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Leonardo Centre on
Business for Society

A BEHAVIOURAL REVOLUTION:

Sustainability actions
that create alpha

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Executive Summary

Rethinking the Finance–Sustainability Link

For more than four decades, one question has dominated research, policy, and practice: *does sustainability pay?* The results have been contradictory. Some studies claim positive correlations between corporate sustainability and financial returns, others report neutral or negative effects. This ambiguity has frustrated investors, regulators, and business leaders alike.

The root of the problem lies in **measurement**. The prevailing reliance on ESG (Environmental, Social, Governance) ratings has produced what has now been referred to as “aggregate confusion”¹:

- ESG scores are **subjectively assessed and opaque** in their assessment and factor weighting methodology
- Consequently, they are **poorly correlated** across providers.
- They are biased toward **disclosure and compliance**, rather than concrete action.
- They **reward what is easy to audit** (commitments, disclosure) while neglecting what matters most: **strategic and behavioural change**.

This report offers a potential breakthrough in this long-standing debate. By shifting the focus from ESG scores to **systematic observation of corporate behaviours**, it provides an objective, data-driven lens to understand how sustainability actions affect both **financial returns and systemic impact**.

The GOLDEN Sustainability Dataset

Our analysis is powered by the **GOLDEN Sustainability Dataset**:

- Over **1,300,000 corporate initiatives** since the mid-1990s.
- Covering **18,000 companies** across all sectors and headquartered in 86 countries.
- Structured via advanced ML/NLP algorithms, classifying initiatives on their **goals (SDGs)**, **behavioural content**, and stakeholder **beneficiaries**.
- Updated regularly on a semi-annual basis.

Each initiative is classified according to their objectives (matching with UN SDGs) and their behavioural content, using a comprehensive taxonomy of 14 type of actions. These were grouped, for analytical reasons, in three macro categories:

1. **Advocacy** – externally oriented, symbolic or philanthropic actions (donations, volunteering, communications).
2. **Preparation** – internal, policy-driven steps (training, measurement systems, incentive structures).
3. **Transformation** – innovation-driven strategic change embedded in products, processes, governance, and value chains.

This taxonomy, grounded in the **Business Impact Maturity (BIM) model**², allows unprecedented granularity: a firm’s **behavioural maturity** can be tracked over time, across sectors, and benchmarked globally.

Key Findings

Maturity Generates Superior Returns

- Companies in the top quartile for **Transformation actions** delivered an avg. **+2.52% annual alpha, or risk-adjusted excess returns** (+38.5% cumulative, 2010–2022).
- **Sharpe ratios** confirm higher risk-adjusted returns (0.753 for high Transformation portfolio vs. 0.640 for the market).
- The analysis of **profitability**, across several measures, confirms the superiority of high Transformation behaviour companies vis-à-vis all other groups.
- **Low Advocacy portfolios** produce similar risk-adjusted returns to high Transformation portfolios, showing that avoiding symbolic “greenwashing” creates value.

By shifting the focus from ESG scores to systematic observation of corporate behaviours, it provides an objective, data-driven lens to understand how sustainability actions affect both financial returns and systemic impact.

¹ See Berg et al. (2023).

² See the Leonardo Centre report on Corporate Sustainability and Shareholder Returns: The Role of Business Impact Maturity.

ESG Ratings Miss the Mark

- ESG scores are **positively correlated** with Preparation initiatives (training, risk management).
- These same initiatives show **little or no impact on profitability and stock returns**.
- The result: ESG-driven portfolios systematically misallocate capital, overweighting procedural compliance and risk-management, while underweighting transformative innovation.

A New Generation of Sustainability Indicators

Behavioural indicators outperform ESG ratings across four dimensions:

Dimension	ESG Ratings	Behavioural Indicators
Methodology	Qualitative, subjective assessment, opaque weighting, highly inconsistent across evaluators	Quantitative, based on >1M systematically categorised observable actions
Granularity	Composite firm-level aggregates	Firm × Action resolution
Performance	Weak correlation with fundamentals. Inversely related to returns, since risk-minimization focused.	High Transformation actions associated with higher profitability and abnormal, risk-adjusted, returns (alpha+2.52% annually)
Coverage	Limited, labour-intensive	Global, scalable, automated

Finance Holds Untapped Systemic Agency

The **Impact Finance Maturity Model (IFMM)** extends the behavioural lens to the financial sector. It positions institutions along two axes:

- **Institutional Influence:** from passive investors to majority owners.
- **Strategic Depth:** from ESG compliance to systemic transformation.

This framework empowers financial institutions to evolve from passive allocators of capital to **agents of systemic change**. The findings on abnormal risk-adjusted returns for specific corporate actions motivates and directs this evolution.

Market Snapshot of Financial Institutions

The financial sector commands resources on a scale that dwarfs global GDP and the SDG financing gap:

- **Commercial Banks:** \$410T in assets (~4x global GDP).
- **Asset Managers:** \$128T AUM (~1.2x global GDP).
- **Private Equity:** \$15T AUM.
- **Sovereign Wealth Funds:** \$13.2T AUM.
- **Development Banks & Impact Bonds:** >\$1T annual issuance.

Strategic opportunities include:

- **Banks** embedding SDG KPIs in loans and scaling sustainability-linked financing.
- **Investment banks** structuring blended finance and SDG securitisation.
- **Asset managers** designing SDG behaviour-based indices and activist thematic funds.
- **Private equity** leveraging governance control to redesign enterprises and supply chains.
- **Sovereign wealth funds** anchoring national SDG strategies.
- **Development banks** catalysing private capital by de-risking systemic projects.

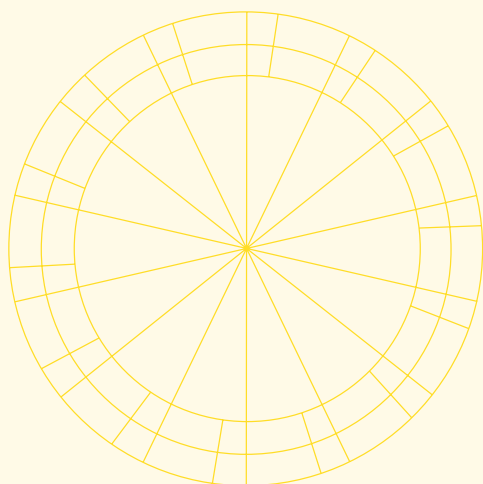
The Market Opportunity toward the 2030 Agenda

The United Nations estimates that achieving the SDGs requires **\$5 trillion per year** (~5% of GDP) in additional investment. Even a **1% reallocation of the \$566T global financial assets** would be sufficient to close the SDG gap.

This is not a cost burden. It represents the **largest growth market of the decade**, spanning energy, infrastructure, health, food, and digital inclusion. Companies and financial institutions that align early will capture alpha, resilience, and legitimacy.

Conclusions

1. **Behavioural maturity matters:** Transformative behaviours drive both superior financial returns and systemic wellbeing.
2. **ESG is off-target:** Ratings reward preparation, not transformation; investors relying on them risk underperformance.
3. **Behavioural indicators are a structural innovation:** Predictive, scalable, and systemic, they align capital flows with genuine transformation.
4. **Finance has systemic agency:** With \$566T in assets, financial institutions can shift from compliance to co-creation of regenerative markets.
5. **The SDG gap is solvable:** Closing the \$5T annual gap requires <1% of financial assets; the barrier is not resources but alignment.
6. **The 2030 Agenda is an investment thesis:** The SDGs are the largest growth market of our time, not a burden.



A Global Call to Action

The financial sector holds the key to systemic transformation. By grounding decisions in **behavioural indicators** rather than static ESG scores, investors can unlock superior returns while simultaneously closing the SDG financing gap.

The **2030 Agenda** is not as a constraint, but as a **historic opportunity**: to redirect 1% of financial assets toward transformation, capture alpha, reduce systemic risks, and accelerate the transition to a regenerative, inclusive global economy.

Finance has both the power and the interest to evolve from a value extraction mechanism to the main engine of a regenerative future.

The United Nations estimates that achieving the SDGs requires **\$5 trillion per year** (~5% of GDP) in additional investment. Even a **1% reallocation of the \$566T of financial assets** would be sufficient to close the SDG gap.

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1

Introduction



The Fundamental Question

The question of the relationship between companies' financial performance and their societal impacts continues to be not only unresolved, but also at the centre of major scientific, business, investor, policy and civil society debates and concerns.

One of the major sources of discontent, and a fundamental part of the problem, has to do with the way corporate impacts on social and natural environments are assessed by specialised institutions. The current reliance on ESG scores to assess corporate sustainability performance is proving highly problematic for a number of reasons:

1. Very low correlations among ratings produced by different institutions on the same companies' ESG performance. This has been proven through rigorous studies and published in highly respected scientific journals³.
2. There is little transparency on how ESG assessments are carried out, and especially on how the various components are weighted to construct the overall scores.
3. They have been developed to help investors minimize risk from environmental, social and governance exposure. Consequently, they emphasise compliance and preparatory actions rather than strategic change or innovation, as this report will illustrate. As a result, ESG ratings miss the key factors identifying synergies between financial performance and sustainability impact.

This report addresses this fundamental problem by introducing a behavioural approach to the assessment of corporate sustainability. This approach shifts the focus to the actual sources of both financial performance and impacts on social/natural environments: what companies actually do, why they do it and how. To this end, this report introduces a new, empirical basis for systematically and objectively quantifying the sustainability efforts by companies and demonstrating how they can address the various types of systemic challenges through alternative behavioural choices. This mapping of resource allocation choices to systemic challenges forms a new, objective, observable way to synthesise a company's sustainability strategy. In turns, this approach allows companies and investors to estimate the impact of specific resource allocation decisions (sustainability strategies) on shareholder returns, which is the core of the analysis in this report.⁴

The key observation is that both financial and sustainability performance are consequences of corporate initiatives aimed at improving either type of performance or both. Therefore, questions about the relationship between the two forms of performance, which have dominated the debate for over four decades, lose relevance, and can instead be replaced by the inquiry into the influence of corporate behaviours on the two dimensions of performance. In other words, the nature of the relationship between financial and environmental performance will typically vary depending on the type of sustainability behaviour put in place by companies. It can be a trade-off, as popularly believed by many business leaders, NGOs and investors, or it can be synergistic, in line with the optimistic view of many other decision-makers and sustainability advocates, or can even be neutral, producing neither a positive nor a negative correlation between financial performance and environmental/social impact.

Figure 1.1: Relationship between financial performance and sustainability impact, which one causes which?



Figure 1.2: A behavioural approach: Sustainability actions influence both financial performance and sustainability impact, and eventually their relationship.



3 Chatterjee, Durand et al. (2016), Durand et al. (2018), Berg et al. (2023).

4 The impact of these strategic decisions, and related actions, on environmental performance outcomes (the reduction of carbon emissions and its alignment to Paris Agreement targets) has been studied and published on *Nature Communications* (Cenci, Burato, Rei and Zollo, Oct. 2023), whereas the impact of sustainability actions on a joint performance function including financial and environmental performance is published on *NPJ Climate Action* (Cenci, Burato, Rei and Zollo, March 2025).

The other advantage of the proposed behavioural approach is that corporate sustainability actions are visible and typically disclosed by companies. This makes the systematic identification and categorisation of these actions possible. Consequently, large-scale statistical analysis can shed new light on the roots of both financial and impact performance.

Therefore, the key question studied in this report is:

Which decisions and related initiatives are producing (in addition to the expected social or environmental impact that they are aimed to generate) positive, negative, or neutral effects on risk-adjusted returns for shareholders?

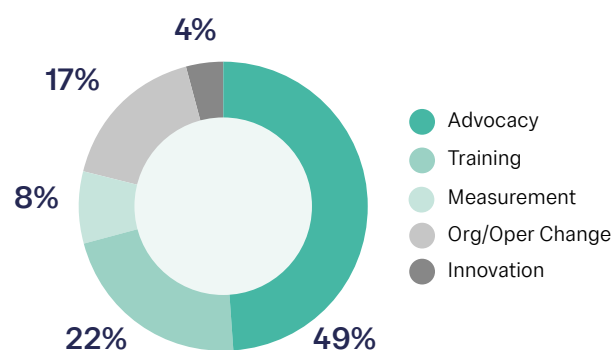
Tackling this question requires a systematic assessment of corporate sustainability initiatives. Figure 1.3 summarises the main brackets of corporate sustainability behaviours across major types, ranging from philanthropic donations and training to impact measurement, operational and structural change, and innovation.

An Overview of the Corporate Sustainability Dataset

GOLDEN Sustainability Dataset includes approximately 1.3 million initiatives in more than 75,000 reports issued by 18,000 companies over the last three decades. The allocation of sustainability initiatives to the various categories of behaviour shows that about 50% of them are dedicated to advocacy type of actions (donations, communications, etc.), which might benefit the communities where the company is located but do not change the way the company operates in any significant way. Of the remaining 50%, about 22% are dedicated to training of employees and setting up the appropriate incentives for them to dedicate time and attention to the sustainability impact of their decisions or actions. Finally, around a quarter are related to various forms of organisational change, including the introduction of sustainability-related control systems (8%), structural and operational change (17%). Only about 4% of the initiatives are focused on sustainability-oriented R&D investments and new product launches.

The initiatives in this substantive half are increasingly related to actual adjustments in the way a company operates, competes and grows. This includes the development of sustainability skillsets and mindsets through training and incentives, the creation and adaptation of sustainability-related processes and structures, and progressive innovation in products and business models. These types of initiatives can also produce enhanced financial results, especially if they enable the company to meet expectations on its environmental and social conduct in its product, resource, labour and financial markets.

Figure 1.3: Companies' sustainability initiatives split between advocacy and (increasingly) substantive change.



Source: Leonardo Centre, Imperial College London.
About 1,300,000 initiatives in 75,000 reports issued by 18,000 companies in 86 countries over 20 years.

It is therefore plausible to expect that:

- **Advocacy.** Advocacy initiatives might create trade-offs between shareholders and other stakeholders' expectations, since cash-flows from operations are invested in projects of interest (primarily) to local communities or other social causes
- **Preparation.** Other types of initiatives, such as upskilling, incentive alignment, volunteering, impact measurement processes, etc. can be considered intermediate, preparatory, steps on the way to produce substantive transformative outcomes (see below). Therefore, their influence on the relationship between financial performance and impact outcomes is expected to be neutral, neither positive nor negative.
- **Transformation.** There might be, instead, positive synergies between the sustainability-driven innovation and change initiatives launched by the company and its financial performance. This might be particularly true if they involve value chain stakeholders, such as customers and suppliers, since goodwill and collaboration along the value chain strengthens a company's position in critical product and resource markets, vis-a-vis its peers.

The report presents more detail in Section 2 on the GOLDEN Sustainability Dataset, which then forms the basis of the statistical analyses of risk-adjusted shareholder returns in Section 3. Finally, Section 4 offers an analysis of the potential implications of the evidence revealed in this report and explores how a structural rethinking of the way financial systems operate can accelerate the transition towards a regenerative and inclusive economic system.

2

Sustainability Behaviour Data



In this section, we share the key features of the data used for the analysis of portfolio risks and returns based on the characteristics of sustainability behaviour (initiatives). The results of the analyses are reported in Section 3.

2.1 The GOLDEN Sustainability Dataset

The GOLDEN Sustainability Dataset is our primary source of information on corporate sustainability behaviour.

It includes over 1,300,000 sustainability initiatives, identified in approximately 75,000 sustainability reports by 18,000 companies, including about 3,000 private and about 15,000 publicly listed companies. The reports come from three major sources: web crawling of sustainability reports issued in English by the largest 25,000 global companies (ranked by size), the market data provider LSEG, previously Refinitiv, and private purchases. We filled any remaining gaps with private purchases from sustainability data providers (most notably, Corporate Register). The time span covered goes back to the mid-1990s, but the data becomes sufficiently rich for statistical analysis starting from the early years of the 21st century. The dataset is updated in December and June each year. This work is the result of a cross-disciplinary partnership between the Leonardo Centre on Business for Society and Imperial's Department of Computing and Data Science Institute, as well as the GOLDEN for Impact Foundation.

The data extracted from the reports is structured around the adoption/application of sustainability initiatives. We define these as a concrete action that a company is pursuing with the specific intent of contributing to tackle a global environmental or social sustainability challenge.

This approach maps business action against the intent to directly address one of the 17 Sustainable Development Goals (SDGs). To avoid mixing actions with outcomes or commitments to act, we purposely filtered out information around past outcomes or future commitment and focus only on the activities launched and enacted in the year of each report.

2.2 The Data Construction Process

To systematically extract descriptions of sustainability initiatives from the text, we implement a multi-stage natural language processing (NLP) pipeline.

Initiative Identification

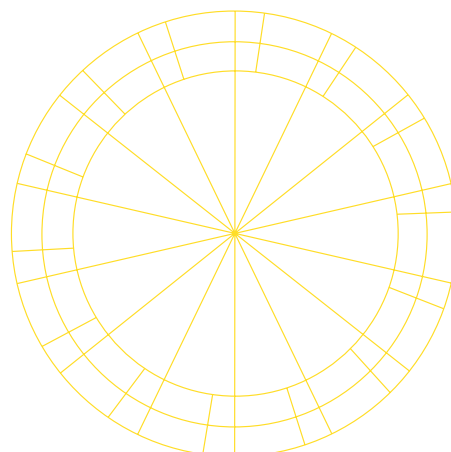
First, we convert the documents to Json files and extract all textual data and relevant metadata. We then segment the extracted text into individual sentences, each of which serves as the fundamental unit for initiative identification.

To achieve this, we leverage two state-of-the-art, transformer-based language models: Bidirectional Encoder Representations from Transformers (BERT) and Robustly Optimised BERT Approach (RoBERTa). We employ both models in an ensemble structure to increase the predictive power of the system overall and compensate their respective weaknesses. We train the model with a sample of over 1,000 manually annotated reports performed by the GOLDEN Observatory led by Professor Maurizio Zollo from 2012 to 2018. This large, manually annotated dataset of sustainability initiatives allowed us to classify each sentence in a sustainability report as either indicative or non-indicative of a sustainability initiative. The precision of the initiative identification procedure is particularly high (98% correct identifications), even by scientific standards.

Initiative Categorisation

The second step of the procedure moves from the identification of initiatives to their classification according to three main dimensions:

- **What:** The primary type of action characterising each initiative.
- **Why:** The goal of each initiative, based on its connection to one of the SDGs.
- **For Whom:** The class of stakeholders that are the beneficiaries of the initiative.



What. A taxonomy of 14 types of actions has been developed through a structured categorisation scheme designed to be exhaustive and mutually exclusive. We list all 14 types we define and their associated description in table A.1 in the Appendix. The categorisation is exhaustive in the sense that both human and digital annotators correctly assign virtually all initiatives to one category. In a very small portion of cases (less than 2%), the description of an initiative includes more than one identifiable type of behaviour, providing a high level of mutual exclusivity in the categorisation process.

Why. Here, the algorithm associates the text describing each initiative to the text describing each of the UN Sustainable Development Goals (SDGs) and identifies the SDG that is most closely linked to the initiative.

For Whom. Finally, we consider which class of stakeholders can directly benefit from the initiative. This is based on the five “primary” classes (employees, suppliers, customers, local communities, and investors) described in the academic literature⁵.

Combined, these three categorisations allow us to interrogate report texts and map each initiative to a relatively rich what-why-for whom space that can be used for cross-sectional and inter-temporal comparisons and for statistical analysis against performance.

To mitigate the risk of fragmenting a cohesive initiative description across multiple sentences where, for instance, objectives and actions are described sequentially, we implement a contextual expansion step. Sentences classified as initiative-related are concatenated with their adjacent sentences, thus capturing the broader discourse surrounding the initiative and aiding the secondary classifications. Whilst we have data from as far back as 1990, we limit our sample to the initiatives launched in the years from 2013 to 2023, and thus reported in the years 2014 to 2024.

2.3 Behavioural Bases of Business Impact Maturity

In this report, we aim to empirically test whether certain types of sustainability initiatives are connected with higher or lower shareholder returns. We hypothesise that certain types of behaviour create trade-offs between financial performance and business impact, whereas others are more likely to generate positive synergies between the two dimensions of performance.

We thus focus on three behavioural signals, each including a mix of “what” and “for whom” categorisations, associated with progressively higher levels of business impact maturity. Each signal is measured in relative terms, vis-a-vis the total number of initiatives launched by the company during the relevant year, and identifies the companies that exhibit a higher or lower ratio compared to their industry peers (the industry average ratio).

Advocacy

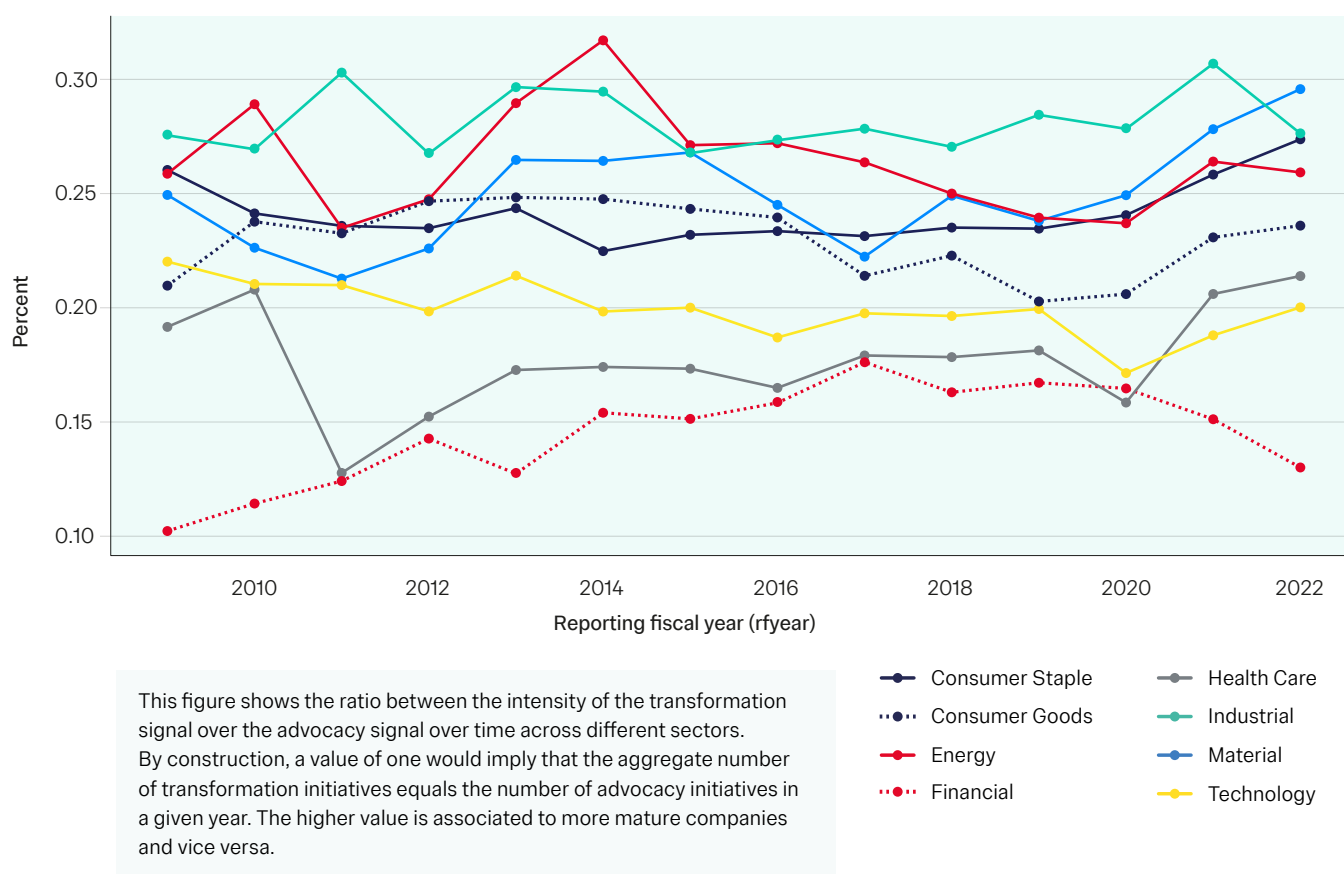
The first behavioural signal is made up of advocacy actions designed to benefit local communities in one of the challenges defined by the UN SDGs. Advocacy actions include philanthropic activities such as donations, funding, and volunteering. They also encompass activities like communication, incentives, training, and organisational structures and operations aimed at benefiting broader society and local communities. For instance, incentives in the form of vouchers to support local communities, training activities offered to societal counterparts, volunteering programs, and organisational changes relating to the establishment of foundations or instruments in pursuit of social causes.

Preparation

The second behavioural signal consists of actions performed by a company that are preparatory to transitioning from advocacy to higher maturity actions such as innovation and change initiatives. Preparation signals are primarily internally focused actions that typically revolve around employee development, incentives, and sustainability-related control processes, such as adopting standards and rules, establishing impact measurement systems, and communications and organisational change that target employees.

5 See “Stakeholder Theory: the State of the Art” by Ed Freeman et al. (2010).

Figure 2.2: Transformation to advocacy ratio over time across sectors



Transformation

The third behavioural signal – Transformation – reflects strategic actions that aim to drive sustainability-related innovation and transformational change, especially those focusing on the way the company engages its value chain partners. For example, in addition to modifications to processes, systems, and assets, as well as R&D investments and the launch of new products, this type of impact behaviour includes communication, incentives, training, and organisational activities directed at customers and suppliers.

Given our hypotheses that different maturity levels have a comparatively different effect on financial performance, we also consider a “combined” signal that is built by computing the ratio between the “transformation” and the “advocacy” signal of a company. We call this indicator the Impact Maturity Ratio.

The full description of the Business Impact Maturity Model has been provided in our report, *Corporate Sustainability and Shareholder Returns*, whereas a synthetic overview is shown in Appendix of this report.

Other Data Sources

Our study aligns the stocks of companies in the GOLDEN Sustainability Dataset with their daily returns from January 2013 to December 2023. Due to the lag in the availability of sustainability reports, returns are matched with the year following the publication of sustainability reports.

The returns data covers common equities listed on major US exchanges (Amex, NASDAQ, NYSE) and the main European exchanges. It is sourced from Compustat. We further collect data on ESG scores from S&P and LSEG – formerly Refinitiv – using the Eikon API, with a one-year lag to align with returns.

3

Sustainability Behaviour and Risk-Adjusted Returns



In this section, we leverage the data we described in Section 2 to empirically test a range of propositions related to the impact of sustainability behaviour on business performance and risk-adjusted returns.

Here are the main findings:

- **The impact of different sustainability behaviour on profitability.** Only companies in their industry's top bracket for transformative initiatives increase their profitability in the following years.
- **Abnormal returns to sustainability initiatives.** Portfolios of stocks in the top bracket (tercile) of the Transformation type of behaviour alone have a significant positive alpha throughout our sample period (approx. 2.52% annualised, or 38.5% cumulative abnormal returns over the period). We attribute this alpha to information frictions related to the complexity for analysts to identify and assess the potential financial impacts of transformative initiatives.
- **Market learning.** This alpha was slowly arbitrated away, decaying to zero not until 2022. In line with previous findings, this price discovery process was slower for stocks outside the universe covered by ESG rating agencies.
- **Is there still alpha? Yes, there is.** Being long on stocks in the top 1/3 of the Transformation type of behaviour and short on those in the top 1/3 of ESG ratings generates a stable alpha throughout the sample period, including the most recent years. This suggests that transitioning from a ESG-driven to a behavioural indices driven portfolio strategy pays off.
- **Lower risks.** The portfolio strategies based on a systematic assessment of corporate sustainability behaviour show that those associated with higher levels of maturity generate significantly higher risk-adjusted returns compared to both a market benchmark and ESG rating scores, as well as lower (or similar, using VaR) linear and non-linear risk levels.

Methodology

The first step was to create a general portfolio of all publicly listed companies in US and the key EU stock exchanges, included in the GOLDEN dataset of sustainability initiatives. The portfolio includes 1,321 stocks, representing most of the US and EU market capitalisation from 2013 to 2023. We then use the signals based on sustainability behaviour (Advocacy, Preparation and Transformation) to create two signal level portfolios: Low (the bottom third) and high (top third). At the end of each month, these portfolios are rebalanced with the most up-to-date information at the time and hold our investment for the subsequent month.

Each behavioural signal is standardised vis-a-vis the sector and the currency area. The sectors are aggregate GICS taxonomy: Consumer (Staples and Discretionary), Primary Industries (Energy and Materials), Financial (Financial and Real Estate), Industrials, Health Care, Utilities, Tech (Information Technology and Communication Services).

3.1 The Impact of Different Sustainability Behaviour on Profitability

The relationship between corporate sustainability initiatives and profitability is complex and subject to ongoing debate within scientific, business, investors and policymakers' circles. This diversity of opinions and results suggests that the convergence might require more detailed and systematic observations of actual sustainability actions by companies.

Profitability and Maturity

We begin our analysis by investigating the impact of different sustainability initiatives on firm profitability. Our target metrics are EBITDA to Total Assets, EBIT to Total Assets, and Net Income to Total Assets. We regress these ROA measures, in turn, on the sustainability behaviour signals at lag 1 to 3 years. We control for firm-level fixed effects for both currency area and industry to account for time-invariant heterogeneity, as well as year fixed effects. This analysis is performed both throughout our full sample and focusing on the stocks within the universes monitored by LSEG and S&P for their ESG ratings.

Table 3.1: Profitability and impact maturity (high Transformation signals): a positive correlation

Signal	Universe	Lag	Coefficient	SE	p-value	Adj. R ²
Transformation	Full sample	1	0.02	0.01	0	0.06
Transformation	Full sample	2	0.03	0.01	0	0.09
Transformation	Full sample	3	0.03	0.01	0	0.08
Transformation	S&P ESG	1	0.01	0.01	0.05	0.04
Transformation	S&P ESG	2	0.02	0.01	0	0.08
Transformation	S&P ESG	3	0.02	0.01	0.01	0.07
Transformation	LSEG ESG	1	0.02	0.01	0	0.07
Transformation	LSEG ESG	2	0.03	0.01	0	0.1
Transformation	LSEG ESG	3	0.03	0.01	0	0.09

Table 3.1 reports the relevant regression results, showing consistently positive and significant association between the High Transformation signal and ROA (EBITDA/Total Asset ratios) across different time lags (1, 2 and 3 years after the sustainability actions) and with three different samples (the GOLDEN universe and the significantly smaller S&P and LSEG samples). In the Appendix, the same type of results are reported for different ROA metrics. Also, the results for panels related to other action types (Advocacy and Preparation signals) are in the same Appendix.

Our analysis shows that only transformative initiatives are associated with a statistically significant increase in future profitability and positive adjusted R² values. The link is strongest for the broader profitability measures (EBITDA/Assets). In stark contrast, other forms of sustainability engagement appear to have a neutral or even detrimental effect on profitability.

Profitability and ESG Ratings

Table 3.2 shows the results of regressions of the same ROA ratios using S&P and LSEG ratings as explanatory variables, with 1, 2 and 3 year lags. The striking results is given by consistently *negative* and significant coefficients across the board.

Why do we see such a stark difference between the correlation of ESG and that of Transformational behaviour signals with companies' accounting performance? To understand this, we studied the contemporaneous correlation between the ESG indices and the three behavioural signals developed from the GOLDEN data.

Results reveal a significant disconnect between the sustainability initiatives that drive firm profitability and those that are rewarded by external ESG ratings. We find

a positive and statistically significant correlation between the number of Preparation stage initiatives and higher ESG scores. There is no significant association between ESG scores and Transformational behavioural signals. We interpret these findings to mean that ESG ratings focus on compliance and reputational risk-related initiatives (captured in the Preparation stage behavioural signals) and fail to capture the sources of strategic value potentially generated by companies' investments in sustainability-driven innovation and deep organizational change (beyond measurement and reporting-related changes).

The implications of ESG ratings predominantly reflecting these risk mitigation actions are significant. It raises the concern that such ratings may inadvertently incentivise companies to focus on developing a wide array of policies and procedures for compliance and reputational risk minimisation reasons, rather than channelling resources towards more complex and impactful transformative initiatives that drive both genuine sustainability progress and financial value. This is not to suggest that robust policies and risk management frameworks are unimportant; they are crucial foundational elements. However, if the primary yardstick for ESG performance (i.e., the rating) disproportionately rewards these foundational aspects over deeper, strategic shifts, the signalling power of such ratings may become misaligned with the goal of fostering profound corporate sustainability transitions, and thus enabling systemic transitions across sectors and geographies. For investors relying on ESG ratings to guide capital allocation, this finding warrants careful consideration. If ratings are more indicative of procedural maturity than of impactful, value-creating transformation, then portfolios optimised solely on high ESG scores might not fully capture the companies leading in sustainability-driven innovation and thus (according to our analyses) best positioned for competitiveness and

Table 3.2: Profitability and ESG ratings: a negative correlation

ESG	ROA measure	Lag	Coefficient	SE	p-value	Adj. R ²
S&P ESGs	EBITDA to Total Assets	1	-0.02	0.01	0	-0.15
S&P ESGs	EBITDA to Total Assets	2	-0.03	0.01	0	-0.17
S&P ESGs	EBITDA to Total Assets	3	-0.03	0.01	0	-0.19
S&P ESGs	EBIT to Total Assets	1	-0.03	0.01	0	-0.19
S&P ESGs	EBIT to Total Assets	2	-0.03	0.01	0	-0.21
S&P ESGs	EBIT to Total Assets	3	-0.03	0.01	0	-0.23
S&P ESGs	NI to Total Assets	1	-0.02	0.01	0	-0.17
S&P ESGs	NI to Total Assets	2	-0.02	0.01	0	-0.19
S&P ESGs	NI to Total Assets	3	-0.03	0.01	0	-0.23

ESG	ROA measure	Lag	Coefficient	SE	p-value	Adj. R ²
LSEG ESGs	EBITDA to Total Assets	1	-0.01	0.01	0.08	-0.11
LSEG ESGs	EBITDA to Total Assets	2	-0.02	0.01	0.01	-0.16
LSEG ESGs	EBITDA to Total Assets	3	-0.02	0.01	0.02	-0.16
LSEG ESGs	EBIT to Total Assets	1	-0.01	0.01	0.08	-0.13
LSEG ESGs	EBIT to Total Assets	2	-0.02	0.01	0	-0.21
LSEG ESGs	EBIT to Total Assets	3	-0.02	0.01	0.01	-0.2
LSEG ESGs	NI to Total Assets	1	-0.02	0.01	0.03	-0.17
LSEG ESGs	NI to Total Assets	2	-0.02	0.01	0.01	-0.21
LSEG ESGs	NI to Total Assets	3	-0.02	0.01	0.04	-0.18

financial performance. It underscores the need for investors to look beyond headline ESG scores and engage in deeper due diligence to understand the *nature* and *depth* of a company's sustainability efforts.

3.2 Abnormal Returns to Sustainability Initiatives

Having established a link between specific sustainability initiatives and future firm profitability, we now turn to the equity markets to investigate whether this information reflected in stock prices.

First, we start by exploring the Sharpe Ratio to measure the risk-adjusted returns of the High/Low strategies (see section 2) on our behavioural signals and ESG ratings. In line with our previous analysis on profitability, Table 3.4 shows that higher levels of transformation activity are associated with higher risk-adjusted returns. The Sharpe ratio for High Transformation is 0.57, in contrast with 0.47 in the Low Transformation portfolio. In contrast, all the other portfolios built with GOLDEN data (Advocacy and

Preparation) as well as will S&P and LSEG scores, show a reduction of the Sharpe ratios from Low to High. Consider that the Sharpe ratio for the unweighted market portfolio is 0.49. So, for instance, Low Transformation (0.47) creates lower risk-adjusted returns, compared to the market returns, whereas 0.57 means a significantly higher risk-adjusted return, compared to the unweighted market returns and to all other portfolios.

Figure 3.1 graphically summarises the performance of these strategies over time in terms of cumulated results.

We then proceed with a more formal analysis based on Fama-French 3 factor model regressions. This allows us to understand whether investors have efficiently priced different sustainability behaviour (alpha not significantly different from zero) or not (significant alpha). Table 3.5 presents the results for all testing portfolios. The rows detail the relevant regression coefficients (alpha and betas) and metrics (p-values, R-squared), whereas the columns display the results for each signal (Advocacy, Preparation, Transformation and ESG scores) and portfolio sort (Low vs High). Results show that the High Transformation portfolio is the only one that generates

statistically significant, abnormally positive, returns across all considered universes. These are:

- 2.52% (annualised) High transformation alpha over the full sample
- 2.16% (annualised) over the S&P ESG universe
- 2.04% (annualised) over the LSEG ESG universe

Portfolios based on sustainability behaviour with lower maturity (High Advocacy or High Preparation) and ESG ratings do not have significant alphas. The coefficients reveal that all portfolios have a market beta slightly above one. The consistently positive and significant coefficients for HmL and generally insignificant coefficients for SmB indicate that the portfolios are primarily composed of mid to large value stocks, which is consistent with the profile of firms engaging in extensive sustainability reporting.

Table 3.3: Correlation between ESG ratings and behavioural signals

Each panel shows the association between ESG ratings and each of the behavioural signals.

Score	Signal	Coefficient	SE	P-value
Panel A: Univariate regression on advocacy				
S&P ESG	Advocacy	-0.06	0.01	0.00
Refinitiv ESG	Advocacy	-0.05	0.01	0.00
Panel B: Univariate regression on preparation				
S&P ESG	Preparation	0.12	0.02	0.00
Refinitiv ESG	Preparation	0.10	0.01	0.00
Panel C: Univariate regression on transformation				
S&P ESG	Transformation	-0.02	0.02	0.25
Refinitiv ESG	Transformation	-0.02	0.01	0.09

Table 3.4: Sharpe Ratio and fundamentals

	Low	High	Market
Panel A: Full sample			
Advocacy	0.52	0.49	
Preparation	0.52	0.50	0.49
Transformation	0.47	0.57	
Panel B: S&P ESG Universe			
Advocacy	0.51	0.47	
Preparation	0.50	0.51	0.49
Transformation	0.47	0.55	
ESG	0.49	0.47	
Panel C: LSEG ESG Universe			
Advocacy	0.52	0.50	
Preparation	0.50	0.50	0.49
Transformation	0.47	0.55	
ESG	0.51	0.44	

Figure 3.1: Cumulated dollar returns of portfolios built with different behavioural signals

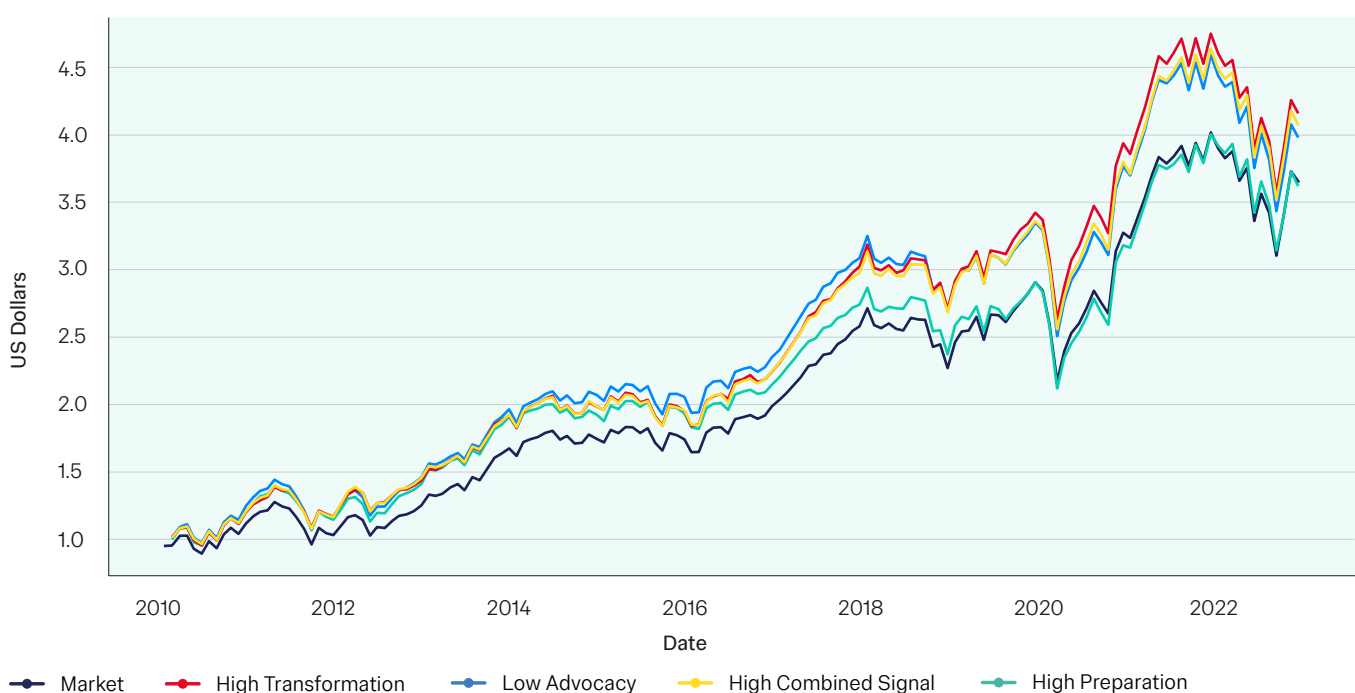


Table 3.5: Three-factor Fama-French model regressions

Panel	Statistics	Low Advocacy	High Advocacy	Low Prep	High Prep	Low Transf	High Transf	Low ESG	High ESG
Full sample	alpha	0.15	0.12	0.14	0.12	0.08	0.21	-	-
Full sample	beta_mkt	1.1	1.13	1.11	1.11	1.12	1.09	-	-
Full sample	beta_smb	0.07	0.1	0.05	0.05	0.04	0.01	-	-
Full sample	beta_hml	0.22	0.32	0.26	0.25	0.32	0.23	-	-
Full sample	p-value (alpha)	0.1	0.16	0.11	0.14	0.32	0.03	-	-
Full sample	p-value (beta_mkt)	0	0	0	0	0	0	-	-
Full sample	p-value (beta_smb)	0.22	0.08	0.37	0.41	0.51	0.81	-	-
Full sample	p-value (beta_hml)	0	0	0.01	0	0	0	-	-
Full sample	Adj. R ²	0.97	0.97	0.96	0.97	0.97	0.96	-	-

Panel	Statistics	Low Advocacy	High Advocacy	Low Prep	High Prep	Low Transf	High Transf	Low ESG	High ESG
S&P ESG universe	alpha	0.12	0.09	0.12	0.13	0.08	0.18	0.11	0.08
S&P ESG universe	beta_mkt	1.1	1.12	1.11	1.11	1.11	1.1	1.12	1.11
S&P ESG universe	beta_smb	0.03	0.08	0.01	0.03	0.01	-0.03	0.09	-0.08
S&P ESG universe	beta_hml	0.23	0.32	0.27	0.26	0.33	0.24	0.23	0.34
S&P ESG universe	p-value (alpha)	0.16	0.25	0.17	0.11	0.32	0.07	0.27	0.43
S&P ESG universe	p-value (beta_mkt)	0	0	0	0	0	0	0	0
S&P ESG universe	p-value (beta_smb)	0.58	0.14	0.88	0.66	0.84	0.68	0.22	0.15
S&P ESG universe	p-value (beta_hml)	0	0	0	0	0	0	0	0
S&P ESG universe	Adj. R ²	0.97	0.98	0.97	0.97	0.98	0.96	0.96	0.96

Panel	Statistics	Low Advocacy	High Advocacy	Low Prep	High Prep	Low Transf	High Transf	Low ESG	High ESG
LSEG ESG universe	alpha	0.14	0.13	0.11	0.12	0.08	0.17	0.14	0.05
LSEG ESG universe	beta_mkt	1.1	1.1	1.1	1.11	1.11	1.09	1.08	1.13
LSEG ESG universe	beta_smb	0.05	0.06	0	0.05	0.02	-0.03	0.08	-0.03
LSEG ESG universe	beta_hml	0.25	0.3	0.26	0.28	0.32	0.24	0.19	0.41
LSEG ESG universe	p-value (alpha)	0.11	0.14	0.23	0.18	0.33	0.08	0.16	0.6
LSEG ESG universe	p-value (beta_mkt)	0	0	0	0	0	0	0	0
LSEG ESG universe	p-value (beta_smb)	0.38	0.08	0.37	0.41	0.51	0.81	0.2	0.56
LSEG ESG universe	p-value (beta_hml)	0	0	0.01	0	0	0	0	0
LSEG ESG universe	Adj. R ²	0.97	0.97	0.97	0.97	0.97	0.96	0.96	-0.97

The alphas shown in the tables are monthly, thus they need to be compounded to obtain the yearly abnormal returns shown in the text.

3.3 Market Learning

The results reported above on the alpha (Fama French regression analysis⁶) are average estimates over the time period of the study (13 years, from 2011 to 2023). The bottom line is that **the financial markets have significantly mispriced the resource allocation** to companies that have been investing in strategically relevant initiatives, to reward those who prioritized risk-management and compliance activities. A key question is whether the mispricing we identify has decayed over time due to learning processes by investors. Indeed, given that the alphas stem from information frictions, we would expect them to diminish as soon as investors learn to distinguish value-creating actions from superficial ones. We investigate this temporal dimension to understand if investors are becoming more adept at a) tracking and understanding the transformative initiatives that our analysis links to firm profitability, and b) identifying these initiatives even in firms that major ESG rating agencies do not prominently cover.

To test for this learning effect, we compute the Fama-French alphas for our High portfolios over a 40-month rolling window. This approach allows us to track the evolution of abnormal returns for each type of sustainability initiatives. The results are plotted in Figure 3.2 with Panel A showing the full sample, and Panels B and C focusing on the LSEG and S&P universes, respectively. The analysis reveals four crucial findings.

- **Initial undifferentiated pricing.** In 2018, the market showed a lack of sophistication by failing to distinguish between superficial and substantive sustainability efforts, valuing the different signals almost equally.
- **Rapid disappearance of generic ESG alpha.** A simple strategy of buying stocks with high ESG ratings saw its alpha disappear very quickly as the market rapidly priced in this mainstream, generic information.
- **Alpha decay in low behavioural maturity portfolios.** The excess returns from straightforward sustainability actions (advocacy, preparation) faded quickly as they became easier to price. In contrast, the alpha from complex, transformative initiatives persisted much longer due to their inherent difficulty to analyse based on qualitative firm-level inquiry.
- **A Market “Learning Gap”.** A significant gap in understanding the returns implications of sustainability signals has emerged between different segments of the market. The analysis shows that

sophisticated investors focusing on large firms with high ESG ratings have become adept at distinguishing between meaningful, value-creating sustainability projects and more superficial ones. However, this nuanced understanding has been slow to diffuse across the broader market. As a result, the mispricing of genuinely transformative initiatives has been wider and has persisted for much longer among companies outside the main ESG rating ecosystems. This finding shows that even in large, liquid markets, the opacity and non-standardised nature of sustainability disclosures present a profound challenge to efficient capital allocation.

3.4 Is There Still Alpha?

The erosion of alpha in mainstream ESG strategies, as documented in the previous section, begs a critical question for today’s investors: Is there still alpha to be found in sustainability?

A first glance at the market might suggest that all sources of sustainability-linked alpha are destined for rapid decay. However, the more granular analysis in Figure 3.3 reveals a persistent and exploitable opportunity for those who can look beyond generic ratings. The key is not to find a signal that never decays, but to capitalise on the *difference* in how quickly various signals are priced by the market. This requires a more sophisticated interpretation of the alpha landscape.

Our strategy is built on a long-short portfolio: long on firms with high Transformation scores and short on firms with high generic ESG ratings. The resilience of this strategy is not due to a static, unchanging alpha source. The long-short construction captures the persistent *spread* between these two decaying rates of alpha. We are profiting from the fact that the market takes significantly longer to understand deep, strategy-relevant change than it does to price in compliance and risk-management focused ESG ratings.

Furthermore, the ‘Transformation’ signal provides two distinct, compounding advantages. First, it acts as a powerful leading indicator. Our analysis shows that the signal identifies the fundamental drivers of future outperformance approximately four months before that value is fully reflected in the market price. Second, the strategy’s long-term viability is enhanced by its superior scalability. Major ESG rating providers are often constrained by labour-intensive analysis, which limits the number of companies they can cover and the speed at which they can expand their coverage universe.

6 Eugene F. Fama and Kenneth R. French. The cross-section of expected stock returns. The Journal of Finance, 47(2):427–465, June 1992. ISSN 0022-1082, 1540-6261. doi: 10.1111/j.1540-6261.1992.tb04398.x
Eugene F. Fama and Kenneth R. French. Common risk factors in the returns on stocks and bonds. Journal of Financial Economics, 33(1):3–56, 1993.

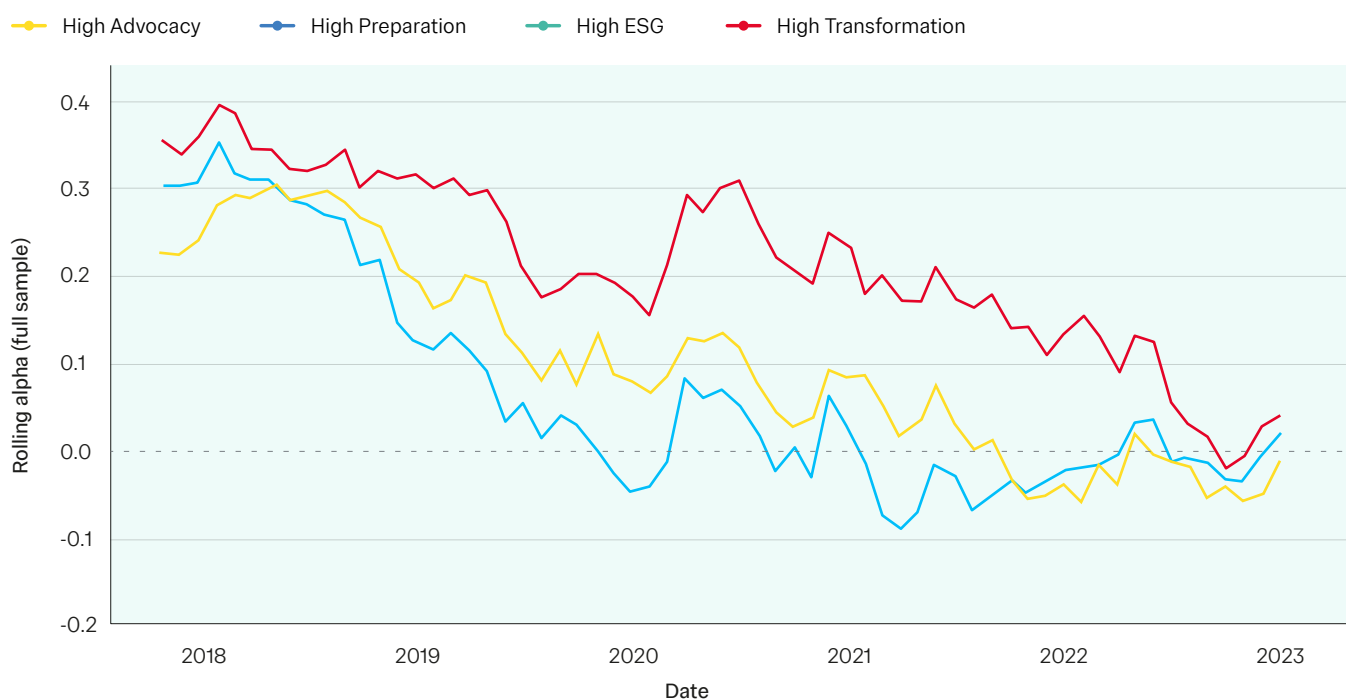
Our quantitative signal, however, is designed for broad and rapid application. It allows us to analyse a much larger set of companies, including recent listings and firms in markets with less traditional analyst coverage, far more quickly than a ratings agency can. This scalability means our opportunity set is consistently larger and renews itself more quickly, providing a structural advantage over investment approaches that depend on the slower-moving, more narrowly focused work of ESG providers.

3.5 Lowering Risk

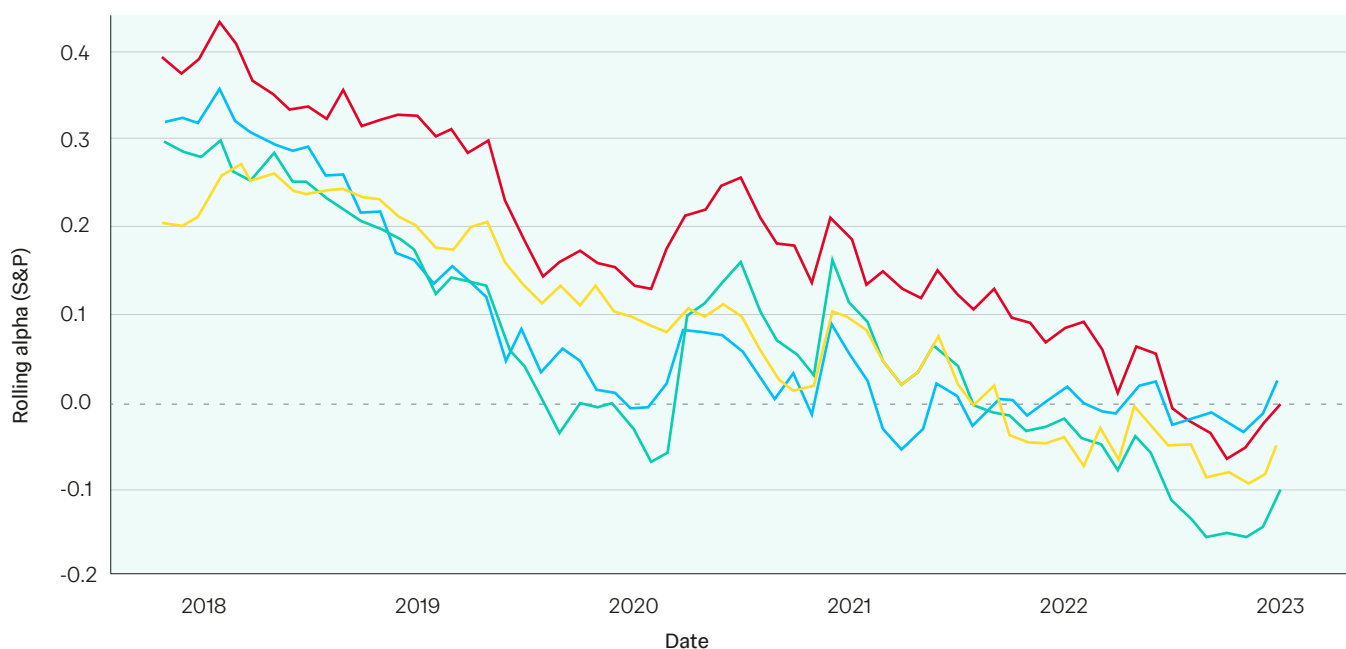
As a final step in our analysis, we complement the risk evaluation of the proposed behavioural approach embedded in the Fama French model regressions with two ad-hoc analyses of tail risk. Table 3.6 reports the Maximum Drawdown and Value at Risk⁷ for each of the behavioural signals (Advocacy, Preparation, Transformation) and portfolio sort.

Figure 3.2: Fama-French alphas for High portfolios over a 40-month rolling window

Panel A: Full sample.



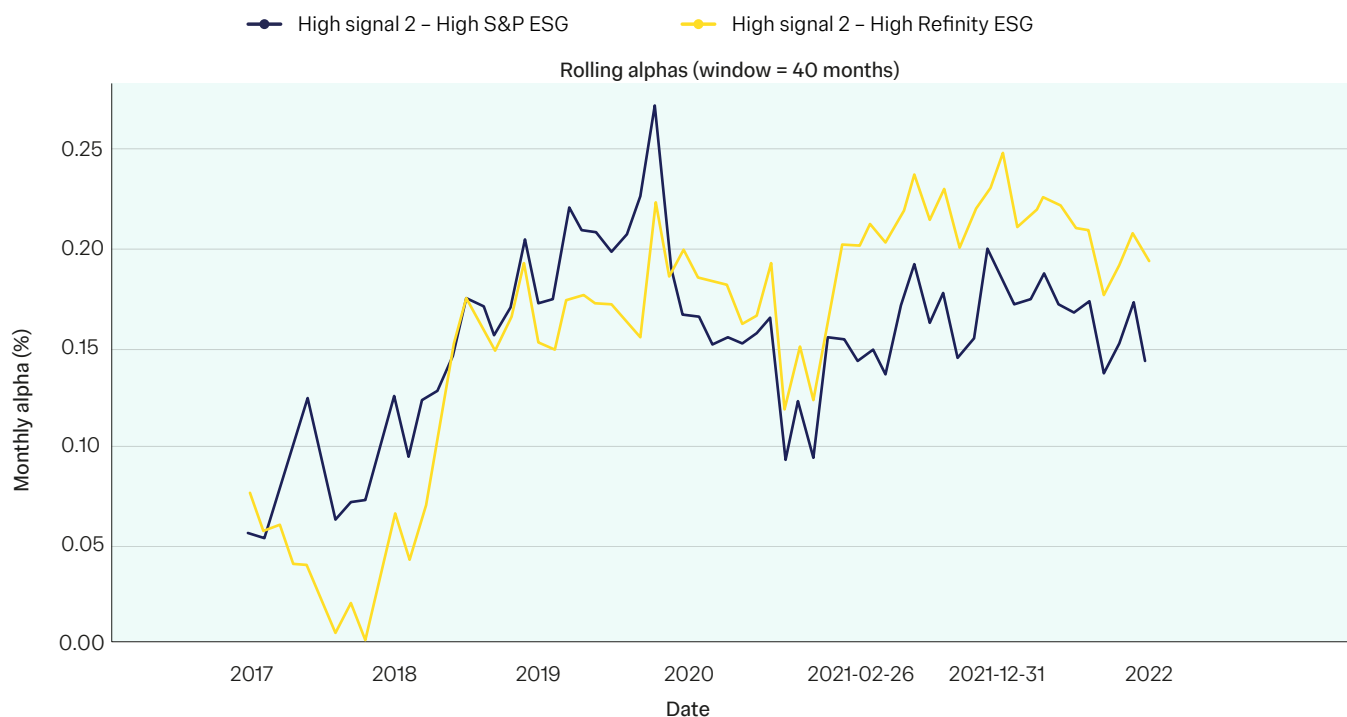
Panel B: S&P ESG universe



Panel C: LSEG ESG universe



Figure 3.3: The Spread Between High Transformation Signals and High ESG ones Produce Stable, Positive, Absormal Returns Over the Entire Period



The analysis suggests that higher returns in High Transformation portfolios are not compensation for greater tail risk, since the tail risk is similar across portfolios and in line with the market. In the case of the maximum drawdown, we find that the best behavioural strategies (High Transformation) have a marginal improvement vis-a-vis the market. Indeed, the high transformation portfolio has -26.77% versus -28.23 over the full sample of stocks. This is consistent across the universes of firms monitored, in turn, by S&P and LSEG.

To summarise the results of the set of analyses presented above, the portfolio strategies based on a systematic assessment of corporate sustainability behaviour show that those associated with higher levels of maturity generate significantly higher risk-adjusted returns compared to both a market benchmark as well as ESG rating scores. Moreover, the same portfolios exhibit lower (or similar, using VaR) linear and non-linear risk levels.

3.6 A New Generation of Behavioural Indicators

From ESG Scores to Behavioural Signals

Over the past two decades, ESG scores have become the dominant currency for assessing corporate sustainability performance. Yet, as shown in earlier sections, ESG ratings suffer from three structural limitations: **methodological inconsistency, opacity of construction, and misalignment with actual drivers of impact and financial performance**. ESG indicators tend to reward the presence of policies, risk-management procedures, and disclosure practices—measures that are necessary but not sufficient for deep sustainability transitions.

By contrast, a new generation of **behavioural indicators**—grounded in observable corporate actions—offers a more objective, granular, and predictive lens on how firms are progressing toward sustainability. These indicators are not based on self-reported commitments or external judgements about corporate intent, but rather on **what firms actually do**: the initiatives they launch, the resources they allocate, and the structural transformations they enact.

Table 3.6: Tail Risk: This table reports risk metrics on a range of long-only portfolios. Namely, the Maximum Drawdown (MD) and historical Value-at-Risk (VaR) at 1% level. The maximum drawdown is the largest loss from a peak to a trough of a portfolio, over the full sample ranging from January 2010 to December 2022. The historical VaR at 1% level is the first percentile of the returns of a portfolio.

Statistics	Advocacy		Preparation		Transformation		Market	
	Low	High	Low	High	Low	High		
Panel A: Full sample								
	MD	-27.52	-30.26	-29.25	-29.47	-28.80	-26.77	-28.23
	VaR 1%	-11.15	-10.72	-10.53	-11.16	-11.26	-11.25	-11.00
Panel B: S&P ESG universe								
	MD	-27.84	-30.12	-29.21	-28.54	-28.47	-27.11	-28.23
	VaR 1%	-11.20	-10.88	-10.68	-11.26	-11.16	-11.28	-11.00
Panel B: LSEG ESG universe								
	MD	-27.74	-29.05	-28.53	-29.57	-28.17	-26.46	-28.23
	VaR 1%	-11.27	-11.12	-10.67	-11.26	-11.45	-11.19	-11.00

7 The Maximum Drawdown refers to the largest peak-to-trough decline (percentage-wise) in the value of these portfolios. Value at Risk is computed at the 1% level.

Distinctive Features of Behavioural Signals Compared to ESG rating models

This new behavioural approach differs from traditional ESG scores in three fundamental ways:

1. Methodological Objectivity

- **ESG:** Largely qualitative and judgement-based, often combining heterogeneous dimensions (policies, disclosures, controversies) into a single opaque score.
- **Behavioural Indicators:** Quantitative, based on systematic NLP extraction of more than 1.3 million corporate initiatives across 18,000 firms, classified into a transparent taxonomy of actions.

2. Granularity and Precision

- **ESG:** Aggregated at the firm level, with limited visibility into the nature and substance of actions.
- **Behavioural Indicators:** Granular at the initiative level, enabling differentiation between symbolic actions (e.g., donations) and strategic transformations (e.g., product redesign, supply-chain reconfiguration).

3. Strategic Relevance

- **ESG:** Optimised for risk management and compliance, rewarding visible, auditable policies.
- **Behavioural Indicators:** Optimised for growth and transformation, highlighting actions linked to innovation, operational change, and value-chain collaboration.

Methodological Advances

The behavioural indicators developed in this report rely on a **quantitative, machine learning-based methodology** that ensures replicability, comparability, and scalability.

- **Data Source:** The GOLDEN Sustainability Dataset, comprising 1 million+ initiatives since the mid-1990s.
- **Classification:** Initiatives are categorised along three behavioural maturity stages—Advocacy, Preparation, and Transformation—reflecting increasing levels of strategic depth.
- **Comparability:** Indicators are normalised at the industry and regional level, enabling benchmarking across peers.
- **Composite Metrics:** The **Impact Maturity Ratio** ($\text{Transformation} \div \text{Advocacy}$) serves as a parsimonious but powerful signal of a firm's behavioural maturity.

Exploratory Capacity

Behavioural indicators unlock new analytical possibilities that ESG scores cannot provide:

- **Risk vs Growth Orientation:** While ESG scores mainly reflect risk mitigation, behavioural indicators capture growth-oriented innovation strategies.
- **Market Performance Prediction:** Transformation behaviours consistently predict higher abnormal returns and profitability, with a 2.52% annual alpha.
- **Risk Resilience:** Behaviour-based portfolios show comparable or lower maximum drawdowns and Value-at-Risk than ESG-sorted portfolios, disproving the notion that sustainability-driven innovation increases financial risk.

Efficacy and Scalability

The new generation of behavioural indicators also surpasses ESG in terms of coverage, efficiency, and scalability:

- **Coverage:** With data on 18,000 firms in 80+ countries, behavioural indicators provide a global perspective, reaching beyond the limited coverage of mainstream ESG providers.
- **Efficiency:** The automated NLP pipeline drastically reduces the cost and subjectivity associated with traditional ESG analysis.
- **Scalability:** Because the approach is fully quantitative and replicable, it can be applied at scale across sectors, geographies, and financial instruments—from index construction to impact-linked lending.

This new class of indicators marks the beginning of a profound shift in how sustainability is measured, reported, and monetised:

- For **companies**, it means recognition and reward for substantive transformation rather than symbolic gestures.
- For **investors**, it provides leading indicators of long-term value creation and risk-adjusted outperformance.
- For **policy makers and regulators**, it creates an evidence-based tool to monitor systemic transitions at firm, sector, and country levels.

In short, behavioural indicators move the sustainability assessment paradigm from **intentions to actions, from policies to practice, and from compliance to transformation**. They represent a critical enabler for aligning capital markets with systemic change. In the next Chapter, the report will provide a new framework for the financial sector and the consequent implications for investment strategies for financial investors.

Table 3.7: Distinctive Features of Behavioural Indicators vs ESG Indicators

Dimension	Behavioural Indicators (New Generation)	ESG Indicators (Traditional)
Methodology	Quantitative, based on observable actions (initiative-level data, NLP classification, >1M datapoints)	Qualitative, based on policies, disclosures, ratings ; often subjective, low inter-rater correlation.
Granularity	Firm × Action resolution: each initiative classified (Advocacy, Preparation, Transformation).	Firm-level aggregation: mixed dimensions (E, S, G) into opaque composite scores.
Structure	Transparent taxonomy (14 types of action, mapped to SDGs & stakeholders).	Unclear weighting schemes; mix of governance, policies, controversies.
Exploratory Capacity	Captures risk & growth dynamics ; predictive of profitability and alpha (e.g. +2.52% excess annual returns).	Mostly risk lens , compliance focus; weak predictor of profitability.
Risk & Performance	Similar/better risk mitigation (VaR, drawdown) plus superior performance.	Risk mitigation, but no significant alpha ; Sharpe ratios close to market average.
Coverage	Global, 18k firms, 1M+ initiatives across 30 years.	Limited by disclosure/reporting; coverage varies by rating agency.
Efficiency	Automated via AI/NLP pipelines; scalable and consistent.	Manual assessments; resource-intensive, costly to scale.
Scalability	High — adaptable across sectors, geographies, and financial products.	Limited — constrained by ESG agency capacity and inconsistent standards.

Reframing Finance for Systemic Transformation



In the final section of this report, we explore/illustrate some of the implications of the ideas and evidence presented above and argue the case for a significant reframing of the role and function of the finance eco-system and how this can accelerate the transition towards an inclusive and regenerative form of economic system.

This section offers a synthetic overview of how the insights emerging from the previous sections can be implemented across the broad spectrum of financial solutions, risk processes, and capabilities offered by financial players. Of course, the financial sector is made up of many different types of actors with significantly distinct roles and business models, from commercial and investment banks to investors and wealth managers, private equity, hedge and venture capital funds, and more. The integration of the SDG behaviour data into the different financial solutions varies according to sustainability investment strategy of each actor.

4.1 Towards a Theory of Transformative Financial Agency

The evolving global challenges of climate and ecological breakdown, as well as social inequality and discrimination, demand a reconfiguration of the financial system—not merely through capital reallocation, but by redefining how financial institutions exercise **influence** and **intentionality**. This framework introduces a novel typology that reorients the conventional categorisation of financial instruments. Instead of viewing investments through a static lens of asset class (e.g., debt vs. equity),

it conceptualises finance as a **relational tool** whose systemic relevance emerges from two dimensions:

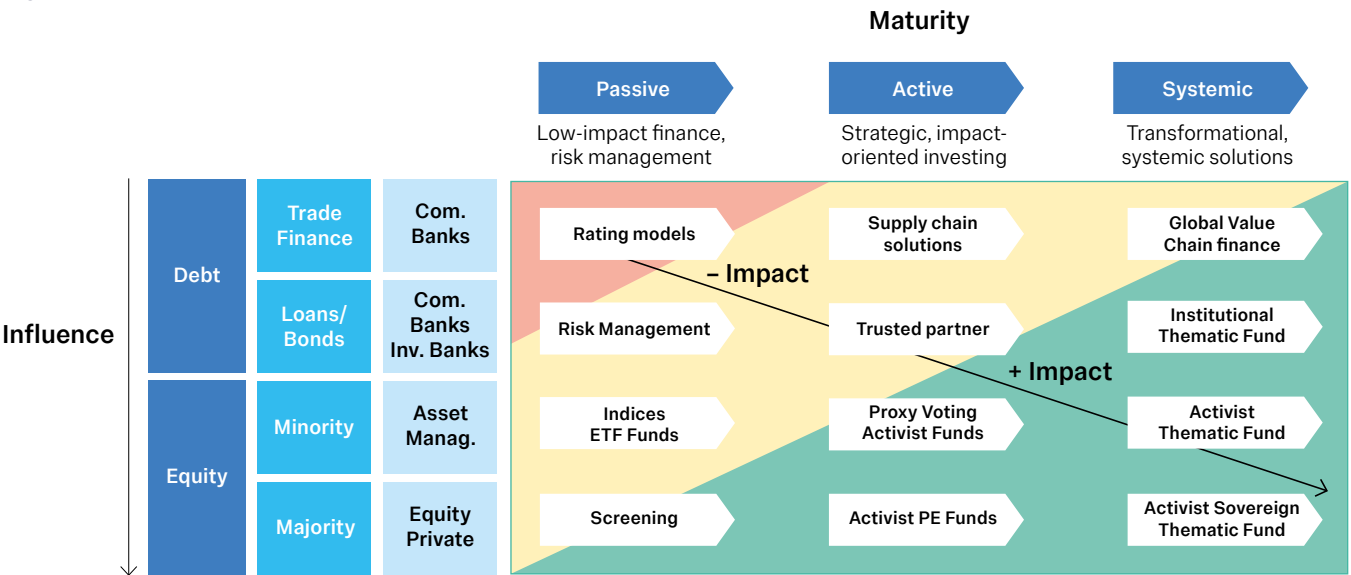
- Institutional Influence:** The degree of governance, control or strategic engagement an investor can exercise over the investee, ranging from passive funders to co-creators of enterprise transformation.
- Strategic Depth:** The level of ambition and intentionality embedded in financial practice, moving beyond risk-based ESG integration towards behaviour-based models and deeply systemic approaches aimed at rewiring industries, ecosystems, and global value chains.

We call this new framework the **Impact Finance Maturity Model**. It aims to contribute to the emerging field of transformative finance, which seeks to go beyond ESG compliance to behaviour-based SDG alignment and towards financial architectures that enable **regenerative, distributive, and resilient systems**.

To aid in the interpretation and communication of the dual-axis framework, a colour-coded gradient is used to indicate the increasing level of strategic engagement and systemic ambition.

The **red zone**, situated at the intersection of low institutional influence and passive engagement, denotes a minimalistic approach to sustainable finance. Institutions operating here tend to apply basic sustainability exclusions and perform limited due diligence, largely for compliance or reputational reasons. Their impact is marginal, as they neither influence the governance of investees nor contribute to systemic change. From a value creation perspective, institutions in the red zone may maintain short-term portfolio stability and manage downside risk, but they often forego long-term differentiation or resilience advantages.

Figure 4.1: Strategic Framework: Impact Finance Maturity Model



Moving into the **yellow zone**, where institutional influence may still be limited but engagement becomes more active, institutions begin to assume a more deliberate posture. Here, the focus shifts to thematic investments, shareholder engagement, and performance-linked incentives. These strategies mark a transition toward intentional impact but often remain bounded within traditional fiduciary and financial risk-return constraints. The value proposition in the yellow zone is more dynamic—investors may capture early-mover advantages, improve stakeholder relations, and meet growing regulatory and client demand for sustainability-aligned capital without fully transforming their operating models.

Finally, the **green zone** represents the highest degree of systemic ambition and strategic alignment. Institutions in this area combine significant influence over their investments—through ownership or governance mechanisms, for example—with a clear commitment to transformational outcomes. These actors not only fund solutions but actively shape the ecosystems, coalitions, and enabling environments necessary to realise structural change. Their capital strategies are guided by a long-term mission, distributed accountability, and a redefinition of value that includes social and ecological regeneration. From a value creation standpoint, institutions in the green zone are positioned to lead the next wave of market innovation by establishing future-proof investment theses, co-creating new markets, and building legitimacy and trust with stakeholders who prioritise resilience, inclusivity, and planetary integrity.

This chromatic progression from red to green thus symbolises an evolution not only in tactical practice but also in institutional purpose—marking the shift from reactive sustainability to proactive system stewardship and social and environmental impact.

4.2 The Impact Finance Maturity Model

Capital Structure and Institutional Actors

The left-hand axis categorises the primary forms of financial capital—**debt** and **equity**—further subdivided into instruments based on the level of ownership and control.

1. Debt Instruments

- **Trade Finance:** Typically facilitated by commercial banks, this instrument supports the flow of goods and services across borders through short-term financing arrangements. *For example*, letters of credit extended to exporters of renewable energy components enhance liquidity and market access.

- **Loans and Bonds:** Representing longer-term obligations, these instruments are managed by commercial and investment banks. *Illustratively*, climate or green bonds—issued by public or private entities—mobilise capital toward environmental infrastructure projects, such as carbon-neutral transportation or sustainable water systems.

2. Equity Instruments

- **Minority Equity:** Commonly managed by asset management firms, minority equity investments provide capital without conferring control, enabling investors to influence governance through shareholder advocacy. *For instance*, asset managers investing in ESG compliant tech firms can adopt SDG behaviourally-based guidelines, often using proxy voting to push for climate disclosures.
- **Majority Equity:** Under the purview of private equity firms, majority stakes offer transformative potential through operational control. *An example* is a private equity acquisition of an agri-business to implement regenerative agriculture and circular economy principles across the supply chain.

4.3 Investment Approaches and Degrees of Impact

This axis distinguishes between **three investment paradigms**, reflecting increasing levels of intentionality, engagement, and systemic relevance.

4.3.1 Passive Investment (Low-Engagement)

This zone encompasses instruments that prioritise financial returns with minimal strategic intervention. ESG factors are often integrated primarily for risk mitigation. There is opportunity to move beyond ESG toward SDG behavioural-based indices.

- **Rating Models:** New quantitative tools, beyond MSCI ESG Ratings or the Sustainalytics framework, to assess corporate exposure to environmental, social, and governance risks, can evolve with the integration of SDG behavioural-based indices. These tools are foundational for screening portfolios but do not actively alter investment outcomes.
- **Indices and ETF Funds:** A new generation of SDG behavioural-based indices (e.g., S&P 500 ESG), providing low-cost exposure to screened portfolios can evolve with the adoption of SDG behavioural-based indices. Based on present simulations, The new SDG funds would outperform market benchmark and while scalable, their influence on systemic change is limited due to non-interventionist structures.

4.3.2 Active Investment (Moderate Engagement)

Active strategies incorporate higher levels of intentionality, including engagement with investees, customised screening, and targeted fund allocation to advance specific sustainability themes.

- **Proxy Voting and Engagement:** Investors can exert influence through shareholder resolutions in listed and non-listed companies, such as initiatives demanding corporate carbon reduction targets or diversity metrics.
- **Activist Private Equity (PE) Funds:** These funds invest directly in high-impact sectors—such as clean energy or inclusive fintech—while supporting capacity-building and governance reform. Active Private Equity Funds can expedite advanced sustainability strategies as a source of value creation as shown by the analysis on accounting data.
- **Trusted Partner Models:** Commercial Banks can accelerate integration of the most impactful sustainability strategies by developing sustainability advisory services for their clients. This will require a significant investment in capabilities and new services as well as a redesign of incentive systems to co-create sustainability outcomes across operations, products, and markets.

KKR: broad-based employee ownership in the private equity sector

The Ownership Model. KKR's approach involves giving equity to every employee in a company, from entry-level workers to senior management. This model aims to align employees' interests with company performance, fostering a sense of ownership and accountability. The strategy has been implemented in over 50 KKR-owned companies, positively impacting more than 100,000 employees.

One significant success story is KKR's investment in GeoStabilization International (GSI). Upon selling GSI for over \$1 billion in 2024, KKR distributed \$75 million among the company's 900 employees, with individual payouts ranging from \$10,000 to \$325,000. This move exemplifies the tangible benefits of KKR's employee ownership model.

KKR's initiatives have influenced the private equity industry, encouraging other firms to consider similar employee ownership programs. For instance, Blackstone has implemented a comparable model, granting stock to employees of its portfolio companies to enhance engagement and performance.

4.3.3 Systemic Investment (High Engagement, High Impact)

Systemic approaches aim to reconfigure the underlying structures of the global economy through catalytic finance that aligns capital with **long-term societal transformations**, such as those defined by the **Sustainable Development Goals (SDGs)** and **planetary boundaries**.

- **Supply Chain Solutions:** Investments support end-to-end transformation of value chains. *For instance*, channelling capital into fair-trade and regenerative agriculture practices throughout the food system.
- **Global Value Chain Finance:** Cross-border and multisectoral funding mechanisms address structural inequities, such as informal labour or environmental degradation in global production networks.
- **Thematic Institutional Funds:** Large-scale funds—often led by public pension or sovereign entities—direct capital toward specific domains (e.g., climate resilience, digital health) with clear social and ecological metrics.
- **Activist Thematic & Sovereign Funds:** These funds embed sustainability into national investment strategies and policy frameworks. For example, sovereign green funds linked to carbon neutrality pledges or biodiversity finance frameworks.

One significant success story is KKR's investment in GeoStabilization International (GSI). Upon selling GSI for over **\$1 billion** in 2024, KKR distributed **\$75 million** among the company's 900 employees, with individual payouts ranging from \$10,000 to \$325,000. This move exemplifies the tangible benefits of KKR's employee ownership model.

SDG Behaviour-Based Insights to drive systemic change

The development of systemic initiatives to tackle large-scale challenges starts with a deep understanding of the status quo within the selected sectors and the identification of priorities at sector level, as well as for each of the key players in the ecosystem. In this context, the GOLDEN Sustainability Dataset provides a comprehensive overview of the dynamics of each sector in terms of strategic focus (e.g. SDGs), level of maturity (e.g. type of actions), and beneficiary (e.g. stakeholders engaged).

Leveraging this dataset, multiple frameworks have been developed and insights have been gained, such as optimisation models applied to selected sectors. For instance, Optimal Portfolios define the portfolio of actions that maximises the joint function of financial and non-financial performance in a selected sector. It also helps to identify for each company the reallocation of managerial efforts needed to reduce the gap and develop a transformative strategy.

The applications of the GOLDEN Sustainability Dataset span multiple perspectives and levels of analysis:

- **Sector Reports:** these are defined to develop sector-level assessment and prioritisation of system level challenges (e.g. Fashion, Food, Energy, Chemicals.)
- **Company Reports.** Corporate Impact Reports are tailored, strategic reports designed to assess maturity levels of a selected company, benchmark with peers, and identify the optimal strategy to maximise financial and non-financial performance.
- **Country Reports.** These insights connect public policy with private sector transition and provide transition pathways for the most relevant sectors in the specific geography (e.g. Country, Region).
- **SDG Reports.** The SDG reports are focused on a specific challenge (e.g. biodiversity) and provide an overview at a global level of all the sustainability initiatives developed by every sector in every country since 2000.

These reports provide for application across the full spectrum of financial institutions (e.g. banks, asset managers, private equity, international institutions) and can maximise potential societal impact, depending on institutional influence and maturity levels (e.g. passive, active, systemic).

4.4. Transformative Potential of Financial Institutions

The global financial sector comprises a diverse set of institutions, each with unique business models, institutional roles, and asset class focus. Specifically, commercial and investment banks primarily engage with debt instruments, while asset managers specialise in equity investments, including mutual funds, hedge funds, private equity and venture capital.

The increasing global emphasis on sustainability, spurred by climate change, biodiversity threats and social issues such as inequality and discrimination, is prompting financial institutions to realign their investment strategies and redefine value creation. The integration of environmental, social, and governance (ESG) factors, however, varies across institutions based on their investment mandates and roles in capital markets. This section provides a structured overview of how ESG considerations are being embedded across different financial subsectors, highlighting current progress, strategic developments, and future opportunities.

Our approach is structured by financial industry segment, progressing from debt- to equity-oriented players. For each segment, we present: (1) a market snapshot; (2) key sustainability integration practices; and (3) practical use cases informed by our Impact Finance Maturity Model framework.

The increasing global emphasis on sustainability, spurred by climate change, biodiversity threats and social issues such as inequality and discrimination, is prompting financial institutions to realign their investment strategies and redefine value creation.

Commercial Banks

Commercial banks facilitate the flow of capital through short-term trade finance, corporate credit lines, and longer-term debt instruments such as loans and bonds. Their broad lending relationship positions them to play a transformative role in channelling capital toward sustainable development.

Typical Instruments: Trade finance, corporate loans, syndicated lending

Position: Low-to-medium influence; passive-to-active strategy

Market Snapshot: In 2023, the global banking industry intermediated US \$410 trillion in assets and generated US \$7 trillion in revenue (McKinsey, 2024)⁷.

As of 2024, over 553 institutions have signed the UN Principles for Responsible Banking, representing a combined total of US \$125 trillion in assets under management (UNEP FI, 2024)⁸. Global green bond issuance exceeded US \$2 trillion cumulatively by 2023, with annual issuance reaching US \$571 billion in 2024. Broader category impact bonds, including green, social, sustainability and sustainability-linked bonds, recorded annual issuance of US \$1 trillion in 2024, marking a nearly 20-fold increase from less than US \$50 billion in 2014 (Bloomberg, 2025)⁹.

Sustainability Integration:

- **ESG Lending and Risk Assessment.** With deep market reach, commercial banks are uniquely positioned to embed the new SDG behaviour-based factors into credit evaluation frameworks. Moving beyond reactive ESG compliance, banks can proactively incorporate behaviour-based climate and social risks, and governance quality into credit assessments and risk-based pricing.
- **ESG-Linked Debt Instruments.** Commercial banks can leverage their core expertise in capital intermediation, to structure and distribute ESG-linked financing solutions, such as green bonds, transition bonds, social bonds, and sustainability-linked loans (SLLs) to channel capital toward behaviour-based-aligned projects. These instruments represent a shift toward responsible banking, where commercial banks actively identify and finance sustainability-focused projects, using tailored terms that incentivise measurable

outcomes such as emissions reduction, renewable energy deployment, or inclusive infrastructure.

- **Empowering SMEs in the Transition.** Beyond large corporations, commercial banks can play an active role in supporting small and medium-sized enterprises (SMEs) on their sustainable transition by offering tailored ESG advisory and financing solutions. Acting as trusted partners, banks enable SMEs to integrate responsible practices into their operations. This engagement is critical to ensuring an equitable and inclusive transition, particularly in emerging markets and underserved sectors.

Investment Banks

Investment banks facilitate capital formation and corporate restructuring by underwriting securities, leading M&A transactions, and offering strategic advisory services. Their influence across primary markets and corporate finance gives them a unique lever to embed sustainability across transactions.

Typical Instruments: Bonds, securitisations, structured finance, advisory, M&A

Position: Low direct influence; active to systemic strategy

Market Snapshot: In 2024, the global investment banking industry generated US \$338 billion in revenue. Particularly, origination & advisory (O&A) activity grew to US \$94 billion, equity capital markets (ECM) reached US \$84 billion, and fixed income, currencies and commodities (FICC) grew to US \$160 billion (BCG, 2025)¹⁰.

Despite growing interest in sustainability-linked M&A and impact-driven structured finance, timely and comprehensive data on these activities remains scarce. This is largely due to fragmented reporting practices and limited disclosure requirements across jurisdictions and financial institutions. Addressing this gap presents a key opportunity: enhancing transparency and establishing standardised disclosures will enable the industry to better track market trends, assess real impact, and benchmark progress across these activities.

8 McKinsey & Company. (2024). Global banking annual review 2024: Attaining escape velocity. McKinsey & Company. <https://www.mckinsey.com/industries/financial-services/our-insights/global-banking-annual-review>

9 UN Principles for Responsible Investment. (2024). Annual Report 2024. <https://www.unpri.org/download?ac=21536>

10 <https://www.bloomberg.com/news/articles/2025-01-03/global-sustainable-bond-sales-reach-1-trillion-for-second-time>

11 BCG. (2025). Capital Markets & Investment Banking Update 2024/2025. <https://d1e00ek4ebabms.cloudfront.net/production/uploaded-files/BCG-e5d49871-ab4b-4fdf-9d45-169aef9a5ef6.pdf>

Sustainability Integration:

- **Sustainability Advisory.** Investment banks can scale systemic impact by advising clients on setting credible sustainability targets and designing transition strategies. Through M&A activities, capital raising and corporate restructuring, investment banks support the sustainable transition of companies and unlock long-term value.
- **Capital Mobilisation.** By underwriting behaviour-based-aligned securities, such as green securitisations, nature-based solutions-linked notes, and blended finance vehicles, investment banks can actively channel capital toward projects that deliver sustainable value at scale.

Asset Managers

Asset managers operate across a broad spectrum of strategies, targeting different market segments based on their investment mandates, risk tolerance, and return objectives. Given their scale and broad market exposure, asset managers are pivotal in integrating behaviour-based considerations into capital markets and advancing sustainable finance.

Typical Instruments: ETFs, ESG indices, mutual funds

Position: Medium influence; passive-to-active strategy

Market Snapshot: By 2024, the global asset management industry reached US \$128 trillion in assets under management, with active strategies continuing to dominate (BCG, 2025)¹⁰.

As of March 2025, over 5,000 institutions had signed the UN Principles for Responsible Investment (PRI), representing \$128 trillion in assets. Global sustainable fund assets hit a record US \$3.2 trillion in 2024, more than four times their 2018 level. Europe leads the market with 84% of assets, while the U.S. share declined to 11%, and the rest of the world grew to 2.3% (Morningstar, 2025).

Sustainability Integration:

- **Passive Strategy Transformation.** Index and ETF funds are evolving beyond traditional market benchmarks. Asset managers can design behaviour-based-screened indices and leverage stewardship tools such as proxy voting to influence corporate behaviour toward sustainability.
- **Behaviour-Based Factors as Alpha Driver.** Asset managers can systematically incorporate behaviour-based-aligned factors to generate returns with active trading strategies. Using proprietary frameworks, asset managers can identify risks and opportunities tied to sustainability performance and deploy long-short strategies for portfolio construction to capitalise on pricing gaps between firms with strong vs. weak ESG profiles.
- **Active Ownership and Engagement.** Through active ownership, asset managers can allocate capital to behaviour-based-aligned themes, such as clear energy, biodiversity, and gender equity, via activist thematic funds that align fiduciary duty with positive impact. Asset managers can engage with targeted firms through direct dialogue, collaborative initiatives, and escalation strategies such as voting against managers or filing shareholder proposals. They also push for improved ESG disclosures, advocate for board accountability, and may condition future investment on measurable sustainability progress.

10 Boston Consulting Group. (2025). Global Asset Management Report 2025: From Recovery to Reinvention. <https://www.bcg.com/publications/2025/reinventing-growth-amid-market-volatility>

Private Equity Firms

Private equity (PE) firms invest in privately held or delisted companies with a focus on operational value creation. Their active ownership model enables deep engagement to drive operational improvements and unlock strategic value.

Typical Instruments: Buyouts, growth capital, venture capital

Position: High influence; activist to sector focused strategy

Market Snapshot: In 2024, the global private capital assets under management (AUM) in 2024 is around US \$15 trillion (McKinsey, 2025)¹².

A PwC survey in 2023 reveals that 70% of private equity respondents rank value creation among the top three drivers of their organisation's ESG initiatives. Additionally, 46% of private equity investors incorporate responsible investment commitments or ESG provisions within their limited partnership agreements. General Partners are increasingly acknowledging that strong ESG performance not only reduces risk but also enhances long-term returns (UNPRI, 2023)¹³.

Sustainability Integration:

- **Due Diligence and Target Screening.** ESG considerations are now embedded across the private equity investment lifecycle, from deal sourcing and due diligence to post-acquisition value creation. During target screening, private equity firms can routinely assess behaviour-based risks and opportunities to shape investment terms and inform value-enhancing strategies.
- **Value Creation Through Sustainability.** Private equity firms can leverage sustainability as a strategic lever, not just for risk mitigation, but to drive operational efficiency, enhance governance quality, and strengthen long-term performance. Their active ownership model and board-level influence enable robust behaviour-based oversight and accountability.
- **Thematic Fund Strategies.** Private equity firms can take a systematic and forward-looking approach to behaviour-based transformation by establishing thematic funds focused on areas such as climate transition, social impact, or sustainable economy. With their long-term

investment horizon and governance influence, private equity firms are well-positioned to drive strategic change within portfolio companies and across industries.

Sovereign Wealth Funds & Development Banks

Sovereign Wealth Funds (SWFs) and Development Banks have a unique mandate to align capital with long-term national and global objectives. They are instrumental in driving capital flows towards systemic sustainability goals across nations.

Typical Instruments: Public-private partnerships, thematic funds, concessional finance

Position: High influence; systemic strategy

Market Snapshot: As of 2024, SWFs managed US \$13.2 trillion in assets (IECGC, 2024)¹⁴.

In 2023, SWFs allocated US \$9.7 billion in green sectors across 40 transactions, with US \$5 billion directed specifically toward renewable energy and infrastructure. As of 2024, 67% of SWFs are actively considering or aligning their portfolios with the UN Sustainable Development Goals (SDGs), a significant increase from 48% in 2022 (IECGC, 2024).

Sustainability Integration:

- **Thematic Investing:** SWFs are deploying capital through institutional thematic funds targeting areas such as food security, climate adaptation, and health systems. By anchoring these funds with long-term capital, SWFs can shape market direction, set impact objectives, and attract private co-investment. This approach enables them to drive measurable impact at scale and align financial returns with tangible progress on global development.
- **Policy-Aligned Capital:** As mission-driven, policy-aligned investors, SWFs and development banks can channel capital in support of national development priorities, environmental limits, and intergenerational equity. Their strategic role enables them to act as catalysts for systemic change and bridge public-private investment efforts to advance long-term sustainable outcomes.

12 McKinsey & Company. (2025). Global Private Markets Report 2025: Braced for shifting weather. <https://www.mckinsey.com/industries/private-capital/our-insights/global-private-markets-report>

13 UNPRI. (2023). Incorporating Responsible Investment Requirements Into Private Equity Fund Term. <https://www.unpri.org/download?ac=271>

14 IECGC. (2024). Sovereign Wealth Funds 2024: Resilience and Growth in a New Global Landscape. https://static.ie.edu/CGC/SovereignWealthFunds_2024report_IECGC.pdf

Summary

This section offers a market-level overview of the financial sector's evolving role in the sustainability landscape. From commercial and investment banks to asset managers, private equity firms, and sovereign wealth funds, we illustrate how these key players are positioned to drive transformative change. By assessing their market depth, core functions, and ESG integration practices through the lens of the Behaviour-Based maturity framework, it underscores the potential for financial institutions to move beyond transactional roles and contribute to regenerative economic systems with more meaningful impact.

Each sector has unique strengths, driven by the financial instruments they deploy, their business focus, and their institutional expertise. The opportunity ahead lies in shifting from short-term, compliance-driven approaches toward more strategic and transformative engagement. By providing both a conceptual and practical framework, our IFMM empowers financial institutions to reflect on their roles and refine their strategies in driving systemic change, contributing to the ongoing discourse on sustainable finance. Two strategic directions emerge for financial practitioners seeking to accelerate their role in the sustainability transition:

Shifting from Passive to Proactive Engagement.

Financial institutions face increasing expectations to actively contribute to the transition toward a just and sustainable economy. Realising this ambition requires a deliberate shift from passive ESG compliance to proactive engagement and, ultimately, achieving systemic co-creation. The insights outlined in this section demonstrate how different financial actors can align their strategic intent and leverage their operational strengths to drive meaningful change. Commercial banks can integrate sustainability targets into their lending criteria; investment banks can innovate by structuring behaviour-based-aligned financial products; asset managers can foster systemic change through strategic capital allocation and active engagement; and private equity and sovereign wealth funds can drive transformation through long-term, active ownership. Financial institutions should evolve from responding to external ESG pressures to taking a leadership role in advancing sustainability across markets, portfolio companies, and value chains.

Advancing SDG Maturity as a Strategic Imperative.

The second key insight emphasises the need to move beyond traditional ESG ratings and embrace behaviour-based maturity indices as a forward-looking, actionable tool for capital deployment and institutional engagement.

Table 4.1: Impact Finance Strategy Map

Financial Actor	Typical Instruments	Position in IFMM	Market Size Snapshot	Sustainability Integration/ Implications
Commercial Banks	Trade finance, corporate loans, syndicated lending, bonds	Low-Medium influence; Passive→Active	Global banking assets \$410T ; revenues \$7T (2023). 553 banks signed UNEP FI Principles (US \$125T AUM). Annual sustainable bond issuance > \$1T (2024).	Move from credit risk focus → proactive behaviour-based-linked lending (SLLs, green bonds). SME transition support.
Investment Banks	Bonds, securitizations, structured finance, M&A, advisory	Low direct influence; Active→Systemic	Industry revenue \$338B (2024): ECM \$84B, O&A \$94B, FICC \$160B.	Structure blended finance & green securitizations; integrate sustainability advisory in capital formation.
Asset Managers	ETFs, ESG indices, mutual funds	Medium influence; Passive→Active	Global AUM \$128T (2024). Sustainable fund assets \$3.2T (2024). 5,000+ signatories to UN PRI.	Stewardship via proxy voting, thematic active funds, climate-transition indices; behaviour-based ? as alpha driver.
Private Equity Firms	Buyouts, growth capital, venture capital	High influence; Active→Sector/ Systemic	Private capital AUM \$15T (2024). 70% rank value creation among top ESG drivers.	High governance control: embed sustainability in operations, drive innovation, mission-linked carry? structures.
Sovereign Wealth Funds (SWFs)	Thematic funds, public-private partnerships, concessional finance	High influence; Systemic	SWF AUM \$13.2T (2024). In 2023: \$9.7B allocated to green sectors, 67% aligning with SDGs.	Policy-aligned capital for national priorities (food, climate, health). Ability to crowd-in private capital & set systemic goals.
Development Banks/MDBs	Concessional debt, guarantees, blended finance	High influence; Systemic	Impact bonds issuance > \$1T (2024). MDB portfolios increasingly aligned to SDGs.	Provide de-risking for high-impact projects; catalyse private capital; enforce transparency norms.

While ESG scores often focus on past disclosures and suffer from methodological inconsistencies, behaviour-based maturity indices offer a more dynamic and nuanced assessment of a company's journey towards sustainability. These indices allow financial institutions to assess firms based on their progression along the sustainability spectrum—ranging from early-stage advocacy to transformative, systemic integration.

Integrating behaviour-based maturity insights into due diligence, portfolio construction, and stewardship efforts enables investors to identify companies implementing high-impact, value-enhancing sustainability strategies. This analytical advantage not only drives better capital allocation and improved risk-adjusted returns but also enhances an institution's ability to unlock the upside potential of behaviour-based-aligned investments. By adopting this approach, financial institutions can achieve greater strategic clarity and measurably improve the impact of their investments, ensuring alignment with long-term value creation and real-world progress toward the SDGs.

4.5 Future Research Direction

As corporations deepen their sustainability commitments, a pressing need emerges to move beyond disclosure-based ESG metrics and towards more granular and actionable insights. Leveraging the GOLDEN Sustainability Dataset, which is powered by large language models (LLMs) to extract corporate sustainability initiatives, we outline two key further research pathways: (1) deepening integration with financial institutions and internal governance, and (2) exploring different aspects on social impact.

Institutional Investors: ESG Integration into Investment Decisions

Why it matters: Institutional investors are under increasing pressure to balance financial performance with sustainability outcomes. However, prevailing ESG ratings often lack the granularity and consistency necessary to differentiate firms pursuing substantive change from those engaging in symbolic compliance. We aim to study whether initiative-level information that captures the nature, stakeholder focus, and structural maturity of firms' behaviour-based-related actions can offer a more decision-relevant foundation for institutional investors to evaluate firms' sustainable performance. Understanding how such information contributes to enhanced portfolio construction, risk assessment, and investment performance is essential for advancing responsible and impact-oriented investment strategies.

How we plan to do it: We aim to investigate how different types of institutional investors incorporate ESG initiative data into screening, engagement, and capital allocation processes to better identify and support transition-aligned firms.

Private Equity as a Catalyst for ESG Transformation

Why it matters: Private equity (PE) firms hold unique potential to embed sustainability at scale through operational control and long-term capital. The industry's actual contribution to ESG transformation remains opaque with concerns about short-term value extraction and long-term impact. Studying ESG initiatives in PE portfolio firms offers a timely lens to evaluate whether active ownership translates into structural change aligned with the Sustainable Development Goals (SDGs).

How we plan to do it: We aim to link ESG initiative data to PE-backed firms to examine how ownership models and fund strategies influence the scope and maturity of sustainability actions.

Corporate Governance and the Strategic Depth of ESG

Why it matters: Boards of directors are central to embedding sustainability within corporate strategy and overseeing the implementation of ESG initiatives. We seek to understand how internal governance mechanisms across multiple dimensions—including the presence of sustainability committees, directors with ESG expertise, and long-term incentive structures in executive compensation—facilitate the adoption of stakeholder-oriented and behaviour-based practices.

How we plan to do it: We aim to analyse how specific board structures and governance mechanisms relate to the scope, depth, and stakeholder alignment of ESG initiatives across firms.

Corporate Sustainability initiatives and Social Impact

Why it matters: As firms increasingly emphasise their social responsibility, a critical gap persists between ESG disclosures and verifiable outcomes for key stakeholders, including employees, customers, suppliers, and local communities. Despite widespread reporting of socially oriented initiatives, empirical evidence on their actual impact remains limited. Advancing robust methods to quantify social impact is therefore both timely and essential.

How we plan to do it: We aim to link behaviour-based data to a range of quantitative measures of social impact, to evaluate whether and where firm-level actions generate measurable improvements aligned with the social dimensions of the SDGs.

5

A Strategic Imperative for the UN 2030 Agenda



The **2030 Agenda for Sustainable Development** calls for an estimated **\$5 trillion per year** in additional investment to achieve the SDGs by 2030. While this figure appears daunting in isolation, it represents only **~5% of global GDP** (≈\$105 trillion in 2024).

By contrast, global financial assets exceed **\$566 trillion**—more than 100 times the SDG financing gap. The challenge is therefore not the scarcity of capital but its **mobilisation and strategic alignment**.

This visual underscores a simple truth: mobilising just **1% of global financial assets** each year would be enough to fully finance the SDGs.

- The SDG investment gap is not homogeneous; it is concentrated in key growth markets:
- **Energy Transition:** \$2.0T/year (renewables, storage, efficiency).
 - **Sustainable Infrastructure:** \$1.5T/year (transport, water, cities).
 - **Health & Education:** \$0.7T/year.
 - **Food & Agriculture:** \$0.5T/year.
 - **Digital Inclusion & Other:** \$0.3T/year.
- This breakdown reinforces that the SDG agenda is not a cost burden, but the **largest growth market of the decade**.

Figure 5.1: below compares the relative scale of GDP, total financial assets, and the SDG gap:

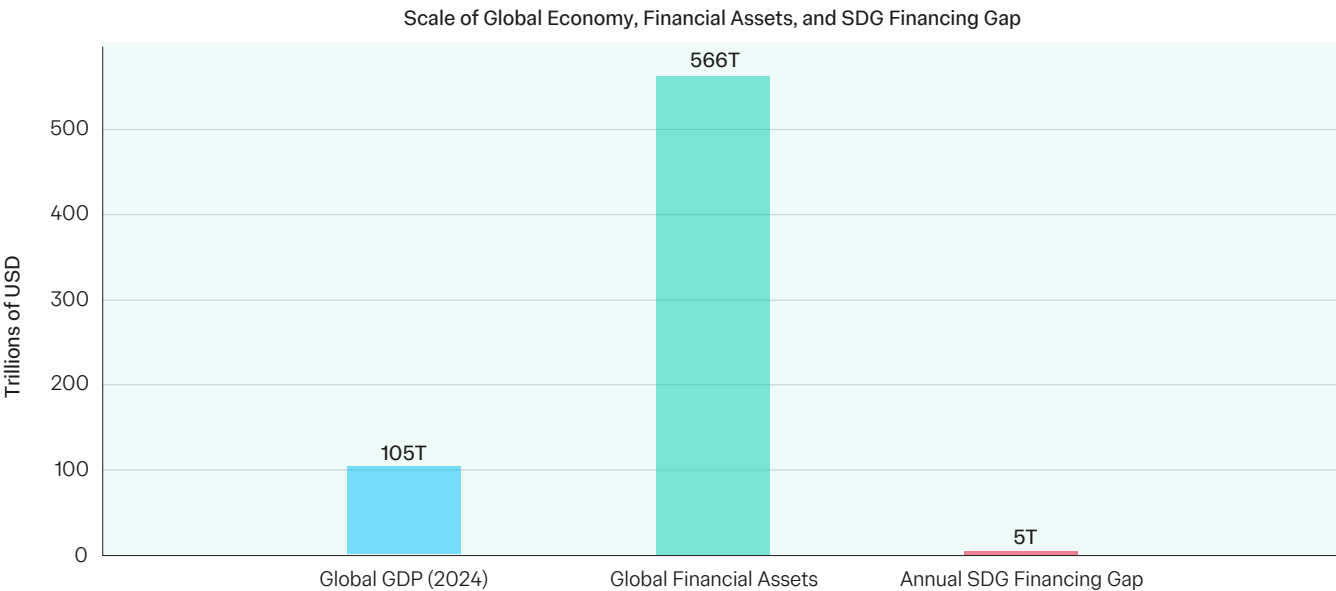
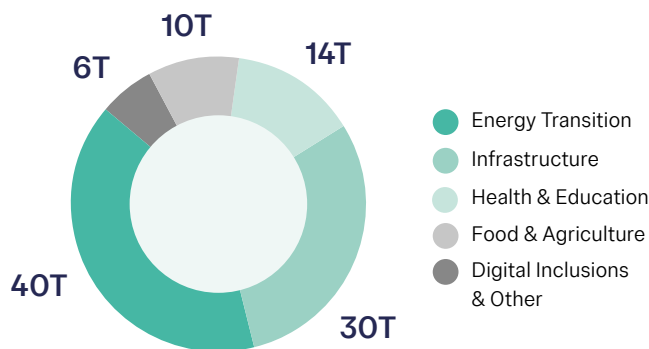


Figure 5.2: Annual \$5T SDG Financing Gap – Sectoral Breakdown



- The global economy faces a decisive decade. With **\$566 trillion in financial assets** and only **\$5 trillion/year required** to achieve the 2030 Agenda, the opportunity is momentous:
- Finance can deliver superior returns by investing in transformation.
 - The **SDG gap equals just 1% of global financial wealth**.
 - The behavioural finance approach provides the tools to deploy this capital with precision, accountability, and systemic impact.
- The conclusion is clear:** the 2030 Agenda should not be framed as a financing burden, but as the **largest investment opportunity of our generation**—a chance to deliver alpha, resilience, and systemic wellbeing at the same time.

Conclusions



Behavioural Maturity is the True Driver of Value

Companies embedding sustainability into their core business (transformation behaviours) consistently outperform peers, generating **+2.52% annual excess returns** and **38.5% cumulative outperformance**. This is not marginal: applied to global capital markets, such maturity-driven strategies could unlock **trillions in additional value creation**, equivalent to a meaningful share of global GDP growth.

ESG Ratings are Off-Target

Current ESG ratings fail to capture this potential. By rewarding procedural compliance over genuine transformation, they misallocate capital on a systemic scale. In the context of a global economy exceeding **\$105 trillion**, continuing to rely on ESG as the dominant lens risks diverting capital away from the high-impact investments required to achieve the **2030 Agenda**.

Behavioural Indicators Unlock a New Generation of Insights

Behavioural indicators provide a **quantitative, predictive, and scalable tool** to bridge the \$5 trillion annual SDG financing gap. By redirecting even **5% of global financial assets** toward maturity-aligned transformation, the annual SDG investment requirement could be met. In other words, the shift from ESG scores to behavioural indicators is not just methodological—it is structural, offering the capacity to mobilise capital at the scale demanded by global challenges.

Finance Holds Untapped Systemic Agency

The **Impact Finance Maturity Model (IFMM)** demonstrates that finance is not a passive allocator but can be a systemic change agent. With global financial institutions controlling capital pools far larger than global GDP, their potential to drive transformation is unparalleled:

- **Commercial Banks:** \$410T in assets ($\approx 4\times$ global GDP).
- **Asset Managers:** \$128T in AUM ($\approx 1.2\times$ GDP).
- **Private Equity:** \$15T AUM.
- **Sovereign Wealth Funds:** \$13.2T AUM.
- **Impact/Green Bonds:** $> \$1T$ annually.

The totality of these markets dwarfs the **\$5T annual SDG investment need**. Mobilising even a fraction of these resources through behavioural finance would close the gap.

The Market Opportunity is Historic

With an annual **\$5T financing gap** for the SDGs, equivalent to just **$\sim 1.2\%$ of the assets managed by global financial institutions**, the opportunity is clear:

- **Behavioural signals** allow investors to capture alpha and deploy capital toward systemic impact.
- Aligning even **1.3% of bank balance sheets** or **4% of asset manager AUM** with transformative sustainability would fully finance the 2030 Agenda.
- In the process, investors would not sacrifice returns—instead, they would capture the very best performance that behavioural maturity generates.

A Strategic Imperative

The global economy has entered a decisive decade. With world GDP surpassing \$100T and sustainability challenges compounding into a polycrisis, the choice is stark: continue allocating capital through ESG lenses that miss transformation, or adopt behavioural finance to **simultaneously deliver returns, reduce systemic risk, and close the \$5T annual SDG gap**.

A Call to Action

Behavioural finance is not just a better measurement tool; it is the missing engine of systemic transformation. By grounding decisions in what companies *actually do*, and by mobilising the vast balance sheets of banks, asset managers, private equity, sovereign wealth funds, and MDBs, the financial sector has both the scale and the mandate to close the 2030 Agenda financing gap.

This is a once-in-a-generation opportunity: to redirect **1% of global financial flows** toward systemic wellbeing, ensuring that finance evolves from an extractive mechanism into the **driving force of a regenerative global economy**.

Companies embedding sustainability into their core business (transformation behaviours) consistently outperform peers, generating **+2.52% annual excess returns** and **38.5% cumulative outperformance**.

Appendix

Table A.1: The Classification of business sustainability initiatives by type of behaviour

	Type of Action	Action Description
	Donations Funding	Philanthropic activities through which companies donate money, goods or services as gifts.
	Communications	Activities that bring specific information or knowledge from the firm to a certain interlocutor, to generate awareness, engage stakeholders, communicate policies.
	Volunteerism	Activities that stimulate and promote volunteerism, fundraising and personal donations from individuals within or outside the firm (i.e. employees, customers, community volunteerism).
	Incentives and	Activities that typically involve the devolvement of benefits, privileges, or rewards toward a particular stakeholder in order to gratify or stimulate an action.
	Pricing	Marketplace activities by which the firm temporarily sets up or modifies pricing structures and tariffs.
	Organisational Structuring	Activities that involve a structural change in the organisational structure of the firm.
	Modification	Activities that modify the procedures adopted by the firm in order to perform a specific activity.
	Assets Modification	Activities that build, expand or modify the physical assets owned and used by the company to run their activities.
	Training	Teaching activities aimed at improving knowledge, skills, and competencies.
	R&D Investments	Activities that encompass an investment aimed at introducing a technological novelty in a product, service or process.
	Association	Activities through which companies join, collaborate or promote cooperation with other firms, organisations, institutions or communities, including multilateral agreements and collaboration initiatives.
	Assessment and Measurement	Activities with which the firm collect and analyse information from inside or outside.
	Adoption of Standards Rules	Activities involving the underwriting, adoption or compliance with externally sourced policies, guidelines, procedures, or standards.
	New Products	Launch of a new product or service (made available to the market). It includes new product's technical specification, the inclusion of new components or features into an existing product or service, as well as packaging.

Taxonomy

Table A.2 presents a concise taxonomy of key sustainability-focused financial instruments. It categorises tools such as green bonds, sustainability-linked loans, and blended finance by purpose, mechanism, and real-world examples. The table serves as a foundational reference for institutions aiming to

align capital deployment with measurable sustainability performance and SDG outcomes. The table supports decision-makers and researchers in identifying tools for integrating sustainability-oriented objectives into financial strategies.

Table A.2: Purposes, key features and real examples for sustainability-focused financial instruments

Instrument	Purpose	Key Features	Real Example
Green Bonds	Finance environmentally focused projects (e.g., renewable energy, energy efficiency).	Use-of-proceeds bonds aligned with ICMA Green Bond Principles.	European Investment Bank – Climate Awareness Bond (€600M, 2007) kpmg 2023
Social Bonds	Fund projects addressing social issues like housing, healthcare, and education.	Aligned with Social Bond Principles (SBPs).	International Finance Corporation (IFC) -social bonds to finance projects for under-served communities ifc.org
Sustainability Bonds	Support both environmental and social projects.	Combination of green and social bond frameworks.	Apple Inc. – \$1.5B sustainability bond (2016). The Guardian
Sustainability-Linked Bonds (SLBs)	Link interest rates to sustainability performance targets.	Coupon increases if sustainability KPIs are not met.	Enel – \$1.5B SLB tied to renewable targets (2019) nortonrosefulbright.com
Green Loans	Provide loans exclusively for green projects.	Aligned with Green Loan Principles (GLPs).	HSBC – \$23 M green loan to solar plant in Vietnam .
Sustainability-Linked Loans (SLLs)	Loans tied to borrower's sustainability performance.	KPIs-based interest rate adjustments.	Consortium led by ING, 550M\$ loan with a margin linked to the company's sustainability performance improvement.
Impact Investment Funds	Investments aimed at generating measurable positive social/ environmental impact.	Double bottom-line approach (returns + impact).	LeapFrog Investments – 1B\$ impact-driven PE fund for emerging markets. esge/esgtoday
Carbon Credits & Offsets	Certificates representing CO ₂ reduction projects.	Used for carbon neutrality and net-zero strategies.	Gold Standard Verified Carbon Credits. climateects , climatepartner.com
ESG-Integrated ETFs & Equities	Investment vehicles prioritising ESG leaders.	ESG screening and best-in-class strategies.	iShares MSCI ESG Leaders ETF (SUSL). ishares.com
Blended Finance Instruments	Combine public, philanthropic, and private capital to de-risk projects.	Often used for large-scale climate infrastructure.	Climate Investor One – blended renewable platform. ft8,ft.com
Transition Bonds (or loans)	Finance companies' shift from high-carbon to low-carbon operations.	Targets to making change in industry and in hard-to-abate sectors.	HSBC- to Etihad Airways' \$600 M transition sukuk, hsbcf.com

Authors

Matteo Burrato, Mojtaba Nouri, Filippo Pellegrino, Livio Scalvini, Shuying Wu, Maurizio Zollo.

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Please send comments and feedback to:

Email: leonardo.centre@imperial.ac.uk

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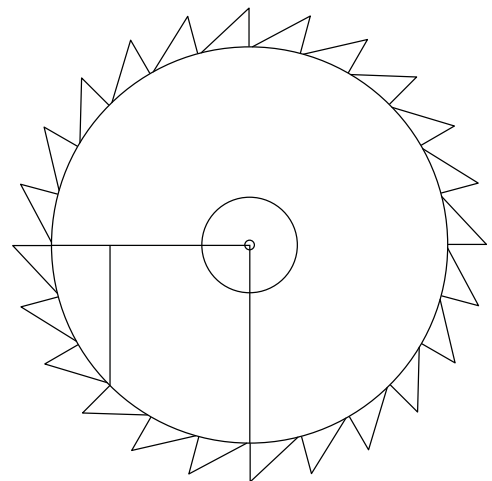
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The Leonardo Centre on Business for Society

Imperial College Business School
South Kensington Campus
London SW7 2AZ
United Kingdom

Email: leonardo.centre@imperial.ac.uk

Website: [imperial.ac.uk/business-school/
leonardo-centre-business-society](https://imperial.ac.uk/business-school/leonardo-centre-business-society)

