

## GS SUSTAIN: ESG of the Future

# Accelerating the Energy Transition: Metrics and tools to measure progress

As Sustainability investing matures to the “Measurement” phase of its cycle and becomes more forward-looking, there is rising focus on how to quantify impact — whether environmental or social. On the environmental side, managements and investors are seeking greater clarity on how to prioritize metrics that can help evaluate climate transition progress. A successful energy transition warrants companies that provide solutions, innovation and ability to improve/decarbonize their own operations. To measure this, we believe investors will look for the 3 P’s: **Plan**, **Path**, **Performance** — with a focus on Green Revenue, Green Capex, greenhouse gas emissions intensity, emissions avoidance and management accountability. We highlight our Climate Transition Tool that provides a framework for quantifying corporate climate transition performance and plan transparency as well as our forward-looking estimates for Green Revenue mix, Green Capex mix and greenhouse gas emissions.

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**Exhibit 1: We believe 3 P's are key to measure climate transition progress: Plan, Path and Performance. We expect investors to focus on 5 metrics: Green Revenue, Green Capex, GHG Emissions intensity, Emissions avoidance and Accountability. Our GS Climate Transition Tool incorporates greater detail to provide a use case to assess companies' transition plan transparency and transition performance**

## The three P's key for measuring climate transition progress



### Plan

Transparency of climate transition goals regardless of what the specific goal may be.



### Path

Understanding timing/catalysts for lower corporate emissions.



### Performance

How greenhouse gas emissions intensity and business mix compares with peers.

## Five metrics that will be in focus by investors across companies in multiple sectors important to the energy transition



### Green Revenue

Amount or percentage of revenue linked to sustainable use cases or climate transition activities. GS SUSTAIN offers analyst forecasts for companies in 19 sectors. Our EU Taxonomy tool estimates Green Revenue eligibility and alignment for 7,000 companies.



### Green Capex

Amount or percentage of capex + R&D linked to sustainable use cases or climate transition activities. GS SUSTAIN offers analyst forecasts for companies in 19 sectors.



### Emissions intensity and path

Scope 1 + 2 greenhouse gas emissions divided by key industry operational metrics (GWh of generation for utilities, tons of steel for steel companies, revenue passenger km for airlines, etc) and path forward. GS SUSTAIN offers analyst forecasts for companies in 7 sectors.



### Emissions avoidance

How a sector/company's products help to avoid emissions by customers or customers/customers if a direct impact using historical data can be determined. GS SUSTAIN estimated emissions avoided for the semiconductors sector in 2021.



### Accountability

Disclosure whether management is incentivized to meet its climate targets and/or on the basis of the metrics above.



## GS SUSTAIN Climate Transition Tool

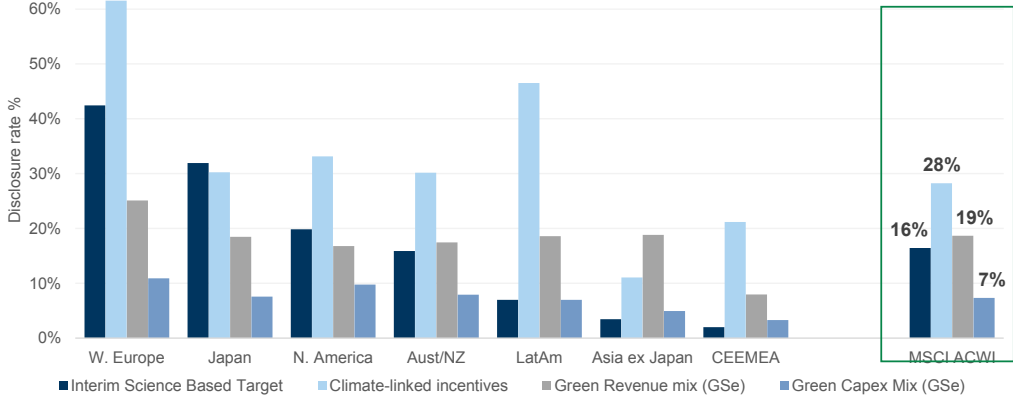
Our tool provides a view on companies' climate transition efforts through two lenses: (1) our Transition Plan Transparency Score and (2) our Transition Performance Score.

**1. Transition Plan Transparency Score:** An **absolute assessment** of companies' disclosures across metrics which demonstrate if a company has a transition strategy in place, how integrated the strategy is with the broader business strategy, and the quality of their reporting.

**2. Transition Performance Score:** A **sector-relative assessment** across indicators which demonstrate how companies are performing relative to peers on reducing their carbon emissions footprint and how they are shifting their product mix or business models towards lower carbon outcomes..

**Exhibit 2: Investors looking for companies with low/improving greenhouse gas emissions intensity may prioritize focus on those with related targets, management incentives/accountability, Green Revenue, Green Capex**

Disclosure rate by region among companies in the MSCI ACWI with interim science-based climate transition targets, climate-linked incentives and Green Revenue/Green Capex exposure (as estimated via our tools)



Source: Bloomberg, Refinitiv, FactSet, Goldman Sachs Global Investment Research

## PM Summary

**Energy reliability issues in multiple major economies, social unrest, post-COVID inflationary pressures and the Russia-Ukraine war have caused a re-evaluation of Sustainability investing and discussions among generalist and specialist investors about the merits and risks of various Sustainable investing strategies. As Sustainability investing matures to the “Measurement” phase of its cycle and becomes more forward-looking, there is rising focus on how to quantify impact – whether environmental or social. In this report we prioritize metrics we believe will be important for quantifying corporate climate transition progress, focused around the 3 P’s: Plan, Path, Performance. We believe investors will increasingly focus on metrics can help quantify company business mix (Green Revenue/Green Capex), company emissions intensity (operational vs. sector peers), sector/company emissions avoidance and management accountability. We highlight our forward-looking estimates and our Climate Transition Tool as two quantifiable use cases to measure impact/improvement.**

**Investor mentality is shifting From Aspiration to Action, resulting in three critical investment implications.** Multiple energy reliability issues in global economies over the past two years, climate events, inflationary pressures impacting lower-income populations are driving a shift among Sustainability investing towards greater urgency to accomplish Sustainable Development Goals vs. a desire to support them. We believe this will broaden the investable universe and lead to increased interest in measuring impact and provide more transparent quantitative frameworks to help drive stock selection. As part of the shift From Aspiration to Action, we believe this could also lead to more narrowed/specified fund objectives.

**The three P’s key for measuring climate transition progress: Plan, Path, Performance.** We believe there is increasing desire among Sustainability-focused investors to quantify what companies are sufficiently progressing towards the climate transition via simplified metrics that can be used alongside fundamental metrics like earnings/EBITDA, corporate returns, growth and leverage when considering attractiveness of an investment opportunity. We believe this will lead to a more specific focus on the 3 P’s:

- **Plan:** Transparency of climate transition goals regardless of what the specific goal may be.
- **Path:** Understanding timing/catalysts for lower corporate emissions.
- **Performance:** How greenhouse gas emissions intensity and business mix compares with peers.

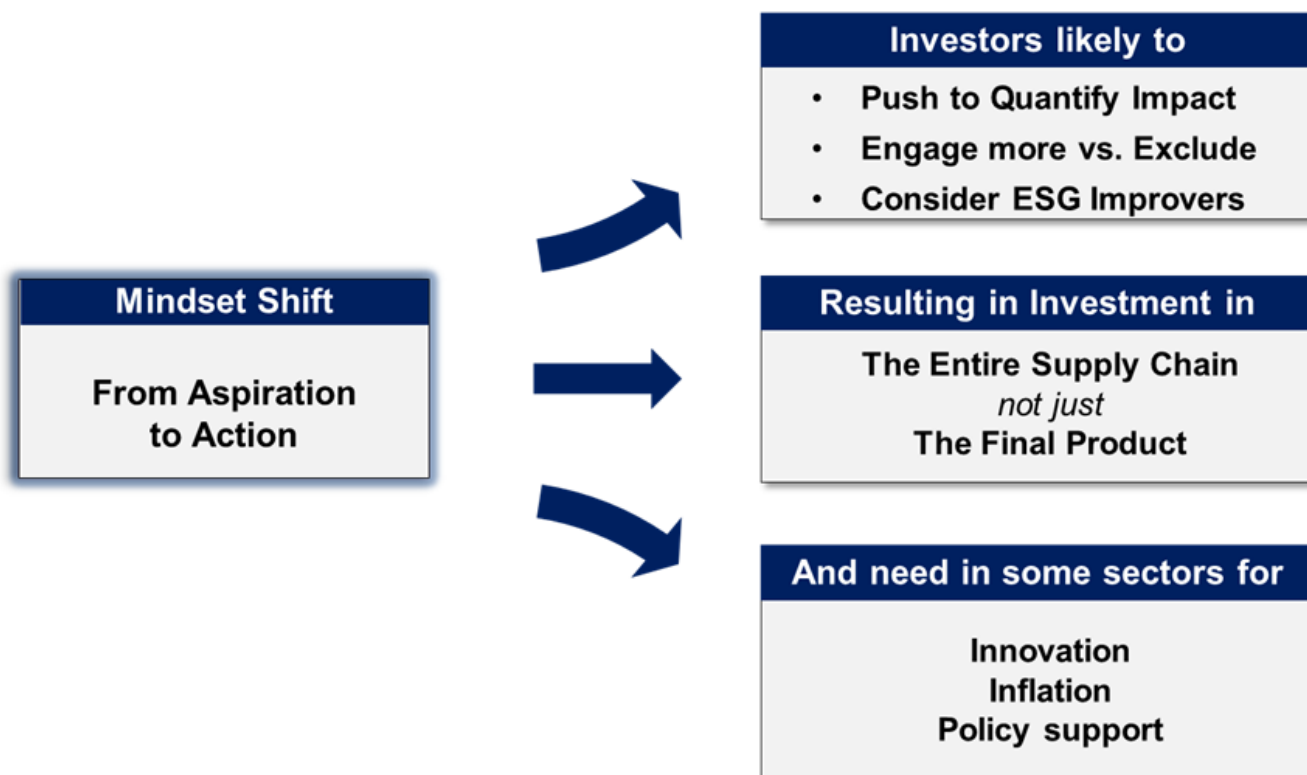
We believe this will translate to a **focus on five metrics that will be in focus by investors across companies in multiple sectors important to the energy transition:**

- **Green Revenue:** Amount or percentage of revenue linked to sustainable use cases or climate transition activities.

- **Green Capex:** Amount or percentage of capex + R&D linked to sustainable use cases or climate transition activities.
- **Emissions intensity:** Scope 1 + 2 greenhouse gas emissions divided by key industry operational measure of related volume (GWh of generation for utilities, tons of steel for steel companies, revenue passenger km for airlines, etc).
- **Emissions avoidance:** How a sector/company’s products help to avoid emissions by customers or customers/customers if a direct impact using historical data can be determined.
- **Accountability:** Disclosure whether management is incentivized to meet its climate targets and/or on the basis of the metrics above.

**Our GS Climate Transition Tool fuses together a number of our GS SUSTAIN data tools to provide a view on companies’ climate transition efforts through two lenses: (1) Transition Plan Transparency and (2) Transition Performance.** The Transition Plan Transparency framework is an absolute assessment of companies disclosures across metrics demonstrating whether a company has a transition strategy in place (e.g., targets), how integrated the strategy is with the broader business strategy (e.g., climate-linked compensation incentives), and considers the quality of reporting (e.g., granularity of data, verification, TCFD-alignment, etc). The Transition Performance framework is a sector-relative assessment, factoring in the carbon emissions profile of a company and current and future Green Revenue and Green Capex exposures.

**Exhibit 3: From Aspiration to Action investment implications**



Source: Goldman Sachs Global Investment Research

## Recommendations

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- 1. Corporate transparency on plans and paths.** We outline metrics that we believe corporates should adopt and investors should use to measure the strength of companies' climate transition plans. We believe companies should (i) provide interim targets, preferably third-party verified as being aligned with a climate pathway (e.g., via the Science Based Targets initiative), (ii) be transparent around the reliance and usage of carbon offsets, and (iii) disclose annually progress relative to targets and key milestones along the way to help provide greater clarity to allow investors to forecast impact.
- 2. Define what's Sustainable.** Investors along with regulators should establish a common global definition of sustainable use cases (idealistically in alignment with the latest scientific thresholds). In the absence of this, we believe the EU Taxonomy will likely increasingly be adopted as a standard by investors. The need for greater agreement on defining what's Sustainable is particularly in need for Financials to be able to measure sustainable financing on an apples-to-apples basis.
- 3. Revenue and Capex segmentation.** Companies seeking greater credit for business lines that may be considered sustainable should provide more detailed disclosure with annual filings at a minimum on revenue and capex mix by business line. Given varying Sustainability/ESG investor strategies, this will allow investors to determine if a given product or area of investment meets their standards for consideration of impact.
- 4. More apples-to-apples emissions intensity accounting.** Companies should provide alongside annual financial filings (at a minimum) emissions data on a consolidated basis and, separately where relevant, incorporating proportional impact from minority positions. On an apples-to-apples basis, companies should provide operational data to measure emissions intensity consistent with quarterly reporting.
- 5. Financial performance + Climate Transition progress metrics are both key.** We do not believe these climate impact metrics should diminish financial metrics. We expect investors will continue to look for companies with favorable corporate financial returns and favorable positioning on their cost curves that have the lowest or most meaningfully declining environmental footprint vs. their peers.

# Why quantification of transition impact matters

**We believe quantifying transition progress — and estimating performance on a forward-looking basis — can help to further normalize Sustainability metrics as useful tools alongside financial performance and fundamentals. This can help garner greater generalist interest/consideration while reducing asset manager Fear of Misaligned Exposure (FOME) — concern that investors or regulators will push back on holding(s) as inconsistent with fund objectives.**

## Regulatory considerations

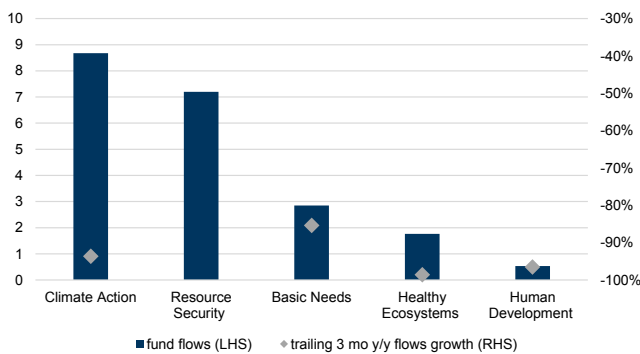
Regulators across the globe are increasingly focused on a greater combination of transparency and disclosure of both corporates and asset managers. In Europe, the EU Green Taxonomy and SFDR will lead to greater disclosure of revenue mix, capex mix and the level of exposure by ESG-designated funds. In the US, SEC rules are focused on transparency via corporate disclosure and asset manager processes.

## Investor considerations

Asset managers are under not only regulatory pressure but also pressure from their investors to ensure that the holding in their funds meet investor expectations of fund objectives. FOME (Fear of Misaligned Exposure) has the potential to be mitigated via specified fund objectives and clear quantifiable approach to what defines the investable universe that when fused with financial fundamentals helps to govern stock selection.

**Exhibit 4: Climate action funds continue to command the greatest share of thematic flows, though 'Basic needs' is seeing better relative growth**

2022 ESG fund flows (\$ bn, LHS) and trailing 3-month y/y flows growth (RHS)

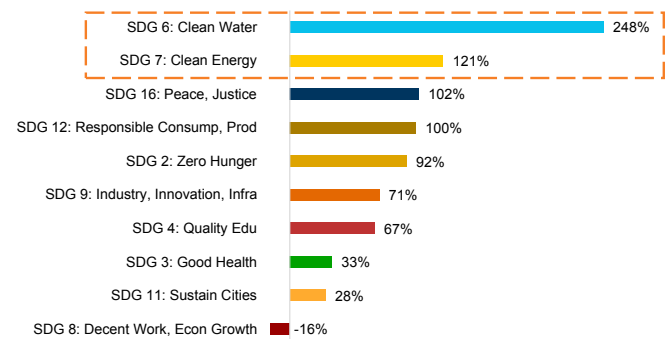


'Basic needs' funds are defined as those with a focus on food, housing, and healthcare accessibility.

Source: Morningstar, Goldman Sachs Global Investment Research

**Exhibit 5: Themes of Clean Water and Clean Energy are overweighted in ESG funds**

Avg weight (vs. ACWI) of companies with net positive SDG alignment in ESG funds (trimmed mean)



Source: Morningstar, Goldman Sachs Global Investment Research



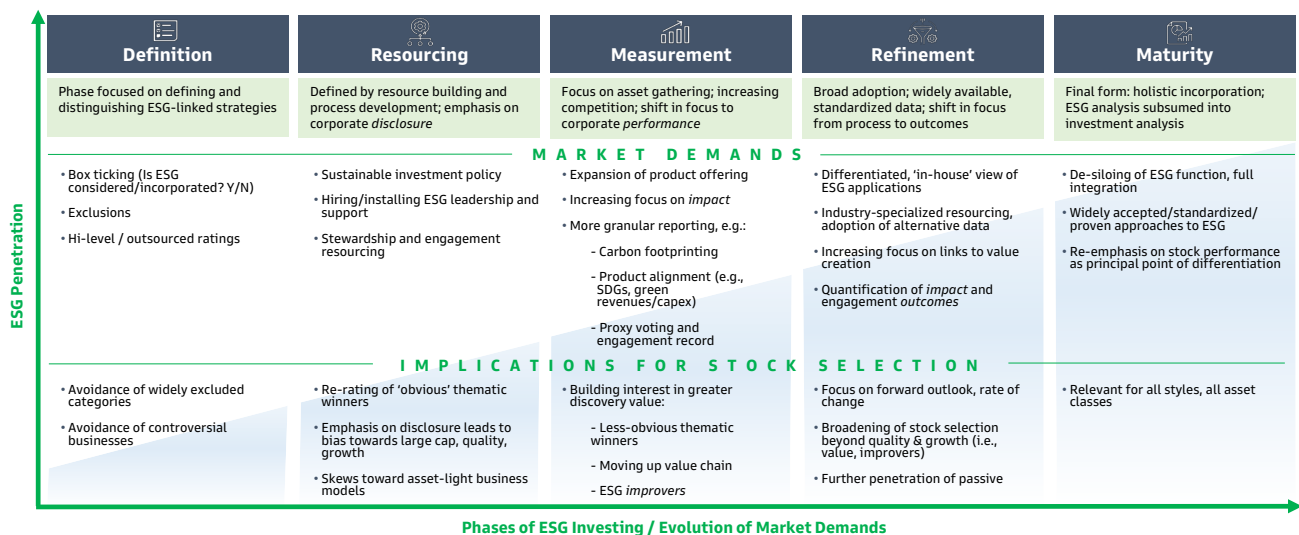
**Exhibit 6: Driven by pressure from multiple angles, we expect ESG investors to become increasingly forward-looking**



Source: Goldman Sachs Global Investment Research

**Exhibit 7: While approaches and stages vary, we view the preponderance of the market as currently in the 'Measurement Phase', with opportunities to prepare for the 'Refinement Phase' ahead**

A view of the evolution of ESG investing



Source: Goldman Sachs Global Investment Research



## Measuring impact: Finding Decarbonization's earnings or EBITDA equivalent

We believe there are three main ways in which companies can demonstrate contribution to decarbonization that will receive greater investor credit:

1. **Normal course business:** Existing core competencies and revenue streams that contribute to sustainable development goals.
2. **Shift in business mix:** Organic expansion into new business lines that contribute to sustainable development goals
3. **Self-help.** Mitigating company's own carbon emissions intensity without change in business mix via new technologies/efficiency initiatives.

**What do investors need to see to support ("CARE" for) companies' increased decarbonization investments?** We believe the capability to generate favorable returns on Green Capex initiatives will be key regarding managements' decisions on how to allocate resources vs. returning capital to shareholders. In our view, investors are likely to "CARE" about Green Capex initiatives based on whether the company can demonstrate:

- **C**ore competencies in that area
- **A**vailable capital to deploy
- **R**eturns at the corporate level that are/remain favorable over medium term
- **E**xecution to meet goals and raise contribution from Green initiatives that are material.

We believe these pillars could serve as the lens investors could potentially use to assess where it is more favorable to allocate capital. In our view, to the extent projects do not meet the four pillars of "CARE," capital may be more efficiently deployed when returned to shareholders and then re-directed to Green initiatives. We believe there will be rising investor support for companies reinvesting in existing core businesses if they can demonstrate they are the low-cost, low-environmental footprint (and with no social harm) supplier of a good in demand. For those that do not meet this or the CARE framework, investors will likely look for managements to return capital to shareholders.

### Metric 1: Green Revenue

#### Why it's useful

1. **Green Revenue can capture business mix and business mix shifts towards sustainable initiatives.** As more investors look for implications of investments on the bottom line, understanding how a company's business supports sustainable goals will be increasingly relevant, in particular how the Energy transformation could cause forward-looking shifts in a company's mix.
2. **Revenue streams are more easily reported than profitability streams.** Ideally investors would want to understand not just revenue but profitability. However,

disclosure of EBITDA by business line is unlikely to be widely adopted. As such, putting Green Revenue in context with corporate returns/profitability will be important to fusing Sustainability metrics with financial fundamentals.

## Challenges

### 1. There is not a global standard that defines how to calculate Green Revenue.

The EU Taxonomy provides a guide based on the activities the EU seeks to classify towards decarbonization objectives. In the absence of a global standard, companies could disclose revenue streams they believe may be pertinent and let investors aggregate to what fits the strategy of their fund. We believe global standard is important as well for the Financials sector to help measure corporate progress on sustainable finance goals relative to peers as opposed to vs. individually-defined corporate targets.

### 2. Revenue is not the consistent measure of performance or exposure for all sector.

Some sectors like petrochemicals or refining operate more on a margin basis which may make revenue exposure less relevant. Additionally, companies will need to be considered vs. their peers given changes in prices could change revenue mix but not volumetric business mix.

## What GS SUSTAIN offers

**Forward-looking estimates.** Looking ahead, we believe investment performance will be more driven by future change and have taken steps toward incorporating forward-looking estimates in our proprietary industry analyst inputs. This includes offering quantitative forecasts of sustainable product revenue for ~650 companies in 19 industries where we believe Green Revenue mix will be most critical. Beyond these sectors, of the more than 3,000 companies under GS coverage globally, 53% saw a change in net E&S scores as a result of our analyst survey inputs.

**Sustainable Development Goal revenue alignment.** The UN Sustainable Development Goals (SDGs) have emerged as one of the most commonly used frameworks for taxonomizing impact across a broad set of sustainability challenges. Our SDG alignment tool employs granular revenue data, GS analyst inputs and other company metadata to map alignment, exposure and misalignment to ten of the SDGs we deem to be most investable.

**EU Taxonomy revenue alignment.** We see the EU Taxonomy as one of the most seminal regulatory developments driving standardization in reporting for corporates/asset managers. Our EU Taxonomy alignment tool maps company revenues to Taxonomy-defined activities to estimate potential Taxonomy-eligible and aligned revenue based on technical screening checks where data exist, and “Do No Significant Harm” and “Minimum Social Safeguards” criteria.

## Metric 2: Green Capex

### Why it's useful

**Early look at where business mix could be transformed.** Many companies that are in

businesses with higher emissions or serving customers with higher emissions need to make investments to diversifying business lines which may not immediately translate into meaningful revenues due to longer lead times. For these companies, understanding the weighting of Green Capex can help to provide an early look on potentially how Green Revenue mix can evolve. Importantly, there are some companies (we have highlighted Capital Goods as one example) that may see rising Green Revenue without needing meaningful rise in Green Capex mix because of ability to deploy similar or modestly-adjusted products for sustainable use that are also used for other purposes.

**Commitment of investment in self-help.** Green Capex can also be deployed by companies looking to reduce emissions footprint within existing core competencies. While this does not translate into Green Revenue, disclosing “self-help”-driven Green Capex can provide greater transparency and potential abilities for investor to forecast future emissions intensity reductions.

**Helping to determine if broader global Green Capex is on track.** We believe an incremental \$2.8 trillion in annual run rate of investment is needed globally this decade to meet a combination of Net Zero by 2050, Infrastructure and Clean Water goals. Of the incremental \$2.8 trillion, \$1.8 trillion is towards the Net Zero goal. We use our analyst forecasts described below for shifts in Green Capex mix to help determine the contribution to this \$2.8 trillion from publicly-traded companies.

### Challenges

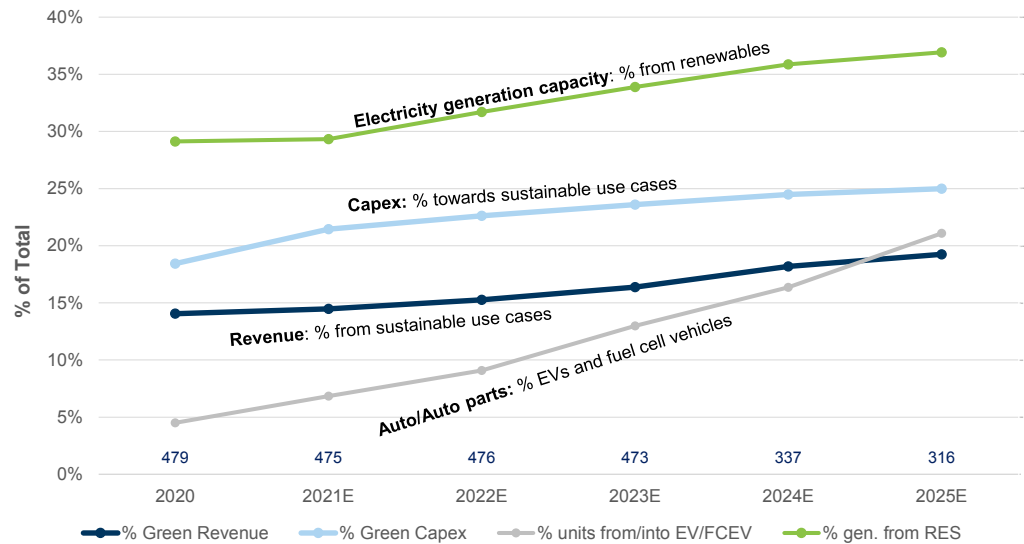
**Investment does not automatically drive profitability.** As described further below, we believe (a) that investors should not substitute climate transition metrics for financial fundamentals and (b) that investors will fuse metrics together in evaluating risk and return. As such, Capex is not an indicator of corporate returns. Even revenue does not fully provide insight into return on capital. As such, looking at Green Capex (and other metrics suggested) in the context of corporate returns is important.

### What GS SUSTAIN offers

**Forward-looking Green Capex estimates.** Looking ahead, we believe investment performance will be more driven by future change and have taken steps toward incorporating forward-looking estimates in our proprietary industry analyst inputs via quantitative forecasts of sustainable product capex for ~650 companies in 19 industries where we believe Green Capex mix will be most critical. Our analysts forecasts imply higher Green Capex mix than Green Revenue mix, unsurprising given our views described above that Green Capex leads Green Revenue and that some Green Capex does not translate to incremental revenue.

**Exhibit 8: Our analyst estimates for revenue and capex linked to sustainable use cases indicate Green weightings rising at a 1.0-1.5% annual pace through 2025E. The percentage of generation capacity from renewables and the share of unit sales linked to EVs/FCEVs in Automotive are expected to rise at a faster pace**

Trajectory of key metrics tracked from select sectors based on our analyst survey; numbers in blue represent rated companies with numeric estimates for % of revenue from sustainable use cases among those surveyed as published in our November 2021 ESG of the Future report



Weighted average using revenue and capex as weights for % of revenue from sustainable use cases and % of capex towards sustainable use cases, respectively. Percent of electricity generation from renewables and % of auto/auto components linked to EVs and fuel cell vehicles are weighted based on 2020-25E revenue. As not all analysts model through 2025, 2024E and 2025E reflect the weighted average yoy change for companies where the covering analysts have submitted data.

Source: Goldman Sachs Global Investment Research

**Metric 3: Greenhouse gas emissions & emissions intensity**

**Why it’s useful**

**We believe providing visibility on controllable emissions is important measure of environmental footprint.** We believe the reporting of Scope 3 emissions — which measures consumer and supplier emissions — will remain controversial. At the same time, we see consensus coalescing around the importance for companies to report and provide a thoughtful plan for mitigating Scope 1 and Scope 2 emissions which measure company emissions and related emissions from consumed electricity.

**Operational emissions intensity helpful, particularly if trackable in way that can be measured against regularly reported volumes.** We believe emissions intensity — not based on revenues but based on operational metrics — is important to see how a company’s environmental footprint is moving with or against its volumetric growth. This can help determine at the company and sectoral basis how companies are evolving by adjusting for supply growth (or declines) of their product/product mix. We believe that to best measure and forecast this, it is important for companies to provide emissions that correspond with the volumes they regularly report. As an example, oil/gas companies that report production net of royalties on a quarterly basis should provide emissions (not necessarily quarterly) that are associated with this reported metric as opposed to a different measurement of production.

## Challenges

**Corporate direct emissions are a small percentage of overall global emissions.** As we have highlighted previously, the sum of the Scope 1 emissions from companies in our ~7,000 public company database that report greenhouse gas emissions represent only 18% of total global emissions. This reflects the importance of consumer, private company and government emissions as needed towards decarbonization efforts. Scope 3 emissions is a tool that can help estimate consumer and supplier emissions. Ultimate impact in mitigating these emissions is based on products or incentives that will encourage behavioral change or more emissions-efficient consumption by consumers, private companies and governments.

## What GS SUSTAIN offers

**Greenhouse gas emission estimates.** Earlier in 2022, we added greenhouse gas emissions to our forecasting tools for seven sectors that represent 90% of overall corporate Scope 1 emissions to help investors consider the medium term direction of Scope 1 and 2 emissions and emissions intensity on a macro and micro basis. The tool would further help to identify ESG Improvers, complementing our other forecasting tools. Companies for which our analysts have provided GHG emissions forecasts represent 65% of emissions from corporates covered by our equity research teams in seven key sectors, corresponding to 7% of global total GHG emissions in 2019.

### Exhibit 9: Our analysis of forward-looking corporate GHG emission estimates indicates absolute emissions declining by 9% and a 15% reduction in emission intensities — on a weighted average basis for all sectors

Change in absolute emissions and emissions intensities for key sectors in our analysis by 2025E vs. 2019 as published in our May 2022 ESG of the Future report

GS SUSTAIN Sector	Change in absolute emissions in 2025E vs. 2019	Change in Emissions Intensities in 2025E vs. 2019
Airlines	9%	-5%
Aluminum	-8%	-14%
Chemicals	10%	-12%
Construction Materials	2%	-12%
Diversified Mining & Metals	-6%	-14%
Oil & Gas Producers	-8%	-16%
Oil Refiners	-10%	-10%
Steel	-3%	-8%
Utilities - Electric	-17%	-20%
<b>Total</b>	<b>-9%</b>	<b>-15%</b>

Emissions intensities are calculated dividing Scope 1+2 emissions (Scope 1 only for Electric Utilities) by the corresponding activity metric as specified in our Energy team's Carbonomics reports. Total emissions intensity change is a weighted average calculated on a market cap-basis for companies included in our analysis.

Source: Company data, FactSet, Thomson Reuters, Bloomberg, Goldman Sachs Global Investment Research

## Metric 4: Emissions avoidance

### Why it's useful

**Rewarding companies that drive resource and energy efficiency.** Achieving global Net Zero goals will require significant investments to improve the efficiency of existing technologies in order to minimize resource and energy consumption, which ultimately help reduce global emissions. Companies that can help service existing demands (e.g., heating/cooling, computing) more efficiently ultimately help lower energy and resource

consumption for the end-consumers, thereby mitigating their impact on climate change. We expect investors to increasingly focus on avoided emissions (also widely referred to as “Scope 4”) as a metric that can help understand the underappreciated role of companies that drive resource and energy efficiency.

### **Understanding second derivative impact of companies’ products and services.**

Measuring avoided emissions can provide ways for investors, consumers and regulators to better understand the role that companies can have on the environment by looking beyond information conventionally measured in Scope 1-3 emissions inventories. For instance, while existing Scope 3 methodologies cover downstream emissions from end-product use, the emissions that may have been ultimately avoided by better product design by the manufacturer cannot currently be reflected under Scope 1-3 footprints of companies.

### **Challenges**

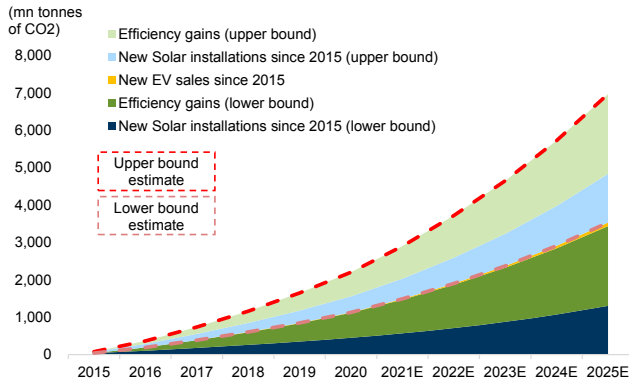
**Lack of data and standardized benchmarks can limit analysis.** Estimating and reporting emissions avoidance requires a comprehensive product-level deep dive to measure how baseline emissions (i.e., “what’s real”) compares against a counterfactual scenario that reflects hypothetical outcomes that may have occurred without improvements in resource/energy efficiency and subsequent behavioral changes (e.g. technology-enabled telemeetings displacing business travel demand). While the World Resources Institute (WRI) provides a guideline that can help companies estimate avoided emissions, various stakeholders have historically challenged avoided emissions due to lack of standardization in: (1) product benchmarks (i.e. what are companies’ products being compared against); (2) benchmark timelines (i.e., what year is being used as a starting point to estimate counterfactual scenarios; and (3) data gaps in other unknown variables such as what marginal fuel sources to use in order to convert energy savings to avoided emissions. In part as a result, company-provided emissions avoidance statistics may not receive as strong consideration by investors as those by credible third parties.

### **What GS SUSTAIN offers**

**Deep dive on Greenablers.** In order to measure the underappreciated role of Greenablers (Green Enablers), we published a deep dive bottom-up analysis to quantify how advancements in Semiconductors have led to energy savings (and ultimately avoided emissions) across various end-products (e.g., Data Centers, PCs, Smartphones, lighting devices) and have helped advance the proliferation of green-technologies (e.g. solar panels and EVs). Semiconductors are critical to energy efficiency, automation, electric vehicles and renewable energy expansion. For every ton of CO<sub>2</sub> that semiconductor companies emit, they help avoid 5x more emissions by enabling greener and more power efficient end-products against a 2015 baseline. Together, we estimate that semis contributed to 1-2 billion tonnes of carbon dioxide emissions avoided in 2020 (>3% of global Energy emissions), and see potential for an additional 2-5 billion tonnes of annual avoidance by 2025.

**Exhibit 10: We estimate energy efficiency gains and solar/EV expansions since 2015 have avoided 1-2 bn tonnes of CO2 in 2020, and see potential for an additional 2-5 bn tonnes of annual avoidance by 2025**

CO2 avoided through new clean technology installations and efficiency gains, including LEDs and solar panels (base year of 2015)

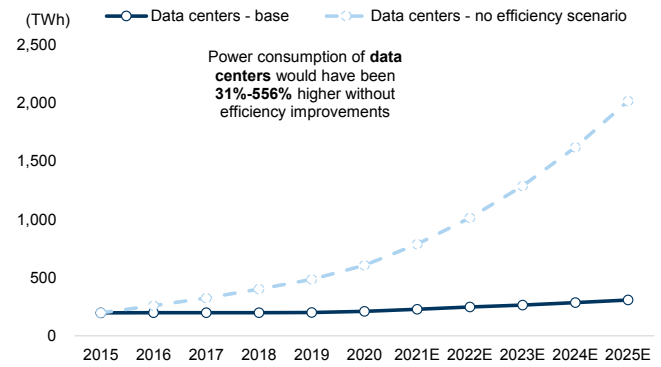


Note: 1) Upper/lower bound avoidance estimates assume efficiency gains and solar installations displace 100% coal/100% gas. 2) Efficiency gains only include those from lamps, data centers, PCs and smartphones.

Source: Goldman Sachs Global Investment Research

**Exhibit 11: In data centers, the energy footprint has only grown by 6% despite a 3x growth in workload between 2015-2020. The white space in between the curves corresponds to energy savings and consequently emissions avoided thanks to advancements in Semiconductors**

Total power consumption of global data centers - base case and no efficiency scenarios



Source: Masanet et al. (2020), IEA, Goldman Sachs Global Investment Research

## Metric 5: Management Accountability

### Why it's useful

**Visibility and accountability.** We believe that incentives and accountability are important for greater confidence among investors that executive management can achieve certain goals, in this case meeting climate transition targets. As such, we believe it is important for companies that have initiated decarbonization goals to have incentives for management achievement that are transparent. Importantly, with many of the climate goals 2030+, establishing sufficient transparency around interim targets and/or annual path to meeting targets around which managements can be incentivized is important to avoid back-end loaded implications that may impact future managements vs. current ones.

### Challenges

**Consistency of structures/transparency.** There is not always consistency in incentive structures — some management incentives are explicit towards climate transition plan goals, while other companies provide broader incentives grouped into ESG category that include climate as part of a broader suite of expectations.

### What GS SUSTAIN offers

#### Detail on climate-linked incentives that feeds into our Climate Transition Tool.

As part of our Climate Transition Tool discussed below, we provide point value in a company's transparency score if any member of the corporate executive team or board has incentives linked to climate metrics. Where companies have not received credit for having specific climate-linked incentives, we provide credit if there are more general



ESG-linked incentives, recognizing that this often includes climate-related indicators.

# GS Climate Transition Tool: Quantifying transparency and performance

**Our GS Climate Transition Tool fuses existing climate-related disclosures with GS SUSTAIN proprietary datasets to provide a lens into the (i) Transition Plan Transparency and (ii) Transition Performance of companies.** Our framework leverages a wider net of climate-related data points, which are intended to build on each other to provide a holistic picture on whether companies have a transition plan in place and how integrated it is with the broader business, as well as to help understand how companies emissions profiles and green business exposures (both revenue and capex) compare relative to sector-peers. Our tool, guided by the structure of the IIGCC Net Zero Investment Framework criteria, aims to provide investors with a starting point in their due diligence process assessing companies in transition.

See [Exhibit 12](#) for the full list of metrics.

## Exhibit 12: The GS SUSTAIN Climate Transition Tool is structured around the IIGCC Net Zero Investment Framework criteria

Detailed metrics and methodology of our GS SUSTAIN Climate Transition Tool scores

IIGCC mapping	GS SUSTAIN Framework Metrics	Maximum pts		Details
		T	P	
1) Ambition	Net zero target	0.5		Points awarded on Y/N basis.
2) Targets	Verified Science-Based target	2.0		Points awarded based on degree alignment of target. 1.5C target +2pts, Well-below 2C target +1.5pts, 2C target +1pts. <b>Note this metric is not measured for oil &amp; gas companies.</b>
	Other interim emissions target	0.5		<b>Points awarded only if no SBT but has other interim target.</b> Awarded on a Y/N basis.
3) Climate Governance	Climate-linked incentives - (C-suite, Board)	1.0		Points awarded on Y/N basis.
	ESG-linked incentives	0.5		<b>Points awarded only if no climate-linked incentives.</b> Awarded on a Y/N basis.
	Sustainability Committee	0.5		Points awarded on Y/N basis.
4) Emissions Performance	Total CO2 (Scopes 1 + 2) intensity		2.0	Points awarded based on sector-relative performance. Q1 (Top quintile in sector) +2pts, Q2 +1pts, Q3 +0.5pts, Q4 and Q5 (Bottom quintile in sector) receive 0pts.
	Energy efficient operators with high Total CO2		0.5	<b>Points awarded only if company if in Q4 or Q5 (bottom quintile in sector) on Total CO2 intensity but in Q1 (top quintile in sector) or Q2 on Energy Intensity.</b>
	Total CO2 (Scopes 1 + 2) momentum		2.0	Points awarded based on sector-relative performance. Q1 (Top quintile in sector) +2pts, Q2 +1pts, Q3 +0.5pts, Q4 and Q5 (Bottom quintile in sector) receive 0pts.
	Total CO2 momentum reductions >7%		0.5	Points awarded based on Y/N, uses our proprietary momentum calculation.
5) Emissions Data Disclosure & Verification	Scope 1 and 2 disclosures	0.5		Points awarded on Y/N basis.
	Scope 3 disclosure	0.5		Points awarded on Y/N basis.
	Granular Scope 3 disclosures	0.5		Points awarded on a Y/N basis if a company has disclosure in at least 2 of the 7 GS SUSTAIN Scope 3 category buckets.
	Emissions verification - any Scope 1, 2, 3	1.0		Points awarded on Y/N basis.
	Audited ESG report	0.5		<b>Points awarded only if no emissions verification.</b> Awarded on a Y/N basis
6) Climate risk and accounts	TCFD Supporter	1.0		Points awarded on Y/N basis.
	Climate Scenario Analysis	0.5		Points awarded on Y/N basis.
	Discusses how climate is integrated into business	0.5		Points awarded on Y/N basis.
	Discusses the impact of climate risks	0.5		Points awarded on Y/N basis.
	Internal carbon pricing	0.5		Points awarded on Y/N basis.
7) Decarbonisation Strategy	GS estimated green revenue mix		2.0	Maximum of (1) GSe EU Taxonomy aligned revenue, (2) GSe analyst green revenue forecasts (2025 or latest avail.), and (3) <b>GSe revenue tied to SDG 7 (Clean Energy) *new*</b> . Points awarded based on level of green revenue mix. 75%+ mix +2pts, 50-75% mix +1.5pts, 25-50% mix +1pts, 1-25% +0.5pts.
8) Capital Allocation Alignment	GS estimated green capex mix		2.0	Maximum of GS analyst estimated (1) current or (2) forecast (2025 or latest avail) green capex mix. Points awarded based on level of green capex mix. 75%+ mix +2pts, 50-75% mix +1.5pts, 25-50% mix +1pts, 1-25% +0.5pts.
9) Climate Policy Engagement	No metrics available at this time			
10) Just Transition	No metrics available at this time			
<b>GS SUSTAIN Transition Plan Transparency Score (absolute)</b>		<b>9.5</b>		Includes only Transition Plan Transparency metrics
A company's score will be shown as a % of the total maximum points available (9.5)*				
<b>GS SUSTAIN Transition Performance Score (sector-relative)</b>			<b>8.5</b>	Includes only Transition Performance metrics
A company's score will be shown as a % of the maximum points scored by companies within the same GS SUSTAIN sector.				

\*The maximum points Oil & Gas companies can receive is 8.0pts. We do not calculate a Transition Performance Score for companies in the Financials sector.

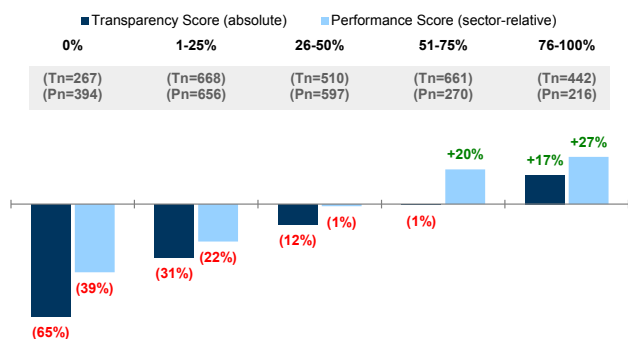
Source: Bloomberg, Refinitiv Eikon, SBTi, IIGCC, Goldman Sachs Global Investment Research

### Links to performance

We observe an increasing ESG fund weighting trend for companies based on both the Transition Plan Transparency Score and Transition Performance Score (Exhibit 13). Most notable is the lack of ownership of companies with 0% on our Transparency / Performance Scores, with companies -65%/-39% underweight in ESG funds relative to their weight in the benchmark, respectively. Top performers see ownership benefits, with companies scoring greater than 75% in our Transparency Score / Performance Score +17%/+27% overweight in ESG funds, respectively. **On valuation, there remains a positive signal with our Transition Performance Score, with no material link with our Transition Plan Transparency Score** (Exhibit 14). We note these relationships are correlations, and not necessarily causal.

#### Exhibit 13: ESG funds are significantly more underweight companies with no transition plan transparency or performance with greater ownership for leaders

Median ESG fund relative overweight of companies in the respective GS SUSTAIN Climate Transition Tool scoring buckets (MSCI ACWI)

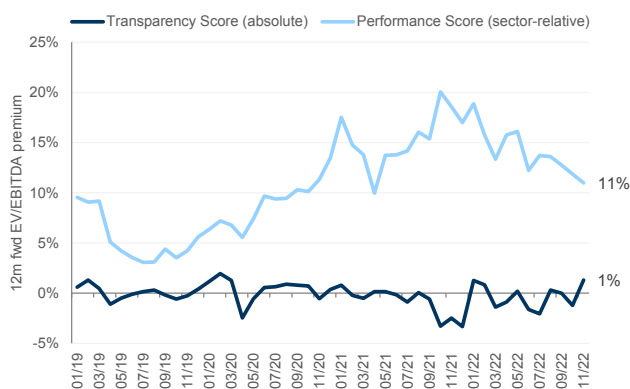


Analysis only includes companies in the MSCI ACWI Index with less than 50% fund factor in our ESG Fund Ownership universe

Source: Morningstar, Refinitiv Eikon, Goldman Sachs Global Investment Research

#### Exhibit 14: Valuation links continue to be tied to our Transition Performance Score, with no signal yet on our Transition Plan Transparency Score

Trimmed mean 12m fwd consensus and EV/EBITDA premiums vs. GICS 3 peers for companies with score of 75% or more on our GS SUSTAIN Transition Scores (MSCI ACWI, ex Financials)



Source: FactSet, Goldman Sachs Global Investment Research

#### Exhibit 15: GS Climate Transition Tool regional score distribution, MSCI ACWI universe

Region	MSCI ACWI Count	GS SUSTAIN Transition Plan Transparency Score					GS SUSTAIN Transition Performance Score					not measured
		0%	1-25%	26-50%	51-75%	76-100%	0%	1-25%	26-50%	51-75%	76-100%	
W. Europe	450	2%	5%	19%	31%	43%	4%	20%	23%	17%	18%	18%
CEEMEA	151	15%	37%	17%	26%	5%	22%	21%	13%	6%	5%	34%
N. America	685	5%	21%	25%	29%	21%	12%	26%	27%	12%	8%	15%
LatAM	86	8%	14%	27%	41%	10%	9%	28%	27%	8%	9%	19%
Aust/NZ	63	2%	11%	14%	44%	29%	16%	29%	22%	11%	6%	16%
Asia ex Japan	1132	25%	42%	17%	13%	3%	27%	29%	20%	7%	3%	14%
Japan	238	4%	13%	15%	46%	23%	11%	26%	30%	13%	12%	9%
<b>MSCI ACWI</b>	<b>2805</b>	<b>13%</b>	<b>27%</b>	<b>19%</b>	<b>25%</b>	<b>16%</b>	<b>17%</b>	<b>26%</b>	<b>23%</b>	<b>10%</b>	<b>8%</b>	<b>16%</b>

Note that we do not measure Transition Performance for Financials companies due to data limitations.

Source: Goldman Sachs Global Investment Research

## Fusing Sustainability with Profitability

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**We believe investors will look for companies with favorable financial fundamentals that are increasingly performing well on the above decarbonization metrics.** A critical area for discussion and mutual understanding among policy-makers/investors/managements is regarding how financial markets will view increased Green investment. We still believe investors could look more closely at attractiveness for sectors and companies in the Green Capex mosaic:

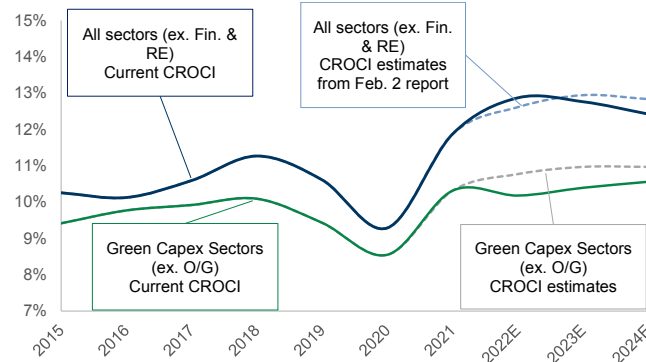
- where corporate returns are expected to be a combination of resilient, above-average or having favorable momentum in coming years; and/or
- in sectors in which the spare capacity for additional Green Capex from reinvestment via free cash flow and balance sheet strength is concentrated.

**We believe markets will consider the implications for corporate-level returns — return on capital employed, return on equity, cash return on cash invested, etc. — when determining their level of support.** As such, simply having spare capacity for additional investment is not a guarantee for financial market support. We believe these would provide an overview of not only financial strength, but also the opportunity for engagement towards directing capital to maximize Green Capex.

**Not all sectors needed for decarbonization have above-average corporate returns.** While multiple sectors important for decarbonization have above-average corporate returns, there are multiple sectors that have below-average corporate returns. For these sectors, we believe some combination of higher prices, lower costs or policy support may be needed to make corporate returns more competitive. We believe that confidence in project returns — both absolute and their momentum — and in measures that would increase cash flow to accommodate Green investments — will be critical to overcome the possible initial skepticism from managements and investors towards deploying larger Green Capex.

**Exhibit 16: CROCI estimates for covered companies have seen a slight upward revision in 2022E and a 20 bps downward revision in 2023E since our report in February pre-Russia/Ukraine; the 2022 decrease in returns expectations is more pronounced among Green Capex sectors**

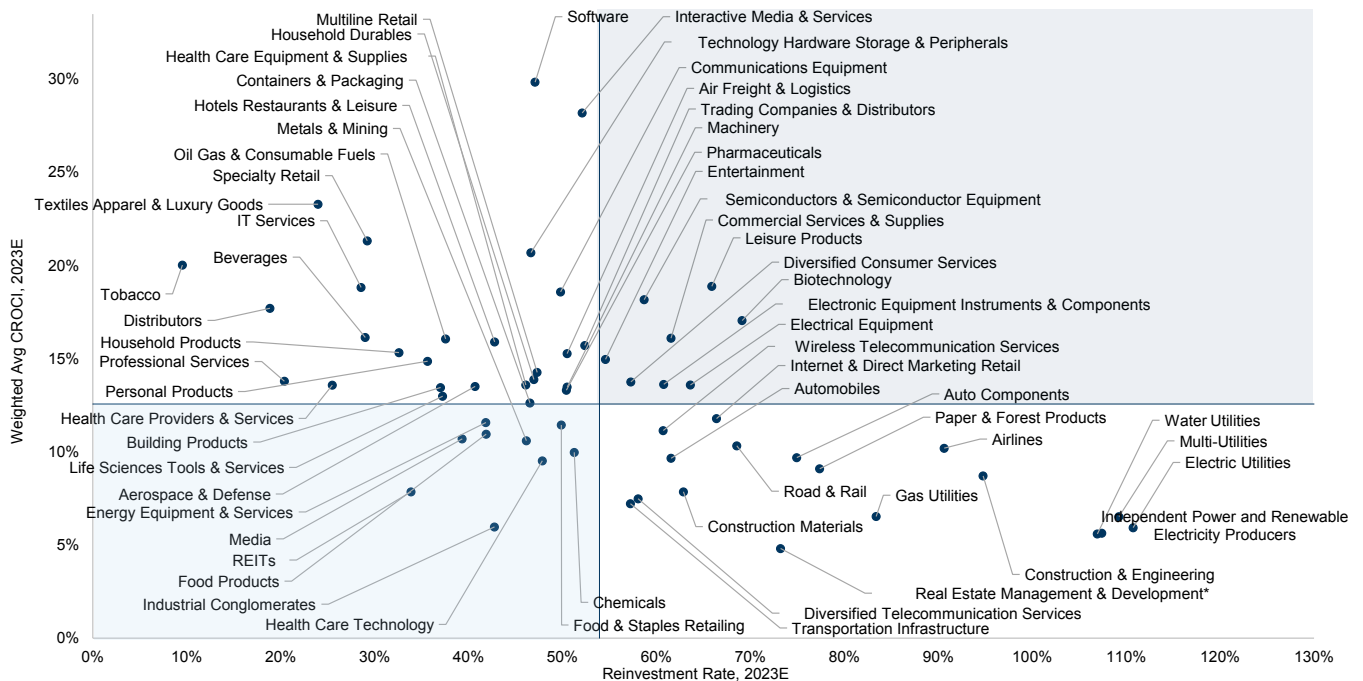
Weighted Average CROCI, all sectors. Comparison of current values (as of Sept. 30) vs. as published in our Feb. 2 Green Capex note; Green Capex sectors exclude Oil & Gas



Source: Goldman Sachs Global Investment Research

**Exhibit 17: There are still relatively few sectors with expected above-average corporate returns that are expected to invest more than 60% of adjusted cash flow in R&D and capex — suggesting capacity for further investment**

Reinvestment rate vs. cash return on cash invested weighted average by sector for companies covered by GS Research, 2023E

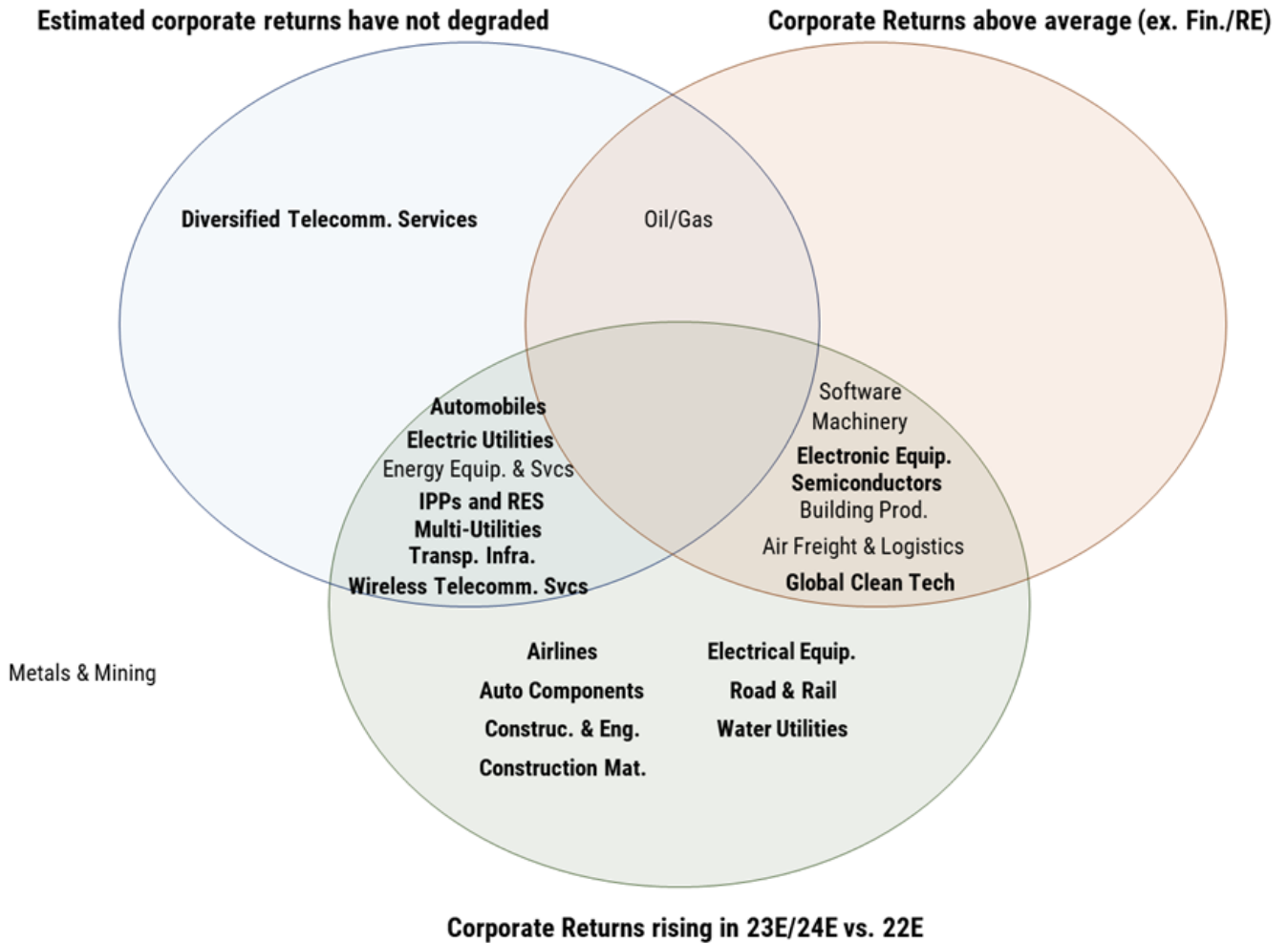


\* We view Real Estate cash return on cash invested as less comparable than other sectors

Source: FactSet, Goldman Sachs Global Investment Research

**Exhibit 18: As of our October 2022 Green Capex report, no sectors are forecast to have resilient, above-average and rising corporate returns based on current estimates — vs. our analyst estimates in January; 13 sectors + Oil/Gas and Energy Services meet two of the three corporate returns criteria**

Overview of sectors for which (1) corporate returns analyst estimates have not degraded vs. our Feb. 2 report, i.e., pre-Russia/Ukraine, (2) estimated corporate returns in 2022E-23E are above average (ex. Financials and Real Estate) and (3) corporate returns are forecast to rise in 2023E or 2024E vs. 2022E. Bolded sectors have above-average — ex. Financials & Real Estate — reinvestment rate (refers to 2022E-23E average)



Corporate returns are considered not degraded if current estimates are higher than or within 0.2% of prior estimates. Calculations refer to the sector 22E/23E average CROCI.

Source: Goldman Sachs Global Investment Research

## How GS SUSTAIN can help

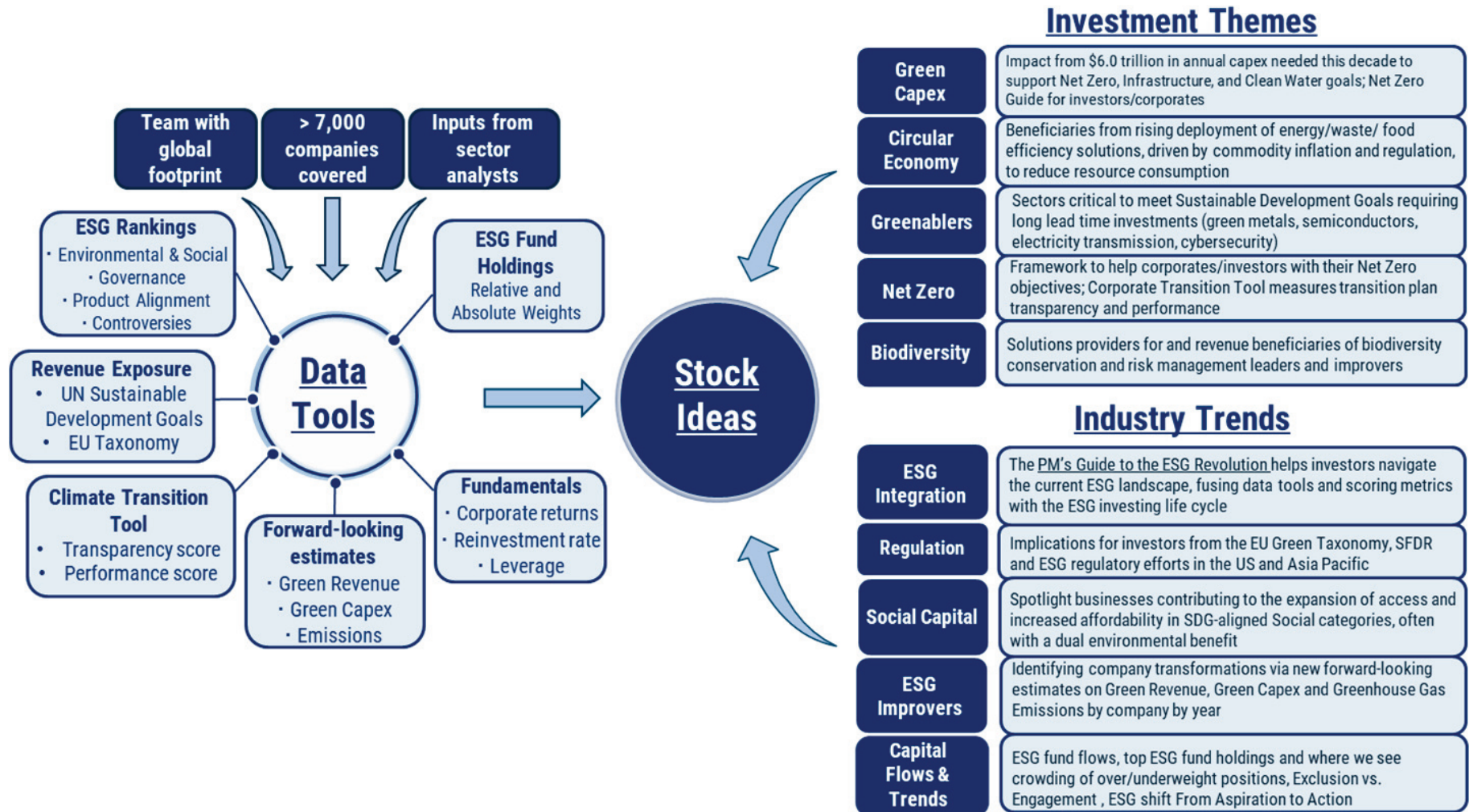
**GS SUSTAIN provides access to proprietary tools and resources to quantify impact and identify ESG Improvers, enabling greater recognition of underappreciated opportunities across sectors.**

Our offering of SUSTAIN tools can help investors to answer ESG questions at the portfolio and security levels, enabling more systematized and quantitative reporting while providing detailed and transparent data sets for idea generation, security selection and corporate engagement.

- **Our multi-pronged SUSTAIN scoring framework** can help provide greater granularity and objectivity for asset managers in both security selection and reporting. The framework across >7,000 companies includes our recently introduced Product Alignment framework and can help investors cast a wider net in the search for impact ideas aligned to less obvious sustainability themes. Existing pillars detail performance around sector-specific environmental and social operational metrics, governance, and controversies.
- **Forward-looking estimates.** Looking ahead, we believe investment performance will be more driven by future change and have taken our first steps toward incorporating forward-looking estimates in our proprietary industry analyst inputs, which now include sustainable product revenue and capex in select industries. Furthermore, we have taken first steps to offering quantitative forecasts of sustainable product revenue/capex for ~650 companies in 19 industries. We now add Scope 1 and 2 greenhouse gas emissions for a smaller segment of companies in 7 sectors.
- **EU Taxonomy revenue alignment.** We see the EU Taxonomy as one of the most seminal regulatory developments driving standardization in reporting for corporates/asset managers. Our EU Taxonomy alignment tool maps company revenues to Taxonomy-defined activities to estimate potential Taxonomy-eligible and aligned revenue based on technical screening checks where data exist, and “Do No Significant Harm” and “Minimum Social Safeguards” criteria.
- **SDG revenue alignment.** The UN Sustainable Development Goals (SDGs) have emerged as one of the most commonly used frameworks for taxonomizing impact across a broad set of sustainability challenges. Our SDG alignment tool employs granular revenue data, GS analyst inputs and other company metadata to map alignment, exposure and misalignment to ten of the SDGs we deem to be most investable.
- **ESG fund ownership.** Aggregating fund holdings across a universe of ~3,000 ESG funds, we analyze this pool of ESG assets to better understand trends in ESG ownership at both the sector and company level. The full dataset provides absolute and momentum ESG ownership detail for well over 10,000 securities.
- **ESG fund flows, valuations and performance.** Our ESG Tracker series analyzes the aforementioned ESG fund universe to gauge ESG fund flow momentum and sizing relative to the broader market, breaking out differences by strategy, fund type and fund style. The tracker also examines valuation and performance across categories.

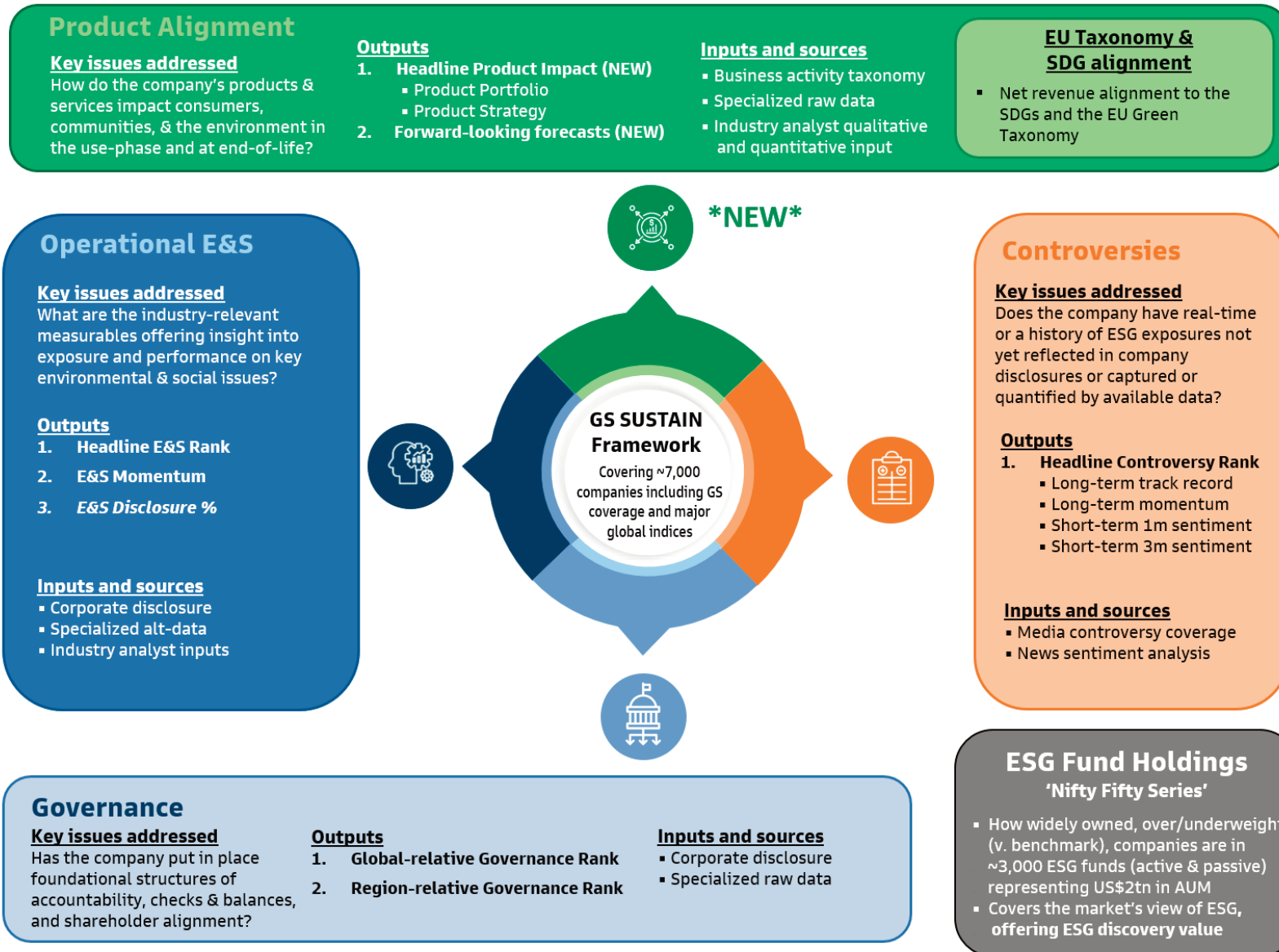


Exhibit 19: GS SUSTAIN: What we offer



Source: Goldman Sachs Global Investment Research

# GS SUSTAIN ESG Pillars



Source: Goldman Sachs Global Investment Research

# Disclosure Appendix

## Reg AC

We, Brian Singer, CFA, Emma Jones, Enrico Chinello, Ph.D., Michael Hao Wu, CFA, Keebum Kim, Derek R. Bingham, Evan Tylanda, CFA, Brendan Corbett, Madeline Meyer, Varsha Venugopal and Grace Chen, hereby certify that all of the views expressed in this report accurately reflect our personal views about the subject company or companies and its or their securities. We also certify that no part of our compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

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**Growth** is based on a stock's forward-looking sales growth, EBITDA growth and EPS growth (for financial stocks, only EPS and sales growth), with a higher percentile indicating a higher growth company. **Financial Returns** is based on a stock's forward-looking ROE, ROCE and CROCI (for financial stocks, only ROE), with a higher percentile indicating a company with higher financial returns. **Multiple** is based on a stock's forward-looking P/E, P/B, price/dividend (P/D), EV/EBITDA, EV/FCF and EV/Debt Adjusted Cash Flow (DACF) (for financial stocks, only P/E, P/B and P/D), with a higher percentile indicating a stock trading at a higher multiple. The **Integrated** percentile is calculated as the average of the Growth percentile, Financial Returns percentile and (100% - Multiple percentile).

Financial Returns and Multiple use the Goldman Sachs analyst forecasts at the fiscal year-end at least three quarters in the future. Growth uses inputs for the fiscal year at least seven quarters in the future compared with the year at least three quarters in the future (on a per-share basis for all metrics).

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