-1.6%	+2.7%	+0.6%	-2.3%	-0.6%	+0.0%
Electricity	12	-6.6%	-4.4%	-3.8%	-9.2%	-3.5%	-3.6%
Oil and Gas	6	-1.6%	+1.3%	+0.9%	-1.7%	-0.6%	+0.2%
Shipping	5	-2.7%	-0.9%	+2.3%	-4.4%	-0.9%	+0.3%
Steel	8	-1.9%	+3.3%	+1.2%	-2.9%	-1.3%	+0.0%
All Universe	**83**	**-3.3%**	**+0.8%**	**-0.8%**	**-4.5%**	**-1.8%**	**-1.3%**

Notes: Target-based trends reflect annualised changes in emissions or emission intensities implied by companies' stated reduction targets. Historical trends correspond to observed compound annual growth rates over 2019–2023 based on reported or asset-level emissions. CapEx-based trends represent projected emissions trajectories derived from forward-looking asset capacities and capital expenditure, independent of stated climate pledges. Negative values indicate declining emissions, whereas positive values indicate increasing emissions.

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Statistical tests confirm that differences between historical, target-based, and CapEx-based trajectories are significant at conventional levels across most sectors, particularly in intensity metrics (Table 3).

Table 3: Statistical differences by sector
a) All sample (160 firms)

		Absolute Emissions		Intensity Emissions	
Sector	Count	Target-Based vs Historical	Target-Based vs CapEx-Based	Target-Based vs Historical	Target-Based vs CapEx-Based
Airlines	20	-9.8% ***	-3.7% ***	-2.6% ***	-4.4% ***
Aluminium	20	-6.9% ***	-0.6%	-3.1% ***	-4.6% ***
Autos	20	-1.6%	-1.0%	+0.2%	-0.3%
Cement	20	-6.1%	-1.6% ***	-1.3% ***	-2.7% ***
Electricity	20	-0.3%	-2.3%	-4.4% ***	-4.9% **
Oil and Gas	20	-5.3% ***	-2.1% ***	-0.3% *	-2.0%***
Shipping	20	-2.0%	-4.2% ***	-1.3% *	-4.8% ***
Steel	20	-4.1% *	-2.3% ***	-1.3% ***	-4.2% ***
All Universe	**160**	**-4.6% *****	**-2.3% *****	**-1.6% *****	**-3.1%*****

b) Companies with ambitious reduction targets (83 firms)

		Absolute Emissions		Intensity Emissions	
Sector	Count	Target-Based vs Historical	Target-Based vs CapEx-Based	Target-Based vs Historical	Target-Based vs CapEx-Based
Airlines	13	-11.5% ***	-5.0% ***	-2.9% ***	-5.4% ***
Aluminium	10	-2.0%	-1.7% **	-2.8% **	-4.7% **
Autos	16	-1.5%	-0.6%	-2.0% ***	+0.1%
Cement	13	-4.3%	-2.2% ***	-1.5% ***	-3.0% ***
Electricity	12	-1.7%	-2.6%	-5.1% ***	-5.3% **
Oil and Gas	6	-2.9%	-2.5% *	-1.0% **	-2.6% **
Shipping	5	-1.8%	-5.0% *	-3.2%	-6.5%
Steel	8	-5.2%	-3.1% ***	-1.5% ***	-4.1% ***
All Universe	**83**	**-4.1% *****	**-2.6% *****	**-2.6% *****	**-3.6% *****

Notes: Values report the mean difference in annual emission (or emission intensity) trends between methodologies, expressed in percentage points. Statistical significance is assessed using Wilcoxon signed-rank tests, which evaluate whether the median of paired differences differs from zero ($p < 0.10$; ** $p < 0.05$; *** $p < 0.01$). Negative values indicate that target-based decarbonisation rates are more ambitious than historical or CapEx-based trajectories.*

Beyond these average differences, the dispersion of results across firms within each sector is considerable. The interquartile ranges reveal pronounced heterogeneity in both the level and direction of decarbonisation trajectories (Table 4). This variability indicates that sectoral averages conceal a wide diversity of individual firm behaviours. Notably, the electricity and automotive sectors – two of the most aligned on average with transition objectives – also exhibit among the highest within-sector dispersion. This combination of apparent alignment and substantial heterogeneity highlights that aggregate progress may mask divergent firm-level pathways, calling for a granular and firm-specific assessment by investors when allocating capital within these sectors.

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Table 4: Heterogeneity within sectors
a) Absolute emissions

Method	Sector	Count	Mean.	Std. Dev.	Med.	Min.	Q1	Q3	Max.	Q3-Q1
Target-Based	Airlines	20	-2.2%	2.3%	-2.1%	-6.8%	-4.0%	0.0%	0.0%	4.0%
	Aluminium	20	-1.4%	2.0%	-0.2%	-6.4%	-2.1%	0.0%	0.0%	2.1%
	Autos	19	-4.2%	3.9%	-4.2%	-15.8%	-6.2%	-0.5%	0.0%	5.8%
	Cement	20	-1.2%	1.6%	-0.2%	-4.6%	-2.4%	0.0%	0.0%	2.4%
	Electricity	19	-4.0%	5.7%	-2.9%	-19.1%	-4.0%	0.0%	0.0%	4.0%
	Oil and Gas	20	-0.7%	1.4%	0.0%	-4.2%	-0.6%	0.0%	0.0%	0.6%
	Shipping	20	-1.5%	1.6%	-0.7%	-3.9%	-2.9%	0.0%	0.0%	2.9%
	Steel	20	-1.1%	1.5%	-0.1%	-4.7%	-2.3%	0.0%	0.0%	2.3%
Historical	Airlines	20	7.6%	3.8%	6.4%	2.5%	4.5%	11.4%	13.7%	6.9%
	Aluminium	20	5.5%	10.0%	2.6%	-10.6%	-1.8%	14.6%	24.4%	16.4%
	Autos	20	-2.9%	10.1%	-4.6%	-11.8%	-8.8%	-2.3%	33.6%	6.5%
	Cement	20	4.9%	12.2%	-1.2%	-6.1%	-2.8%	7.5%	32.7%	10.3%
	Electricity	20	-3.6%	8.0%	-2.1%	-31.5%	-4.9%	0.7%	6.4%	5.6%
	Oil and Gas	20	4.6%	8.7%	4.2%	-7.9%	-1.4%	7.8%	25.8%	9.2%
	Shipping	20	0.5%	13.1%	0.7%	-36.2%	-3.8%	4.0%	37.0%	7.9%
	Steel	20	3.0%	9.1%	2.6%	-10.0%	-1.8%	4.9%	33.7%	6.7%
Capex-Based	Airlines	20	1.5%	0.6%	1.5%	0.2%	1.1%	1.8%	2.6%	0.6%
	Aluminium	20	-0.8%	1.6%	-0.5%	-4.2%	-1.5%	0.0%	1.9%	1.5%
	Autos	18	-3.7%	5.0%	-3.9%	-11.4%	-6.4%	-1.3%	9.7%	5.2%
	Cement	20	0.4%	0.6%	0.0%	0.0%	0.0%	0.8%	1.6%	0.8%
	Electricity	19	-2.0%	3.2%	-2.0%	-8.9%	-3.8%	0.5%	3.3%	4.3%
	Oil and Gas	20	1.4%	1.5%	1.3%	-0.9%	0.1%	2.2%	5.2%	2.1%
	Shipping	20	2.7%	2.4%	2.4%	0.0%	0.9%	3.6%	8.9%	2.7%
	Steel	20	1.3%	2.3%	0.3%	-0.3%	0.0%	1.1%	8.1%	1.1%

b) Emissions Intensity

Method	Sector	Count	Mean.	Std. Dev.	Med.	Min.	Q1	Q3	Max.	Q3-Q1
Target-Based	Airlines	19	-2.8%	2.2%	-3.3%	-7.8%	-3.6%	-0.6%	0.0%	3.0%
	Aluminium	10	-5.1%	2.2%	-5.2%	-9.1%	-5.9%	-4.3%	-0.7%	1.6%
	Autos	19	-4.3%	2.6%	-4.0%	-8.8%	-6.6%	-3.1%	0.0%	3.5%
	Cement	11	-2.1%	1.1%	-2.0%	-3.5%	-2.7%	-1.8%	0.0%	0.9%
	Electricity	13	-8.0%	5.8%	-7.3%	-19.1%	-11.7%	-3.5%	-1.1%	8.2%
	Oil and Gas	20	-0.6%	0.8%	-0.3%	-2.3%	-1.2%	-0.1%	0.2%	1.1%
	Shipping	14	-2.6%	2.9%	-2.9%	-9.1%	-3.8%	-1.3%	4.7%	2.4%
	Steel	15	-2.6%	1.4%	-2.7%	-5.3%	-3.4%	-2.1%	0.0%	1.3%
Historical	Airlines	20	-0.2%	1.3%	-0.3%	-2.0%	-1.0%	0.4%	2.5%	1.3%
	Aluminium	20	-1.7%	2.6%	-1.6%	-7.1%	-3.5%	0.1%	4.1%	3.7%
	Autos	19	-4.4%	5.8%	-2.8%	-27.3%	-3.6%	-2.2%	-1.2%	1.4%
	Cement	20	-0.4%	0.5%	-0.4%	-1.7%	-0.7%	0.0%	0.0%	0.7%
	Electricity	20	-2.6%	3.2%	-2.6%	-10.5%	-4.0%	-0.8%	3.9%	3.2%
	Oil and Gas	20	-0.3%	0.3%	-0.2%	-1.0%	-0.6%	-0.1%	0.2%	0.5%
	Shipping	20	-0.8%	1.3%	-0.8%	-4.1%	-1.2%	0.3%	0.8%	1.5%
	Steel	20	-1.4%	1.4%	-1.1%	-6.1%	-1.7%	-0.6%	0.0%	1.1%

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Capex-Based	Airlines	20	-0.1%	0.4%	0.0%	-1.1%	-0.2%	0.1%	0.4%	0.3%
	Aluminium	20	0.6%	1.0%	0.5%	-0.9%	-0.1%	1.4%	2.7%	1.5%
	Autos	18	-4.6%	3.3%	-3.7%	-11.7%	-5.9%	-2.6%	0.0%	3.3%
	Cement	20	0.0%	0.1%	0.0%	-0.1%	0.0%	0.0%	0.5%	0.0%
	Electricity	19	-2.7%	2.2%	-2.8%	-8.3%	-3.3%	-0.8%	0.2%	2.5%
	Oil and Gas	20	0.0%	0.1%	0.0%	-0.1%	0.0%	0.1%	0.4%	0.1%
	Shipping	20	0.6%	0.9%	0.6%	-1.1%	0.0%	1.0%	2.3%	1.0%
	Steel	20	-0.3%	1.2%	0.0%	-5.2%	0.0%	0.0%	1.3%	0.0%

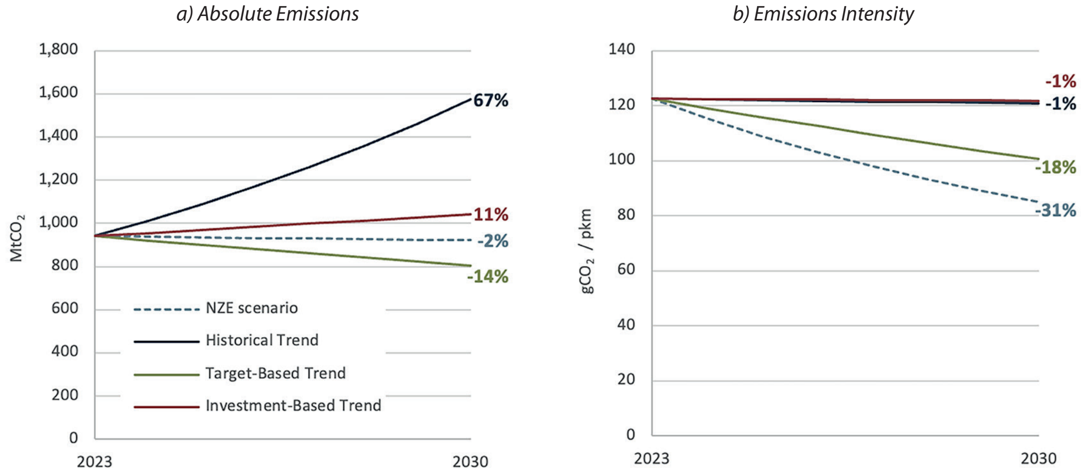
Notes: The interquartile range (Q3 – Q1) is expressed in absolute terms. It represents the difference, for each metric, between the upper quartile (Q3, 75th percentile) and the lower quartile (Q1, 25th percentile). Given that most sectors in the sample include approximately twenty observations, this measure captures the dispersion across the central ten companies of each sector.

2.2 Sector-Specific Results

Airlines

In the aviation sector, the IEA anticipates substantial gains in emissions efficiency driven by advancements in aircraft technology, improved engine performance, sustainable aviation fuels, and enhanced operational practices. These improvements are expected to significantly reduce emissions per unit of output over the coming decades. Nevertheless, aggregate sectoral emissions are projected to remain broadly unchanged, as rising air traffic volumes offset the gains.

Figure 1: Airlines



Notes: This figure presents, for the Airlines sector, the trajectories of absolute emissions (Scope 1) and sectoral emissions intensity (gCO_2/pkm – passenger-kilometres) under alternative assumptions. The starting point for both indicators is derived from the IEA World Energy Outlook 2024. The Net Zero Emissions by 2050 (NZE) scenario trajectory is shown in blue. The historical trend implied by the past emissions of the companies in the sample is shown in orange. The trajectory based on companies' stated reduction targets is displayed in green, while the trajectory inferred from firms' investment capacity is represented in red.

Corporate decarbonisation targets in the airline industry exhibit a mixed degree of consistency with a net-zero pathway. On the one hand, the projected intensity trajectory implied by corporate targets is relatively close to the IEA scenario, suggesting that companies are broadly aligned with the technological and efficiency improvements required to decarbonise the sector on a per-unit basis. However, the comparison with recent historical trends

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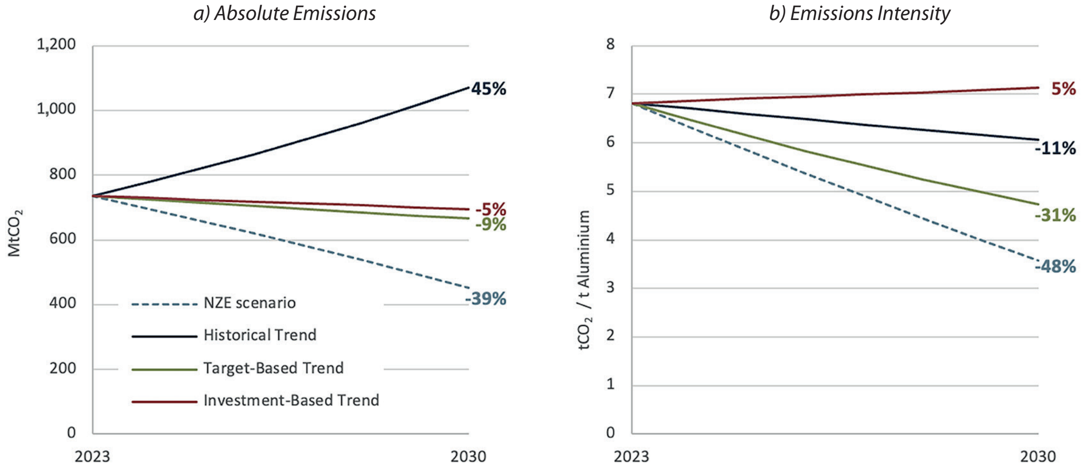
reveals a stark contrast: intensity reductions over the past decade have been insufficient, and the continuation of such trends would place the sector far from the required trajectory. Moreover, an assessment based on current and planned investments suggests that emissions intensity could even rise in the future, reflecting insufficient capital allocation toward low-carbon technologies. When the focus shifts from intensity to absolute emissions, the picture is more nuanced. Target-based and CapEx-based trajectories are broadly consistent with, or even slightly more optimistic than, the scenario benchmark. By contrast, the extrapolation of historical performance presents a markedly different picture, with absolute emissions projected to increase at a much faster pace than the scenario pathway (Figure 1).

Aluminium

In the aluminium sector, the IEA's net-zero pathway envisions rapid efficiency gains stemming from large-scale decarbonisation of electricity inputs, the deployment of inert-anode electrolysis and other process innovations, the electrification and heat-recovery of alumina refining, and an increasing reliance on secondary (scrap-based) production. Consistent with these assumptions, emissions intensity is projected to decline by more than 40% between 2023 and 2030, accompanied by a significant reduction in absolute emissions (Figure 2).

Figure 2: Aluminium



Notes: This figure presents, for the Aluminium sector, the trajectories of absolute emissions (Scope 1+2) and sectoral emissions intensity (tCO_2/t aluminium) under alternative assumptions. The starting point for both indicators is the IEA World Energy Outlook 2024. Scope 2 emissions are estimated by combining electricity consumption data for aluminium with a global average grid factor. The Net Zero Emissions by 2050 (NZE) scenario trajectory is shown in blue. The historical trend implied by the past emissions of the companies in the sample is shown in orange. The trajectory based on companies' stated reduction targets is displayed in green, while the trajectory inferred from firms' investment capacity is represented in red.

Relative to this benchmark, corporate targets indicate a slower yet still substantial decrease in intensity of slightly above 30%, while the continuation of recent historical trends would yield only limited improvements of around 10%, and a CapEx-based trajectory points to an almost stagnant profile with a reduction of less than 6%, perhaps reflecting the relatively high dependency of aluminium production on grid or electricity source decarbonisation to reduce and eliminate Scope 2 emissions. In terms of absolute emissions, the target-based and CapEx-based pathways are expected to contract by about 10% and 5%, respectively, but both remain above the scenario benchmark by 2030, whereas a continuation of historical dynamics would lead to a sharp expansion of more than 45%.

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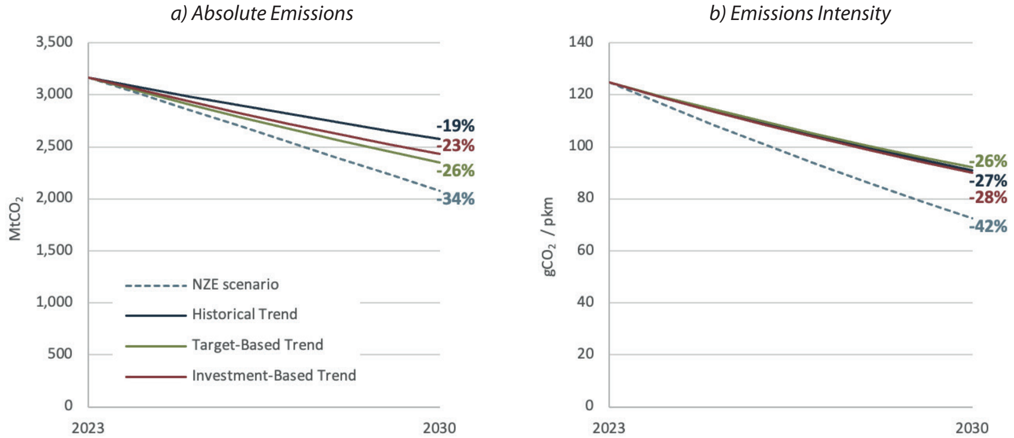
Automobiles

In the automobiles sector, the IEA's Net Zero Emissions pathway is driven primarily by the rapid electrification of light-duty vehicles - electric models are expected to represent roughly two-thirds of global sales by 2030 - alongside continued improvements in fuel efficiency for internal-combustion vehicles and additional gains from lightweighting and aerodynamics. These combined developments underpin a significant reduction in use-phase emissions, with emissions intensity projected to decline by more than 30% between 2023 and 2030 under the NZE scenario (Figure 3).

Figure 3: Automobiles



Notes: This figure presents, for the Automobiles sector, the trajectories of absolute emissions (Scope 3 downstream) and sectoral emissions intensity (gCO_2/pkm - passenger-kilometres) under alternative assumptions. The starting point for both indicators is derived from the IEA World Energy Outlook 2024. The Net Zero Emissions by 2050 (NZE) scenario trajectory is shown in blue. The historical trend implied by the past emissions of the companies in the sample is shown in orange. The trajectory based on companies' stated reduction targets is displayed in green, while the trajectory inferred from firms' investment capacity is represented in red.

Relative to this benchmark, corporate targets indicate a slower but still substantial reduction of around 25%, a pace that is broadly consistent with both CapEx-based and historical trajectories. In terms of absolute emissions, the NZE pathway implies a reduction of about 40% over the same period, compared with declines of roughly 25% under target-based and CapEx-based projections and around 20% under the continuation of historical trends. Overall, the automobiles sector stands out as one of the few where targets, capital allocation, and recent performance are broadly aligned, even if they remain slightly behind the trajectory required to meet a net-zero pathway. Nevertheless, the wide dispersion of firm-level trajectories within the sector (Table 4) underscores that this alignment reflects an average outcome rather than a uniform pattern, with some firms advancing much faster and others lagging behind the transition benchmark.

Cement

In the cement sector, the IEA's Net Zero Emissions pathway relies on a combination of process innovations and demand-side measures, including the substitution of clinker with alternative materials, large-scale deployment of carbon capture and storage, improved kiln efficiency, and the shift to low-carbon fuels. These developments are expected to drive a reduction in emissions intensity of about 25% between 2023 and 2030, alongside a decrease in absolute emissions of the same order of magnitude (Figure 4).

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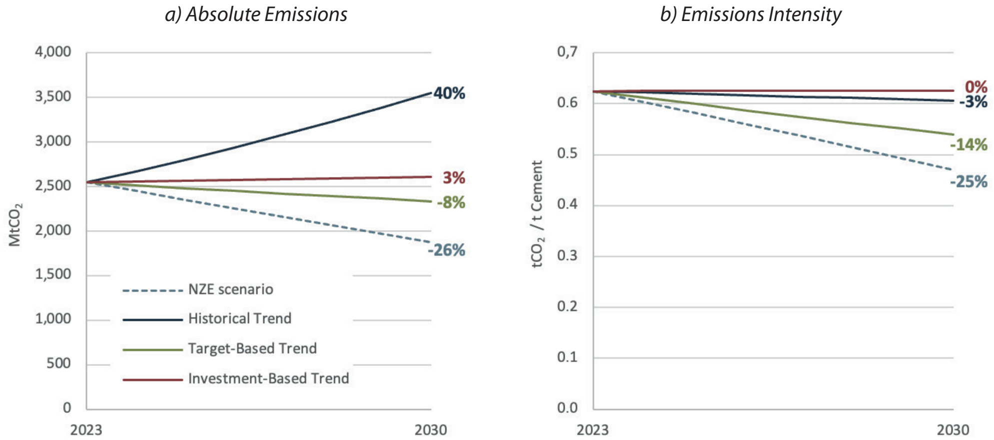
Figure 4: Cement



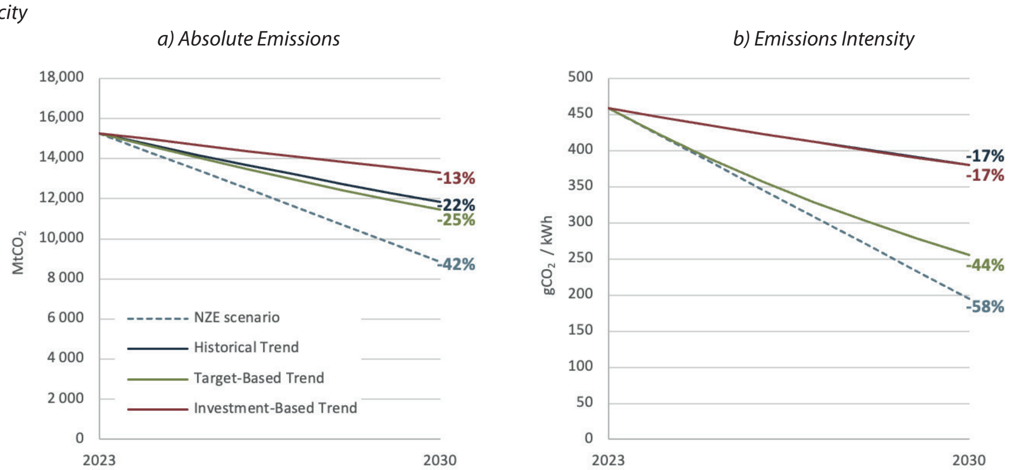
Notes: This figure presents, for the Cement sector, the trajectories of absolute emissions (Scope 1) and sectoral emissions intensity (tCO_2/ t Cement) under alternative assumptions. The starting point for both indicators is derived from the IEA World Energy Outlook 2024. The Net Zero Emissions by 2050 (NZE) scenario trajectory is shown in blue. The historical trend implied by the past emissions of the companies in the sample is shown in orange. The trajectory based on companies' stated reduction targets is displayed in green, while the trajectory inferred from firms' investment capacity is represented in red.

Relative to this benchmark, corporate targets imply a slower decline of intensity of around 15%, while both CapEx-based and historical trajectories show little progress, with intensity falling by less than 5%. In terms of absolute emissions, the target-based pathway achieves a reduction of around 10%, but CapEx-based projections point to constant emissions, and the historical trend suggests a sharp increase. As a result, 2030 emissions remain well above the net-zero benchmark under all three perspectives.

Electricity

In the electricity sector, the IEA's Net Zero pathway hinges on a rapid system transformation: installed renewable capacity is set to triple by 2030, with wind and solar share of global generation roughly doubling to around 30% by the end of the decade, alongside accelerated coal retirements, greater grid flexibility, and rising end-use electrification. These dynamics imply a 60% decline in emissions intensity and a 45% fall in absolute emissions over 2023–2030 (Figure 5).

Figure 5: Electricity



Notes: This figure presents, for the Electricity sector, the trajectories of absolute emissions (Scope 1) and sectoral emissions intensity (gCO_2/ kWh) under alternative assumptions. The starting point for both indicators is derived from the IEA World Energy Outlook 2024. The Net Zero Emissions by 2050 (NZE) scenario trajectory is shown in blue. The historical trend implied by the past emissions of the companies in the sample is shown in orange. The trajectory based on companies' stated reduction targets is displayed in green, while the trajectory inferred from firms' investment capacity is represented in red.

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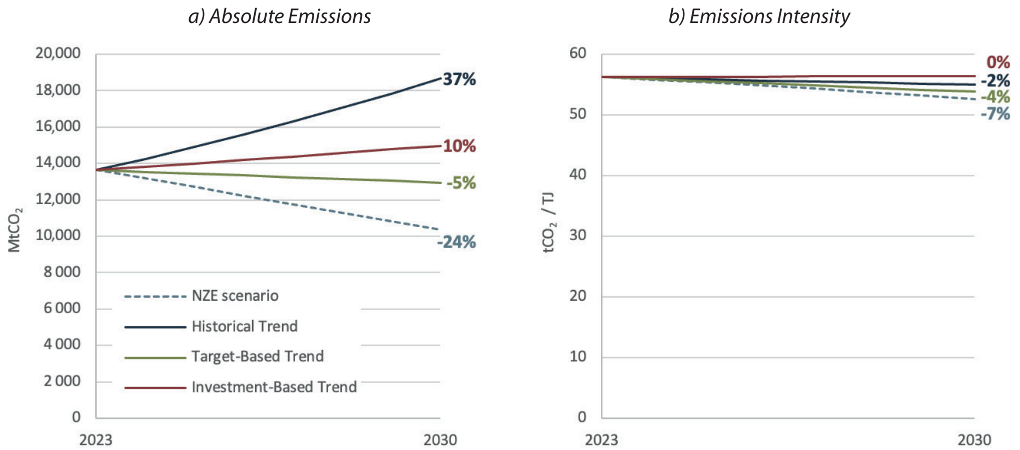
Relative to this benchmark, corporate targets point to a 45% reduction in intensity, while CapEx-based and historical trajectories deliver only 15% declines. In absolute terms, target-based and CapEx-based projections fall by 25% and 13%, respectively, and the continuation of recent historical trends by 25%. Overall, while all three perspectives remain above the NZE benchmark, the gap is noticeably narrower in absolute terms for corporate targets and even for recent history, indicating movement in the right direction; nonetheless, a further acceleration is required to bring the power sector fully onto a net-zero-consistent path. Yet, the power sector exhibits one of the widest intra-sector dispersions across firms, revealing that this aggregate improvement conceals highly uneven transition dynamics among companies (Table 4).

Oil and Gas

In the oil and gas sector, the IEA's net-zero pathway hinges on rapid operational abatement -cutting methane, ending routine flaring by 2030, and electrifying upstream operations -supported by carbon capture at processing and refining sites, together with a sizeable decline in oil and gas demand by 2030. In this framework, emissions intensity falls by about approximately 15% and absolute emissions by about approximately 25% over 2023–2030 (Figure 6).

Figure 6: Oil and Gas



Notes: This figure presents, for the Oil and Gas sector, the trajectories of absolute emissions (Scope 1+2+3) and sectoral emissions intensity (tCO_2e/TJ) under alternative assumptions (Scope 2 emissions are estimated using the energy consumption from electricity of the sector and a global average grid factor, both from WEO data). The starting point for both indicators is derived from the IEA World Energy Outlook 2024. The Net Zero Emissions by 2050 (NZE) scenario trajectory is shown in blue. The historical trend implied by the past emissions of the companies in the sample is shown in orange. The trajectory based on companies' stated reduction targets is displayed in green, while the trajectory inferred from firms' investment capacity is represented in red.

Relative to this benchmark, corporate targets reduce intensity and absolute emissions by about 5%, leaving 2030 outcomes above the scenario. CapEx-based trajectories are markedly off-pace - intensity worsens by about 10% and absolute emissions rise by about 10% - while the continuation of recent history leaves intensity roughly flat but absolute emissions up by about approximately 35%.

Shipping

In the shipping sector, the IEA's net-zero pathway combines stronger efficiency measures (design improvements, operational optimisation) with an early shift to low- and zero-emission fuels. In this context, emissions intensity falls by about 20% and absolute emissions by about 15% over 2023–2030 (Figure 7).

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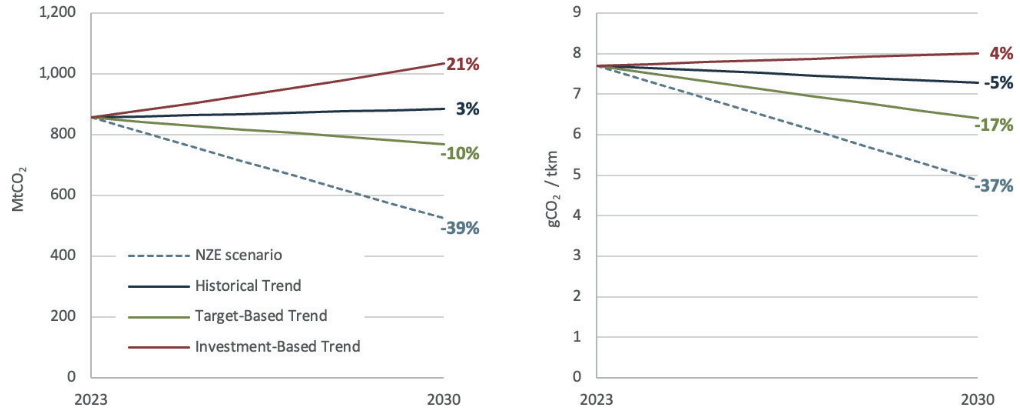
Figure 7: Shipping
a) Absolute Emissions b) Emissions Intensity



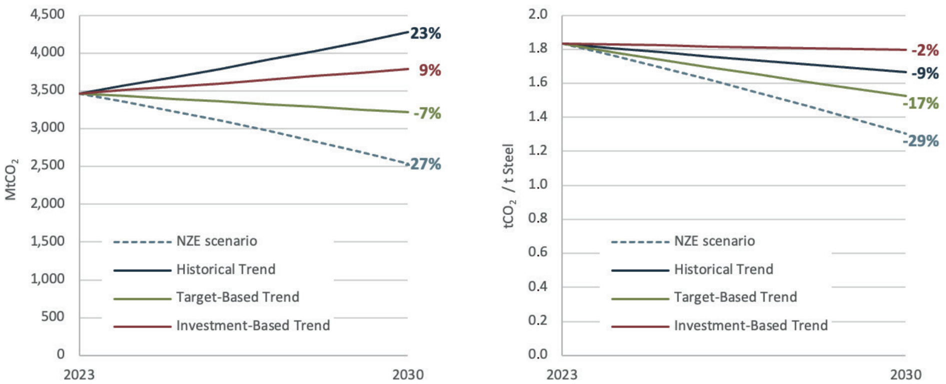
Notes: This figure presents, for the Oil and Gas sector, the trajectories of absolute emissions (Scope 1) and sectoral emissions intensity (gCO_2e/tkm – tonnes-kilometres) under alternative assumptions. The starting point for both indicators is derived from the IEA World Energy Outlook 2024. The Net Zero Emissions by 2050 (NZE) scenario trajectory is shown in blue. The historical trend implied by the past emissions of the companies in the sample is shown in orange. The trajectory based on companies' stated reduction targets is displayed in green, while the trajectory inferred from firms' investment capacity is represented in red.

Relative to this benchmark, corporate targets are close on intensity and in absolute emissions. However, CapEx-based trajectories diverge sharply - intensity and absolute emissions rise by roughly 20%, while the continuation of recent history leaves intensity down approximately 5% but absolute emissions up to approximately 5%, both well above the scenario by 2030.

Steel

In the steel sector, the International Energy Agency's net-zero pathway hinges on a rapid shift away from the conventional blast-furnace–basic-oxygen-furnace route toward lower-emission production systems: a larger share of scrap-based electric-arc furnaces, early deployment of hydrogen-based direct-reduced iron that feeds electric-arc furnaces, application of carbon capture and storage to the remaining blast furnaces, and material-efficiency measures that temper demand growth. Under this framework, emissions intensity declines by about 25% and absolute emissions by about 17% over 2023–2030 (Figure 8).

Figure 8: Steel
a) Absolute Emissions b) Emissions Intensity



Notes: This figure presents, for the Steel sector, the trajectories of absolute emissions (Scope 1+2) and sectoral emissions intensity (tCO_2e/ t Steel) under alternative assumptions. The starting point for both indicators is the IEA World Energy Outlook 2024. Scope 2 emissions are estimated by combining electricity consumption data for steel with a global average grid factor. The Net Zero Emissions by 2050 (NZE) scenario trajectory is shown in blue. The historical trend implied by the past emissions of the companies in the sample is shown in orange. The trajectory based on companies' stated reduction targets is displayed in green, while the trajectory inferred from firms' investment capacity is represented in red.

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Relative to this benchmark, corporate targets point to a drop in intensity of approximately 15% and of 5% in absolute emissions, leaving 2030 levels above the scenario. CapEx-based projections diverge – intensity worsens by approximately 10% and absolute emissions rise by the same order of magnitude – while a continuation of recent history leaves intensity down 10% but absolute emissions up to close from 25%, well above the scenario by 2030.

3. Conclusion

3. Conclusion

This study asked whether listed companies' decarbonisation targets are consistent with (i) recent historical performance; and (ii) the capital-allocation patterns implied by investment plans.

The analysis combined company-reported and asset-based datasets to construct comparable intensity and absolute-emission trajectories for eight climate-critical sectors.

Four results emerge.

- First, target-based trajectories generally approach scenario-consistent intensity paths, but the absolute trajectories implied by those same targets often fall short once production growth is accounted for.
- Second, CapEx-based projections are almost systematically less ambitious than targets, indicating that planned capital stocks and technologies do not, on average, deliver the reductions embedded in target narratives.
- Third, recent historical trends rarely bridge this gap; instead, they tend to mirror CapEx-based paths, reinforcing concerns about feasibility.
- Finally, inter-sectoral heterogeneity is material: misalignment is most pronounced in steel, oil and gas, and shipping, while electricity and automobiles display partial convergence in both intensity and absolute terms. Yet these two sectors also display some of the highest intra-sector dispersion, indicating that apparent alignment at the sectoral level conceals marked differences across firms.

Two sets of practical recommendations follow.

For investors and lenders: (i) condition stewardship on capex–target coherence driven by detailed company-specific credibility analysis; (ii) track physical process indicators (physical intensity and physical production); and (iii) prioritise absolute-emission outcomes where output growth is significant.

For regulators: (i) mandate multi-year historical reported data of sector-relevant intensity;

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Scientific Portfolio has assembled a team with a broad range of expertise and backgrounds, including financial engineering, computer science, sustainable and climate finance, and institutional portfolio and risk management. It proudly carries EDHEC's impactful academic heritage and aspires to provide investors with the technology they need to independently analyse and construct equity portfolios from both a financial and extra-financial perspective.

To achieve this, it offers investors three sources of value through its portfolio analysis & construction platform:

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