GS SUSTAIN

From Aspiration to Action: Seven themes for the 2022 Global Sustainability Forum & Water Symposium

Commodity inflation, the Russia-Ukraine war and climate events are pushing forward critical debates over how best to accelerate innovation and allocate capital that can advance Sustainable Development Goals, maintain energy reliability and support inclusive growth. ESG and Sustainability investing frameworks are receiving greater public scrutiny from investors, policymakers and regulators. These should be critical focus areas at the **Goldman Sachs Global Sustainability Forum on September 29**, preceded by the **Goldman Sachs Water Symposium on September 28, both in New York**. We expect these two days to provide a springboard for discussions of opportunities, risks, what's needed to stimulate greater investment, and current/future innovations. Keynote speakers include Scott Kirby, CEO of United Airlines, and Radhika Fox, Assistant Administrator, Office of Water at the US Environmental Protection Agency.

As we have written, we believe Sustainability investing is shifting From Aspiration to Action, with a greater urgency to accomplish key goals. We believe this will: (a) lead to a broadening of the investable universe to consider the entire supply chain vs. the final product; (b) accommodate greater engagement vs. exclusion; and (c) put more pressure on companies and asset managers to measure impact.

In this report, we highlight seven key themes we expect to be in focus and on the agenda for the September 28 Water Symposium and September 29 Global Sustainability Forum. These include:

- Future of ESG Investing
- Green Capex and Pace of Innovation
- Cost Inflation & Inclusive Growth
- Water Infrastructure, Modernization and Quality
- Circular Economy
- Mitigating Carbon Footprints
- Investment Ideas and Performance

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We discuss why each is important, key debates and highlighted panel discussions/fireside chats.

To register for these events

Please click here for the Global Sustainability Forum and click here for the Water Symposium. Both will be held in-person in New York City.

Confirmed companies at our Global Sustainability Forum (Sept. 29) and Water Symposium (Sept. 28)

GLOBAL SUSTAINABILITY FORUM (Sept. 29)

KEYNOTE

UNITED AIRLINES

AKER CARBON CAPTURE	CARBON DIRECT	IBERDROLA	PUTNAM INVESTMENTS
ALLIANCEBERNSTEIN	DEERE & CO.	JACOBS	RECURSION PHARMACEUTICALS
AMUNDI	DOW	MORGAN STANLEY	SUNRUN
APPLIED MATERIALS	DSC MERIDIAN	NORTHVOLT	T-MOBILE
ARRAY TECHNOLOGIES	FIDELITY INTERNATIONAL	ORBIMED	T. ROWE PRICE
BNDES	GRIDPOINT	PICTET ASSET MANAGEMENT	VIKING GLOBAL INVESTORS
BREAKTHROUGH ENERGY	HENRY SCHEIN	PROLOGIS	WEYERHAEUSER
CALIFORNIA RESOURCES			

WATER SYMPOSIUM (Sept. 28)

KEYNOTE

US ENVIRONMENTAL PROTECTION AGENCY

374WATER	EQUARIUS RISK ANALYTICS	FORTUNE BRANDS	JACOBS
AMERICAN WATER WORKS	ESSENTIAL UTILITIES	GAST CLEARWATER	PENTAIR
ARIS WATER SOLUTIONS	EVOQUA	GRADIANT	WATERBRIDGE

Source: Goldman Sachs Global Investment Research

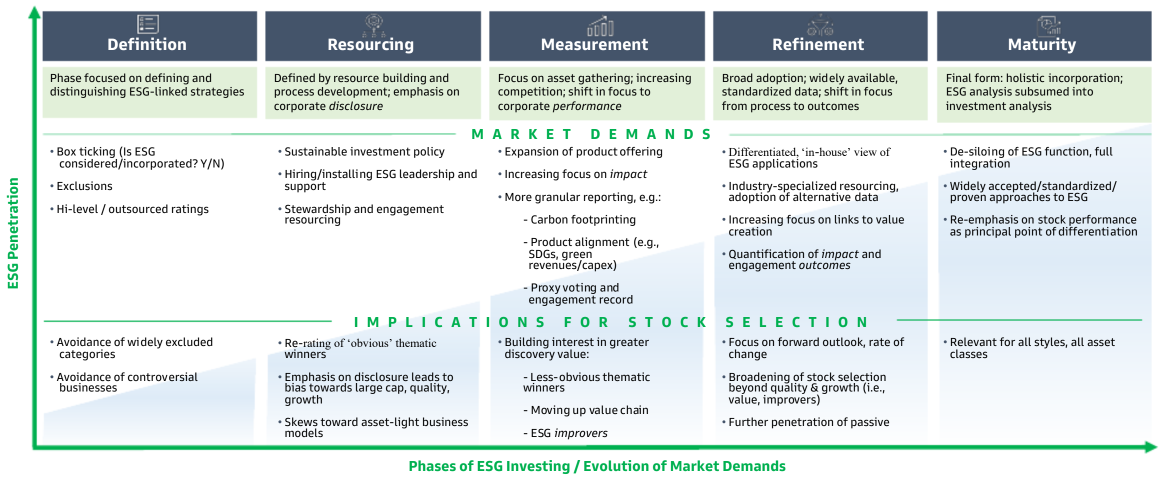
Highlighted panels

- **The State of ESG: Progress, Backlash and the Future. Morgan Stanley Investment Management** — Thomas Kamei, Executive Director, Counterpoint Global; **Putnam Investments** — Katherine Collins, Head of Sustainable Investing.
- **Corporate Engagement: Strategies, Challenges & Outcomes. DSC Meridian** — Paula Luff, Director of ESG Research & Engagement; **Fidelity International** — Jenn-Hui Tan, Global Head of Stewardship & Sustainable Investing; **T. Rowe Price** — Maria Elena Drew, Director of Research, Responsible Investing.
- **ESG & Sustainability in the Boardroom. Goldman Sachs** – Pamela Codo-Lotti, COO of Activism and Shareholder Advisory; Additional panelists TBC.

Why it's important

The combination of commodity/broader inflation, energy reliability issues across major economies, climate events and increased regulations are leading to stronger debates over the impact of ESG investing strategies. As we highlighted in our *PM's Guide to the ESG Revolution III* report, we believe we are entering a new phase of ESG investing marked by greater penetration, rising focus on product impact, and increasing scrutiny on both corporates and asset managers. Greater penetration and increased competition in the category means that it's no longer enough to simply consider ESG — granularity and objectivity are needed for both security selection and reporting. Demands from asset owners are intensifying on the *how* and *why* of ESG investments, and asset managers need the right tools to respond. Increasing focus on product impact is being driven by more urgent demands for addressing key Sustainable Development Goals (SDGs) coupled with the rise of regulatory frameworks like the EU Taxonomy. Looking ahead to the next phase for ESG investors, we expect an increasing emphasis on rate-of-change and discovery value to capture alpha opportunities.

Exhibit 1: 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

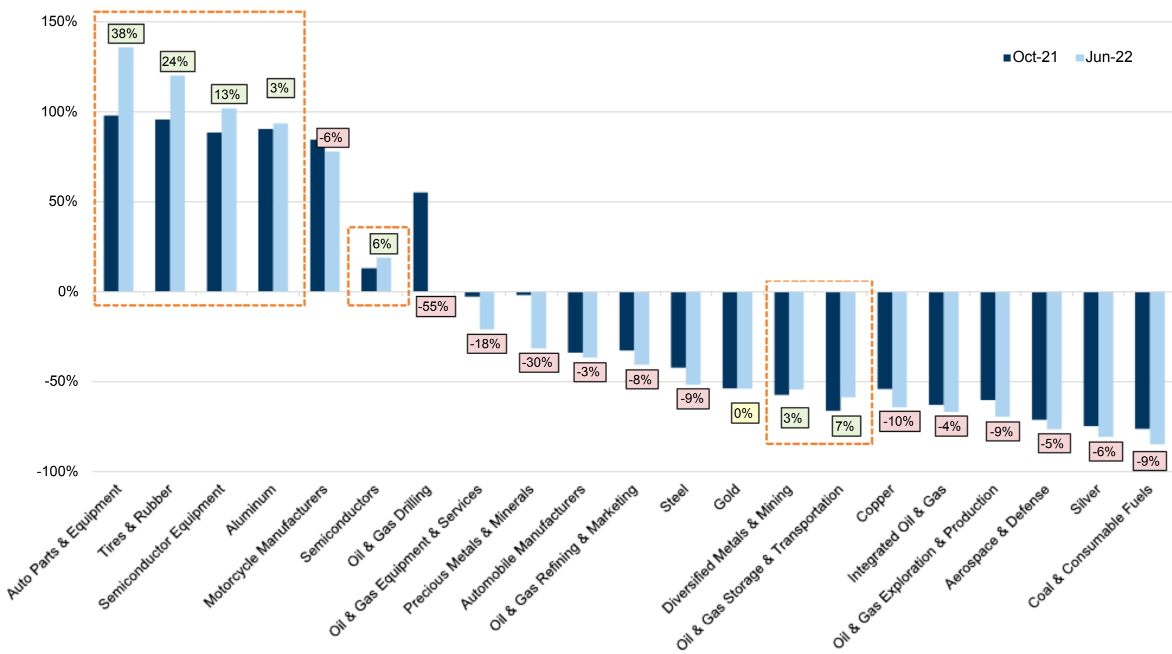
Key debates

Engagement is needed, but divestment is winning, for now. As discussed in our *Divestment Dilemma* report, most asset managers we speak with prefer not to be bound by rules-based exclusions and view engagement as the more effective way to help catalyze change. But the latest data suggest that divestment — and its close cousin, avoidance — have the momentum as money managers seek to burnish their ESG credentials and mitigate potential friction with clients and regulators.

Securities ownership of companies in controversial business lines of critical need. Inflationary pressures, supply chain shortages and the Russia-Ukraine crisis have underscored the critical societal benefits of select industries traditionally eschewed by ESG funds, including Energy, Metals & Mining and Aerospace & Defense. Although we have yet to see a turn in ESG funds' willingness to own Energy and Defense (both categories saw further declines in their weightings in our latest *Nifty 50* reading), Metals & Mining has seen a reversal in ESG ownership momentum so far this year.

Exhibit 2: Auto Parts, Semis, Aluminum and Diversified Metals & Mining are among sub-industries with positive ownership momentum in our latest reading

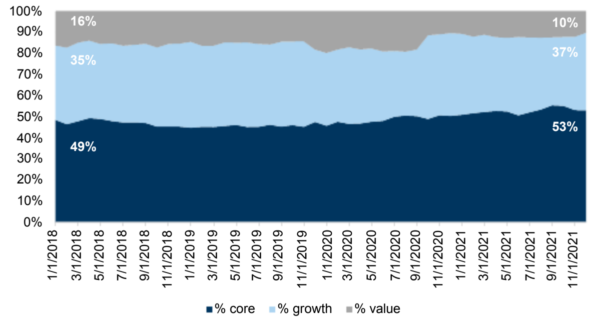
GICS-4 ESG ownership relative weights across several sub-industries of critical need; boxes show ESG ownership momentum (vs. Oct 2021)



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

When will we see greater traction for *Improvers* strategies? In our latest *PM's Guide* report, we addressed the extent to which high premiums and crowding in "more obvious" ESG winners were contributing to more focus on forward-looking analysis and rate-of-change opportunities. In our investor conversations, we are hearing budding interest in ESG improvers, generally suggestive of ownership in 'dirtier' industries where companies are poised for material changes to production or product footprints. To date, we have only seen a handful of improver-themed funds, though we expect that improvers will more commonly be included as part of an ESG or impact strategy looking ahead. Key will be quantification of improvement — especially forward-looking views on what companies can say favorable change in business mix and/or improvement in key metrics like greenhouse gas emissions/emissions intensity. For more details, please also see our ESG of the Future reports that introduced annual forward-looking estimates by our analysts in select sectors for Green Revenue/Green Capex mix and Scope 1/2 greenhouse gas emissions.

Exhibit 3: ESG value strategies are limited today
% of core, growth and value funds in ESG fund universe*

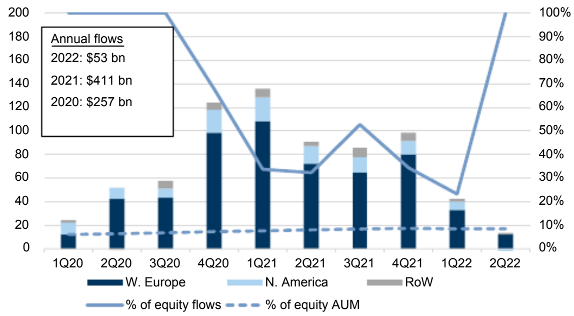


*classified based on Morningstar's value, core, growth scoring framework

Source: Morningstar, Goldman Sachs Global Investment Research

Consequences of rising regulation. The rise of ESG-related capital markets regulation in the US this year has added to momentum in Europe and the Asia Pacific region. Proposed fund naming rules in the US would create an SFDR-like dynamic in the US in terms of fund classification, though with less high-stakes implications than in Europe where ESG is dominating flows, and without the EU Taxonomy undergirding the classifications in a highly granular and prescriptive way. Pending new rules around the world raise the bar for competing in the ESG investment market, requiring fund managers to elevate the level of transparency regarding their ESG implementations and processes. However, some elements of rising regulation could contribute to unintended consequences of oversimplified ESG measurables—for example, further spurring the propensity of ESG funds to exclude controversial or carbon-intensive industries to mitigate footprint metrics based on point-in-time, historical data, rather than engaging or owning companies poised to see significant reductions in future emissions.

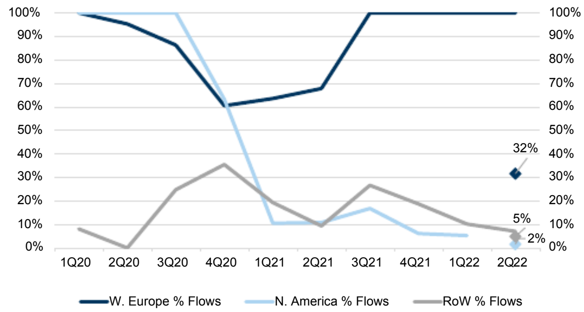
Exhibit 4: ESG accounted for 100% of total equity flows in 2Q22
Quarterly ESG fund flows by fund region of domicile ($bn, LHS), % of overall quarterly equity fund flows and AUM (RHS)



In quarters where ESG flows were positive and net equity flows were negative (1Q20, 2Q20, 3Q20 and 2Q22) we count ESG flows as 100% of net equity fund flows

Source: Morningstar, Goldman Sachs Global Investment Research

Exhibit 5: ESG continues to take share across regions and accounted for 100% of equity fund flows in W. Europe in recent quarters
ESG quarterly flows as a % of overall regional equity fund flows by fund region of domicile (lines); latest total ESG AUM penetration by region (diamonds)

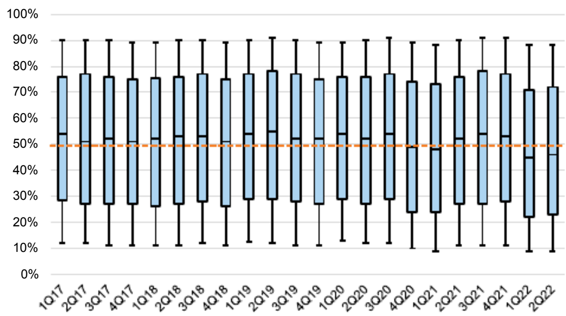


Non-ESG regional equity fund flows were negative in some regions for some periods in which ESG accounts for 100% of flows: (W. Europe:1Q20,2Q22)(N. America:1Q20,2Q20, 3Q20,2Q22); both ESG and Non-ESG N. American fund flows were negative in 2Q22

Source: Morningstar, Goldman Sachs Global Investment Research

Will softer fund performance in 1H2022 be only temporary and contribute to the ESG debate? ESG funds saw weaker relative performance vs. non-ESG category funds in both 1Q and 2Q2022, the two quarters of greatest relative underperformance in the past five and a half years. We believe recent underperformance is at least partially attributable to ESG funds' propensity to avoid controversial industries, including Energy, Defense and Mining, all of which have performed well in 2022. N. American ESG funds have higher rates of ownership for many of these activities, especially the energy complex and military contracting, likely contributing to sturdier performance vs. other regions. N. American-focused ESG funds stand out as the only region performing in-line vs. benchmark since January 2021.

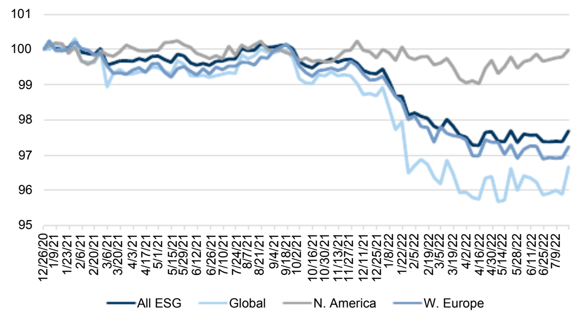
Exhibit 6: Peer-relative performance softened in 1Q and 2Q2022
Distribution of Morningstar return percentiles for ESG funds (10th, 25th, 50th, 75th & 90th %iles displayed); line denotes fund category median



Morningstar return percentile ranks are assigned within Morningstar fund categories, which group funds based on their investment styles as measured by their underlying portfolio holdings and other statistics.

Source: Morningstar, Goldman Sachs Global Investment Research

Exhibit 7: N. American focused ESG funds have performed in-line vs. their benchmarks since the start of 2021
Median excess returns (total returns vs. Morningstar category benchmarks) for ESG funds by region of investable-focus, indexed to 100 (1/1/21-7/22/22)



Morningstar fund categories group funds based on their investment styles as measured by their underlying portfolio holdings and other statistics.

Source: Morningstar, Goldman Sachs Global Investment Research

Green Capex and Pace of Innovation

Highlighted panels

- **Keynote Address: Shrinking the Green Premium Through Innovation.** Speaker: **United Airlines** — Scott Kirby, Chief Executive Officer.
- **Bridging Divides: Deploying Infrastructure & Solutions to Deliver Inclusive Growth.** Speakers: **Deere & Co.** — Jill Sanchez, Director of Sustainability; **Jacobs** — Jan Walstrom, Senior Vice President, Office of Global Climate Response & ESG; **T-Mobile** — Brigitta Witt, Vice President, Social Impact and Sustainability.
- **Expanding Residential Solar & Improving Grid Efficiency. GridPoint** — Mark Danzenbaker, Chief Executive Officer; **Sunrun** — Mary Powell, Chief Executive Officer, and Director.
- **Advancing Innovation and Getting to Scale. Breakthrough Energy** — Tyson White, Director of Partnerships; **Northvolt** — Landon Mossburg, President of North America.
- **Greenablers: Enabling Sustainable Development Goals. Applied Materials** — Chris Librie, Director of ESG; **Goldman Sachs** — Kara Mangone, Global Head of Climate Strategy; **Prologis** — John Hoekstra, Global Head of Sustainability Solutions.

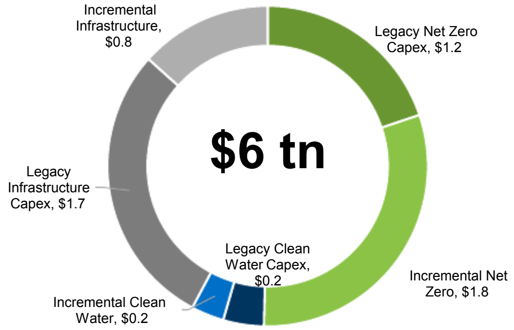
Why it's important

We continue to believe Green Capex will be the multi-year secular theme driving the next wave of infrastructure as focus rises to decarbonize the world and meet Clean Water and infrastructure goals. We see the need for $2.8 trillion incremental annual investment on average this decade vs the 2016-20 average. As we detailed in our Green Capex: Making Infrastructure Happen report, Green Capex toward Net Zero, Infrastructure and Clean Water needs to increase to $6 tn annually in the 2020s to achieve Net Zero and other Sustainable Development Goals (SDGs) — see Exhibit 8. Investments in these three focus areas has been about $3.2 trillion annually within 2016-2020, which represents about 15% of average global gross capital formation during 2016-19. Incremental Green Capex will be needed from a combination of governments, private companies and public companies, and will involve, in our view, an all-in approach across multiple sectors that will be critical or needed on path to Net Zero, Infrastructure and Clean Water goals (see Exhibit 9). On the back of continued inflationary pressures, we see potential upside risk to the $6.0 trillion annually that is required this decade. At the same time, the potential for greater deployment of solutions could increase the pace of innovation in areas like hydrogen, battery storage and energy efficiency.

We believe the private sector is on track for $0.9 tn of the incremental $2.8 trillion Green Capex needed annually in the 2020s. This should raise discussion of what's needed to stimulate greater investment from the private and public sector. As we detailed in our latest Green Capex report, we see the ability for public companies to spend $1.0 trillion in additional Green Capex without stretching balance sheets while still retaining 30%+ of operating cash flow.

Exhibit 8: An incremental $2.8 trillion of Green Capex is needed per year in the 2020s to support Net Zero, Infrastructure and Clean Water pathways

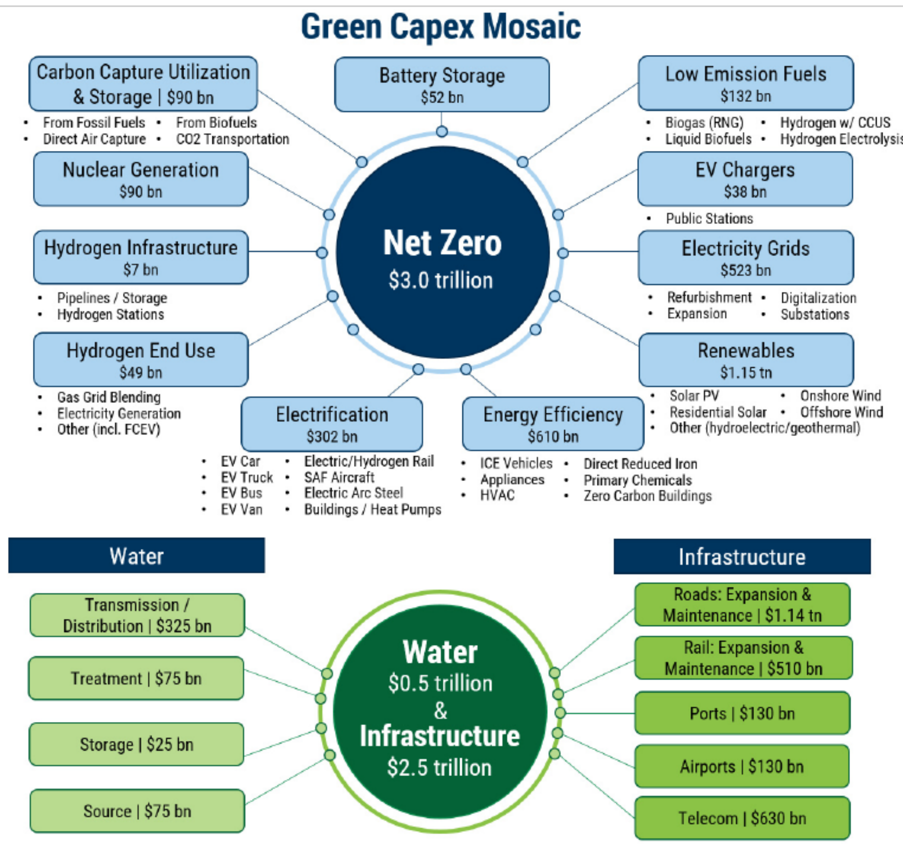
Green Capex in the Net Zero scenario



Source: World Bank, IEA, McKinsey, OECD, Goldman Sachs Global Investment Research

Exhibit 9: The Net Zero, Infrastructure and Clean Water mosaic

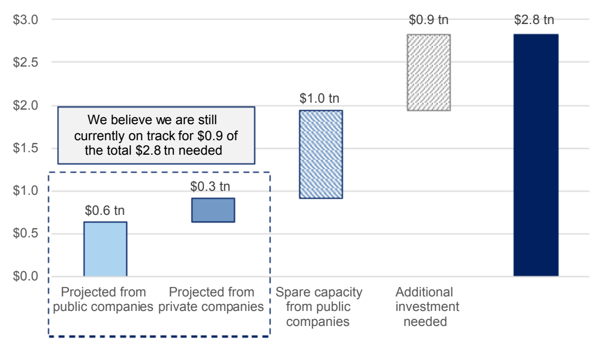
Critical technologies/focus areas and annual investment in the 2020s to achieve Net Zero, Infrastructure and Clean Water needs



Source: IEA, McKinsey, OECD, Company data, Goldman Sachs Global Investment Research

Exhibit 10: We believe the private sector is still on track for $0.9 tn — despite a different public/private companies mix vs. prior reports — of the incremental $2.8 tn Green Capex needed annually in the 2020s — with a greater mix from public companies, more than offset by a decline in our expectations from private equity funds. We see potential for $1.0 tn of additional Green Capex from publicly traded companies based on estimated spare capacity

Components of incremental annual investment needed this decade to meet Net Zero, infrastructure and clean water goals, $ trillion



Source: IEA, OECD, McKinsey & Company, FactSet, Preqin, Goldman Sachs Global Investment Research

Key debates

When and why investors should "CARE" about companies' Green Capex initiatives. Diversified companies pursuing new business opportunities aligned to Sustainable Development Goals have not consistently received credit from ESG funds, raising a debate what is needed for investors to afford greater credit. We believe investors could potentially look at Green Capex commitments by corporates using a 4-pillar framework, "CARE," assessing whether the company:

1. Has **C**ore competencies in the area,
2. Has the **A**vailable capital necessary for the project,
3. Can ensure acceptable **R**eturns from the project and
4. Has the ability and the necessary track-record to **E**xecute on the project.

Corporate returns, in particular, could emerge as a key measure to evaluate Green Capex initiatives. As detailed in our latest Green Capex report, ahead of valuation considerations, we believe ESG and generalist investors will look incrementally at investment attractiveness for companies exposed to Green Capex based on: (a) corporate returns attractiveness, resilience and momentum; and (b) spare capacity for reinvestment via free cash flow and balance sheet strength. These can both capture the financial health as well as the opportunity for engagement towards directing capital to maximize Green Capex or ESG improvement.

Green Capex spare capacity concentration in Oil/Gas and Metals/Mining likely to intensify the divestment vs. exclusion debate. As detailed in later sections and in our The Divestment Dilemma: Exclude or Engage report, we see rising debates among investors as to what the appropriate level of recognition of traditionally overlooked and/or excluded sectors from ESG funds — such as Oil/Gas and Metals/Mining — should be, given that, despite negative externalities, they serve critical societal needs. This could help bring greater balance to the debate and increased willingness by ESG investors to own — and engage with — companies in controversial industries.

Cost Inflation & Inclusive Growth

Highlighted panels

- **Bridging Divides: Deploying Infrastructure & Solutions to Deliver Inclusive Growth.** Speakers: **Deere & Co.** — Jill Sanchez, Director of Sustainability; **Jacobs** — Jan Walstrom, Senior Vice President, Office of Global Climate Response & ESG; **T-Mobile** — Brigitta Witt, Vice President, Social Impact and Sustainability.
- **Keynote Address: Shrinking the Green Premium Through Innovation. United Airlines** — Scott Kirby, Chief Executive Officer.
- **Mitigating Rising Costs in Renewables. Array Technologies** – Erica Brinker, Chief Commercial Officer and Head of ESG; **Iberdrola** – Agustín Delgado, Chief Innovation and Sustainability Officer.
- **Providing Health Care Solutions & Innovation. Henry Schein** – Jennifer Kim Field, Vice President of Corporate Social Responsibility; **Orbimed** – panelist TBC; **Recursion Pharmaceuticals** – Michael Secora, Chief Financial Officer.

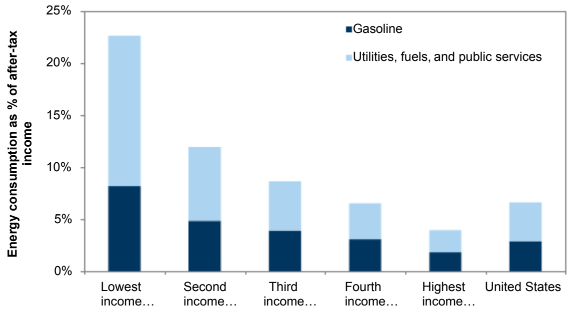
Why it's important

A spike in energy and food prices has financial and social repercussions more pronounced in lower-income populations. Whether looking at lower-income countries or income disparity within a country, higher fuel prices are having a more meaningful impact to those with lower income. In the US, which has seen rising income and wealth gap over much of the past 40 years, gasoline and power/utilities spending represented 23% of after-tax income for the bottom quintile of income earning households vs. just 4% for the top quintile in 2019 (Exhibit 11). The disparity in consumer spending on food consumption is even more stark. In 2019, food spending represented 36% of after-tax income for the lowest quintile vs. 8% for the highest quintile (Exhibit 12). The surge in energy and food prices seen in recent months risks increasing this disparity.

Decarbonization via a fossil fuel price spike represents an area where environmental and social goals compete, at least in the shorter term. Clear affordable and reliable demand alternatives — and related infrastructure — to shift consumption away from fossil fuels can ease the burden on lower-income populations. Electric vehicles were disproportionately purchased by those in higher income brackets in the US in 2019. While a spike in fossil fuel prices that forces down demand has the potential to accelerate decarbonization, investments/innovations or policies that can successfully mitigate the negative impacts on lower-income individuals and countries are key to simultaneously advance social and environmental sustainable development goals. Similarly, energy consumption per-capita has been on the rise globally, with large disparities between the global average and higher-consuming countries like the US/Japan/Europe. For Sustainable Development Goals like No Poverty and others to make meaningful advances, per-capita electricity consumption on a global basis is likely to increase. This will likely create additional pressure on electricity prices.

Exhibit 11: Consumer spending on energy and utilities represented 23% of annual after-tax income for the lowest income quintile in the US in 2019 vs. 4% for the highest quintile

US energy spending as percent of after-tax income quintiles, 2019

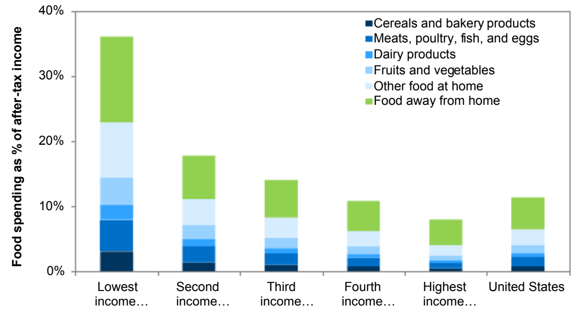


Utilities excludes telephone services

Source: US Bureau of Labor Statistics, Goldman Sachs Global Investment Research

Exhibit 12: Consumer spending on food consumption represented 36% of annual after-tax income for the lowest income quintile in the US in 2019 vs. 8% for the highest quintile

US food spending for consumer units in different income quintiles, 2019



Source: US Bureau of Labor Statistics, Goldman Sachs Global Investment Research

Key debates

We believe the two most important factors influencing the positive and negative repercussions of decarbonization are: (a) the speed of transition (rapid vs. gradual); and (b) whether the transition is driven by lower supply vs. lower demand. The matrix of rapid vs. gradual and supply-driven vs. demand-driven transition has implications for path to decarbonization, economic impact, demographic impact, energy reliability and the pace of innovation, as seen in Exhibit 13. We also believe it will impact investment opportunities. Based on policy and investor ownership in recent years, there has been a more meaningful focus on reducing supply of commodities that has helped to contribute to upward pressure on commodities. More recently, we are seeing increased government stimulus such as RePower EU and the Inflation Reduction Act. We expect continued debate on the positive and negative ramifications of policy and investment choices made (or not made) towards stimulating greater supply vs. demand of high emitting commodities and stimulating innovation to make more competitive the cost of cleaner technologies.

Exhibit 13: We believe the pace and catalyst for meaningful decarbonization have positive and negative repercussions with varied impacts for capital flows

Key initial potential implications from a rapid vs. gradual and supply- vs. demand-driven Energy transition

		Speed of the transition	
		Rapid	Gradual
Catalyst for the transition	Supply-driven	Spike in fossil fuel prices $ go to fossil fuel companies Quicker transition Economic growth volatility/risk Faster pace of innovation Burden on lower-income population	Driven by pace of innovation $ to companies with lowest cost Longer period of transition Less risk of recession Greater need for adaptation solutions Inequality impact a function of innovation
	Demand-driven	Spike in fossil fuel prices $ go to consumers' governments Quicker transition Economic growth volatility/risk Faster pace of innovation Capital use by gov'ts key for inequality	Higher prices but without spike $ go to consumers' gov'ts + innovators Longer period of transition Less risk of recession Greater need for adaptation solutions Capital use by gov'ts key for inequality

Source: Goldman Sachs Global Investment Research

Water Infrastructure, Modernization and Quality

Highlighted panels/speakers

- **Keynote Address: The Current State and Outlook for US Water. US Environmental Protection Agency** — Radhika Fox, Assistant Administrator, Office of Water.
- **Opportunities and Challenges in Water Infrastructure and Water Treatment/Quality. Essential Utilities (WTRG)** — Dan Schuller, EVP and CFO; **Evoqua Water Technologies (AQUA)** — Alex McDonald, PhD, Director of Business Development, Heavy Industry; Walt Kozlowski, Director of Strategic Marketing and Sustainability.

Why it's important

Improving water/wastewater infrastructure and water quality remain two of the key focus areas for the water industry, which help reduce water loss while supporting the short and long-term well-being of the population; we still view the system as under-invested. On the US infrastructure side, we see material incremental investment needs to reverse the aging of the water pipes, potentially up to $900 bn per our prior analysis, with meaningful fragmentation of the water/wastewater utility systems partly driving this challenge but also offering consolidation opportunities. On the water quality/treatment side, we see the historic levels of federal spending on contaminant remediation as a key driver of an increasing investment in water treatment technologies, though the pace and timing of investments remains a key area of focus and debate. The upcoming GS Water Symposium will look to address these topics among a host of others, with perspectives from public and private companies and industry leaders.

Key debates

- **Is industry consolidation the solution to accelerating water infrastructure modernization?** The US water utility sector is highly fragmented – more than 50,000 water utility systems exist nationwide, with investor-owned and privately held water utilities operating just 16% of these systems. Of the approximately 50,000 community water systems in the US, 82% serve less than 3,300 customers each, making the water industry the most fragmented of the major utility industries. The key discussion centers on the benefits of industry consolidation, which could spur additional investments in the smaller systems, but also raising the question on whether this is the optimal method to both improve the country's water infrastructure while moderating customer bill impact.
- **Public support for contaminant remediation is growing with the pace of investment in remediation in focus.** Public awareness of water contaminants, and therefore regulation and policy support for water treatment, continues to build momentum in the US. For example, last year, the Infrastructure Investment and Jobs Act set aside $10 bn in funding for PFAS remediation, representing the largest level of federal funding for PFAS remediation yet. In addition, on 6/8, the EPA issued

much more stringent advisory limits for PFAS, updating its drinking water health advisories for PFOA from 70 ppt to 0.004 ppt and for PFOS from 70 ppt to 0.02 ppt and is expected to announce an enforceable maximum contaminant level (MCL) for PFAS later this year or early 2023. Therefore, the cadence and speed of the ramp of investments in contaminant remediation is a key area of focus and debate.

Circular Economy

Highlighted panels

- **Circular Economy: Assessing the Investment Opportunity. AllianceBernstein** — Michelle Dunstan, Chief Responsibility Officer; **Dow** — Howard Ungerleider, President and Chief Financial Officer
- **Bridging Divides: Deploying Infrastructure & Solutions to Deliver Inclusive Growth.** Speakers: **Deere & Co.** — Jill Sanchez, Director of Sustainability; **Jacobs** — Jan Walstrom, Senior Vice President, Office of Global Climate Response & ESG; **T-Mobile** — Brigitta Witt, Vice President, Social Impact and Sustainability.

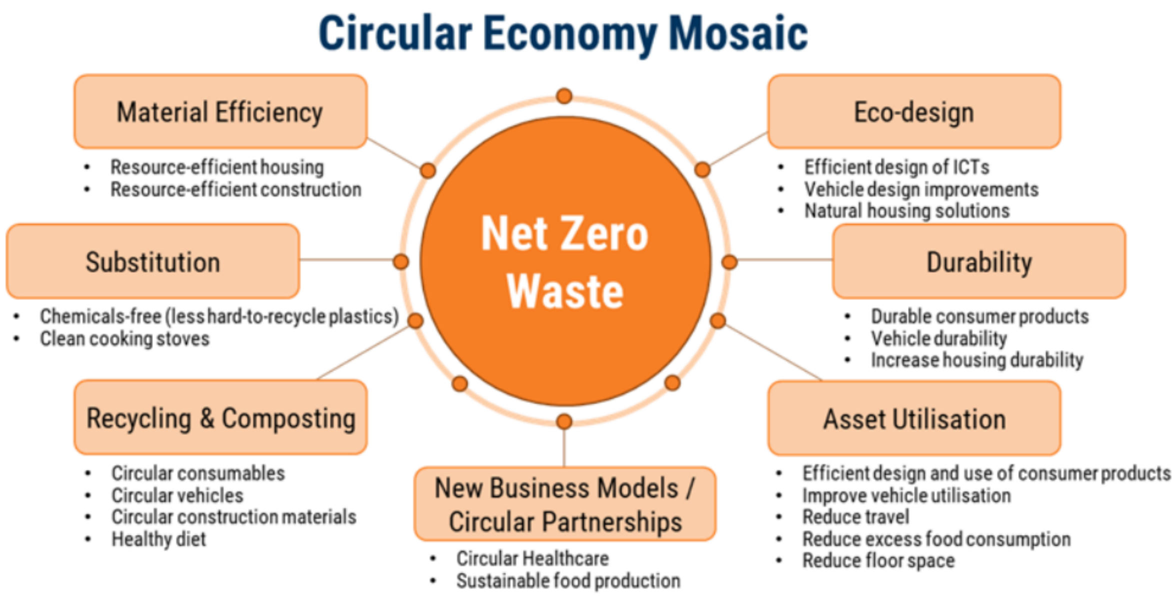
Why it's important

The need to move towards a Circular Economy – one in which consumption of ecological resources is equal to or less than what the planet can regenerate – has been discussed for years but not sufficiently deployed, with resource consumption 75% more than Earth's regeneration capacity in 2021 and waste on track to be 70% higher by 2050 vs. 2016. A Circular Economy could help add $4.5 trillion in additional economic output by 2030, and $25 trillion by 2050. The World Economic Forum estimates that by 2025 recycling, reuse, and remanufacturing could help the economy unlock $1 trillion a year untapped resource savings.

We see three catalysts that can push forward deployment of Circular Economy solutions.

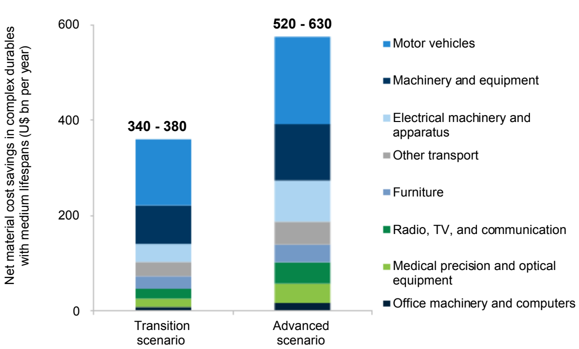
1. The spike in commodity prices is likely to increase deployment of energy/waste/food efficiency solutions from both individuals and corporates.
2. The intrinsic link between resource consumption/waste and GHG emissions will make Circular Economy solutions critical for transitioning towards a low carbon economy.
3. The extension of the EU Taxonomy to include Circular Economy categories is likely to increase corporate and investor focus on solutions as well as valuation uplift for strong performers.

Exhibit 14: The Circular Economy Mosaic



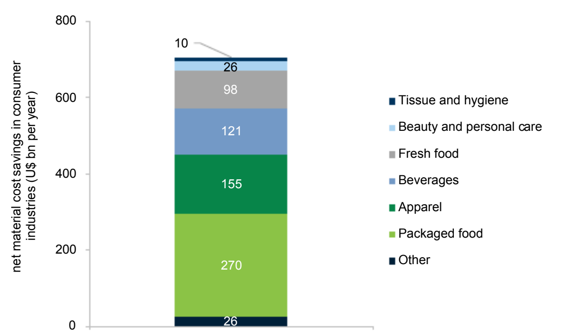
Source: Oxford Institute for Energy Studies, Circle Economy, Goldman Sachs Global Investment Research

Exhibit 15: Circularity in manufacturing could yield net materials cost savings of up to US$630 billion p.a. in the EU alone



Source: World Economic Forum, Ellen MacArthur Foundation, Eurostat

Exhibit 16: Circularity in relevant fast-moving consumer goods sectors could yield net materials cost savings of ~US$700 billion p.a. globally



Source: World Economic Forum, Ellen MacArthur Foundation

Key debates

Transitioning towards a Circular Economy will be pivotal to solving decarbonization and will become an increasing focus for investors, corporates and regulators to achieve net zero carbon goals and decouple economic growth from resource consumption, in our view. Circular Economy solutions could help reduce global GHG emissions by 23Gt, or 39%, making the Circular Economy critical to any decarbonization strategy. Zero waste pledges are few and far between compared to the proliferation of net zero carbon pledges from companies, governments and investors, yet both are necessary for a sustainable low carbon economy due to the intrinsic link between resource usage, energy and emissions (resource-energy nexus). We believe the decarbonization synergies gained through transitioning towards a circular economy will become an increasing focus and priority among governments, corporates and investors in the years ahead.

To tackle the gap between recyclability and actual recycling, a wide range of actions can help address challenges to circularity today. Many altematives to recycling offer increased material, energy and or emissions savings in the path to circularity — reusing goods and materials prevents any inefficiencies from the recycling process, and reducing consumption of goods and services to begin with minimizes the material and emissions associated with production, regardless of whether virgin or recycled materials are used. In order to accomplish circular economy goals, strategies to tackle waste, overconsumption and ecodesign must have technical feasibility, policy support and infrastructure capacity, where supporting infrastructure has capacity for maximum material flow.

The next phase of the EU Taxonomy will catalyze investor and corporate focus on the circular economy. We see corporate and investor adoption of the EU Taxonomy as inevitable, serving as a tool for both investment and eventual corporate strategic decision-making. The Taxonomy could reshuffle the balance of what gets owned in ESG funds - presenting opportunities for ESG 'value' or 'momentum' strategies where companies require significant transition financing. Sectors originally left out or not in scope of the initial climate change activities of the Taxonomy may see renewed focus after being included under the new objectives, including manufacturing of clothing, manufacturing of food and beverages, all civil engineering activities and road maintenance, and waste services.

Mitigating Carbon Footprints

Highlighted panels

- **Decarbonization Via Offsets & Capture. BNDES** – Lourenço Tigre, Chief Financial Officer; **Carbon Direct** – Jonathan Goldberg, Chief Executive Officer; **Weyerhaeuser** – Russell Hagen, Senior Vice President and Chief Development Officer
- **Carbon Capture Utilization & Storage: Scale, Costs and Risks. Aker Carbon Capture** — David Phillips, Head of UK and Investor Relations; **California Resources** — Chris Gould, Chief Sustainability Officer
- **GS Voices: Carbon Footprinting for Equity and Credit Portfolios.** Sarah Lawlor, COO GMD Sustainable Solutions Council; Tim Rohkemper, ESG Financing Structuring

Why it's important

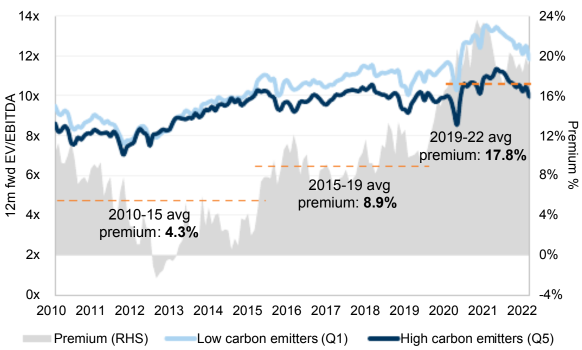
As the pressure and requirements for decarbonization and climate transparency continues to mount on corporates and investors, we expect not just strategies/targets, but also pathways/results to be an elevated area of focus. Managing and mitigating carbon exposure is becoming more important, with carbon increasingly being priced in directly through regulation and indirectly through equity multiples. ESG funds are rewarding companies with greater ownership for being transparent on their transition efforts, and those demonstrating progress decarbonizing, while low-carbon ESG funds continue to dominate thematic fund flows.

Net zero commitments continue to rise, with climate-focused regulation further driving the global agenda towards improved climate-related disclosures. According to the Net Zero Tracker, 83% of global GHG emissions, or 91% of global GDP, is now covered by national net zero targets (as of August 2022). Over one third of the world's largest 2,000 public equities (by revenue) have set a net zero target, while $130 tn in assets supports the Glasgow Financial Alliance for Net Zero (GFANZ) initiative. A global climate reporting standard is in development by the ISSB, leveraging both the TCFD and SASB as the foundational frameworks to shape corporate climate-related disclosures. Within each region, there remains a growing focus on climate-related reporting, including the latest SEC proposal in the US, and developments across Asia Pacific and Europe. Please see our The Net Zero Guide report for more details.

ESG fund ownership, valuation, and flows benefits for low versus high emitters. While some companies are facing direct carbon pricing via regulation, such as emission trading schemes or carbon taxes, we are also finding greater evidence of indirect pricing through equity multiples and ESG fund ownership. We find a ~20% 12m fwd EV/EBITDA GICS3 sector-relative premium for low versus high carbon emitters (Exhibit 17). We also find ESG funds significant underweight companies with lack of transition plan transparency and/or performance decarbonizing (Exhibit 18). Finally, ESG flows have continued to gain share through 2022 amid a challenging macro backdrop, with growing emphasis on impact and thematic strategies. In addition, "low-carbon" remains the dominant strategy attracting global thematic fund flows (Exhibit 19).

Exhibit 17: We find an expanding EV/EBITDA valuation premium for low versus high carbon emitters

Low carbon (Q1) vs. high carbon emitters (Q5) (Total Scope 1 & 2 GHG Emissions / GFA) 12-month-forward EV/EBITDA multiples (2010 - 2022), sector relative, excluding Financials

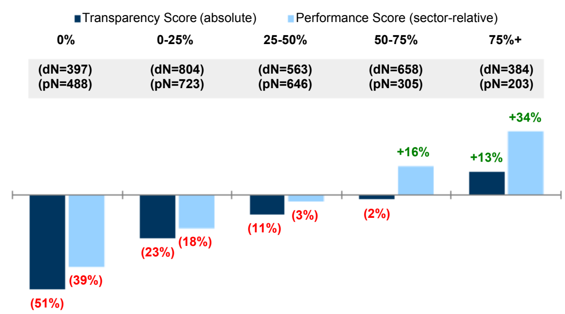


We caveat that some valuation divergence within GICS 3 sectors will be due to differences in business models.

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

Exhibit 18: ESG funds are significantly more underweight companies with no transition plan transparency or performance with greater ownership for leaders.

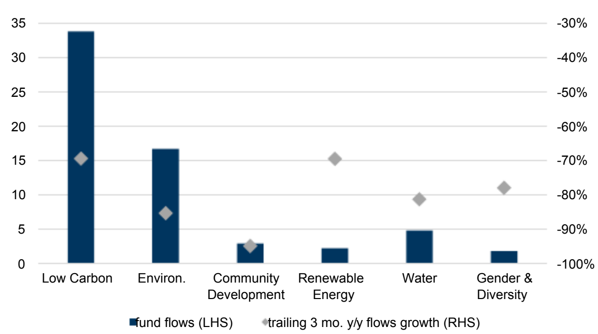
Median ESG fund relative overweight of companies in the respective GS SUSTAIN Climate Transition Tool scoring buckets (MSCI ACWI)



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

Exhibit 19: Low-carbon funds are commanding the greatest share of thematic flows

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



Source: Morningstar, Goldman Sachs Global Investment Research

Key debates

Methodologies for measuring decarbonization progress. As highlighted in our Net Zero Guide series, there are a number of methodologies investors are using to assess company progress decarbonizing their businesses. The most utilized framework amongst signatories to the Net Zero Asset Managers initiative uses a mix of both qualitative and quantitative metrics to assess the transition status of companies. This includes considerations of important, but less disclosed topics, such as whether companies transition plans promote an orderly and just transition. Whether approaches should strictly focus on emissions reductions, or consider a wider array of metrics which help in understanding the broader impact of a company's transition plan on the environment and society is still debated. Additionally, there remains little consensus and understanding around how to apply the concept of "fair share" emissions reductions into net zero investment strategies, which means the reductions expected of companies' factoring in geography and sector. We discussed the merits of applying energy efficiency improvements as a second lens to assess companies' progress towards transition. Strategies that only consider emissions footprints may unintentionally penalize companies (predominantly with EM exposure) that are actively transitioning, but may be decarbonisation-constrained in the near-term due to lower accessibility to greener grid networks.

- *Our GS Climate Transition Tool provides a view on the climate transition efforts of 7,000 global companies through two lenses: (1) our Transition Plan Transparency Score (absolute); and (2) our Transition Performance Score (sector-specific). The dataset is available upon request.*

Challenges with carbon data and implementation of forward-looking metrics. While there is a growing focus on carbon in investment decision-making and stock selection, the availability of quality and credible data remains a key challenge. Additionally, there is natural overlap between Scope 1, 2, and 3 emissions which can create challenges when carbon footprinting portfolios and developing a strategy to decarbonise. Investors are also increasingly looking to embed forward-looking metrics into their investment process, such as emissions forecasts or implied temperature rise metrics. There are a number of industry initiatives underway attempting to develop the right forward-looking metric, which is a big topic of debate given the long-dated nature of net zero.

The role of carbon offsets in corporate decarbonization strategies. Debate remains across the market around whether and the extent to which carbon offsetting should be utilized in net-zero transition strategies, particularly given concerns around the quality of carbon offsets in the voluntary market**.** Investors are increasingly pushing companies to set net zero targets verified by the Science-Based Targets initiative, which only permits companies to offset the last 5%-10% of their emissions footprint. The IEA net zero scenario also has limited reliance on carbon offsets. Meanwhile, in developing our GS net zero pathways, our Carbonomics team expects offsets to play a more significant role in global decarbonization, contributing to ~15% of the emissions reduction needs. As corporate usage of offsets looks set to continue accelerating given the rise in decarbonization commitments, eventual consensus on the role offsets should play will be required.

Investment Ideas and Performance

Highlighted panels

- **ESG & Alpha: Where and How Investors Are Finding Performance.** Speakers: **Amundi** — Craig Sterling, Director of Core Equity and Head of Equity Research, U.S.; **Pictet Asset Management** — Ella Hoxha, Senior Portfolio Manager, Global Bonds; **Viking Global Investors** — Mark Savino, ESG Analyst.
- **GS Voices: Sustainability Implementation in Equity & Credit.** Speakers: **Goldman Sachs** — Tim Rohkemper, ESG Financing Structuring; William Wolcott — Head of Credit Portfolio Trading
- **GS Voices: Leveraging AI in Sustainable Investments.** Speaker: **NN Investment Partners** — Sebastiaan Reinders, Head of Investment Science.

Why it's important

We see a rising focus on Sustainability and ESG fund performance and how funds and related indices generate investment ideas due to a combination of greater regulatory, investor and external focus. As we highlighted earlier, we see ESG shifting into the Measurement phase where investors will focus increasingly on defining more clearly fund goals and quantifying ESG or related overlays for inclusion. Over time, we believe this will result in an expansion of the investable universe and a greater focus on engagement over exclusion/divestment. We see seven key investment themes resulting from the shift From Aspiration to Action in the face of comodity inflation, energy reliability issues, and rising focus on inclusive growth.

- **Green Capex Reinvestors.** We see opportunities for further recognition of companies that are estimated to reinvest a high (vs. sector average) and/or rising percentage of cash flows into Capex + R&D, while also maintaining/boosting confidence in favorable medium to longer-term corporate returns.
- **Green Revenue Beneficiaries of Green Capex spending.** Across the Green Capex mosaic (Exhibit 9) we believe there exist opportunities for further appreciation of companies along the Green Capex supply chain which could potentially be revenue beneficiaries of increased Green Capex spending upstream. We believe investors could tend to favor companies with above-average returns.
- **Inclusive Growth and Food Security.** Inflationary pressures post-Russia/Ukraine conflicts highlight the need to mitigate food prices, as they impact disproportionately more lower-income vs. higher-income populations (see here for more details). As a result, we see opportunities for further recognition of those companies able to mitigate food prices inflation.
- **Clean Reliable Energy.** With disruptions in electricity networks impacting major global economies in 2021 and 2022 YTD, we see opportunities for further recognition of companies whose products and services that mitigate disturbances/interruptions and ensure reliability of energy supply. In particular, we see companies levered to **Battery Storage** and **Hydrogen** — two key areas of

innovation in energy reliability — as potential beneficiaries in the theme.

- **Energy Efficiency.** With energy prices under inflationary pressure, we see rising scope for further appreciation of companies whose products/services can result in higher throughout and/or lower power consumption. Energy is another area where lower-income populations are disproportionately affected vs. higher-income — see here for more details).
- **Greenablers.** On the back of the Russia/Ukraine conflict, we see opportunities for further recognition of Greenablers ('Green Enablers'), i.e., companies in those sectors where investments are needed more urgently and timely to avoid supply bottlenecks due to long project leadtimes. While not exclusive, in our Green Capex: Making Infrastructure Happen report we identify four key Greenablers — **Copper/Aluminum**, **Electricity Transmission**, **Semiconductors** and **Cybersecurity** — critical and/or needed across the Green Capex mosaic.
- **ESG Improvers — business mix shift and greenhouse gas emissions.** We believe there is room for further appreciation of transformation and transition stories among companies estimated to increase the percentage of revenue/capex linked to sustainable use cases or that show the capability to reduce their greenhouse emissions footprint. Our ESG of the Future reports introduced our analyst estimates for Green Revenue and Green Capex mix as well as Scope 1 & 2 greenhouse gas emissions towards identifying improvers.

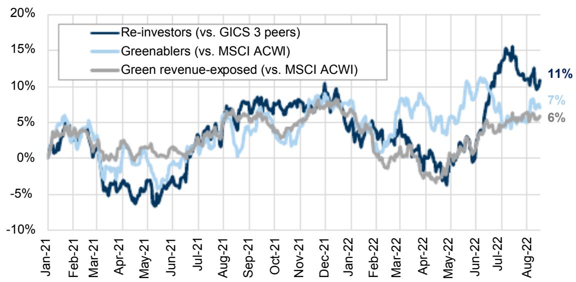
Exhibit 20: Our From Aspiration to Action themes and Russia/Ukraine war implications

Theme	Why it's important: Pre-Russia/Ukraine War	Why it's important: Post-Russia/Ukraine War	Focus Stocks
Inclusive Growth: Food Security	Meet Zero Hunger, Good Health & Well-Being goals	Mitigate food price inflation	AGCO, CNH Industrial, Costa Group, Deere, Dollar General, Elders, Walmart and Yili Industrial
Clean Reliable Energy	Meet Net Zero, Clean Water and infrastructure goals	Accelerate innovation in energy reliability solutions	*Battery Storage*: Enphase, LG Chem, Samsung SDI, SK Innovation, SolarEdge, STEM, Sungrow and Tesla *Hydrogen*: Air Liquide, Baker Hughes, Ceres Power, Industrie De Nora, Nel and Siemens Energy
Energy Efficiency	Reduce greenhouse gas emissions from consumers	Alleviate impact of energy price spike	ABB, AMD, Analog Devices, Carrier, Daifuku, Daikin, Dassault Systemes, Delta, Eaton, Emerson, KB Home, Keyence, Midea, Oriental Yuhong, Rexel, Siemens, Sika, SMC and Trimble
GREENABLERS Greenablers	Increased focus for sectors earlier in the Green supply chain.	Enhanced focus on Green Metals, Cybersecurity needs	*Copper/Aluminum*: Anglo-American, Constellium, Freeport-McMoran and Zijin Mining *Cybersecurity*: Fortinet, Okta, Palo Alto, Sangfor and Tenable
ESG Improvers	Increased focus on emissions intensity reduction, business mix transformation	Commodity price spike increases spare capacity for Green Capex	BP, Cemig, EDP, Enel, ENI, EQT, Hess, Jiangxi Copper, Orsted, Pioneer, SSAB and TotalEnergies

Buy-rated stocks as of August 16

Source: Goldman Sachs Global Investment Research

Exhibit 21: Stocks that screen for our three Green Capex investment themes have outperformed respective benchmarks since the beginning of 2021, but performance in 2022 YTD has been mixed
Average relative stock performance of Green Revenue Beneficiaries, Green Re-investors and Greenablers since Jan. 1, 2021

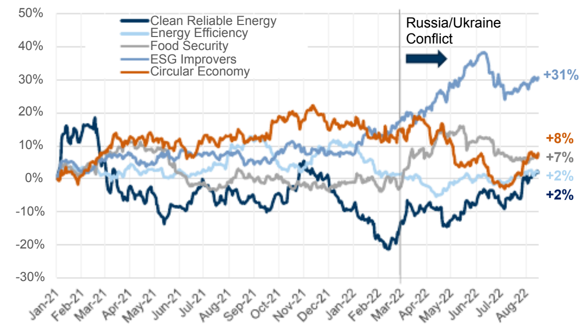


Note: Equal weighted indices. Includes stocks with corporate returns above average -- referred to global or regional sector average, ex. Greenablers. Stock selection based on constraints discussed in Green Capex: Making Infrastructure Happen report, but includes Neutral and Sell-rated stocks as opposed to just Buy-rated stocks.

Data as of August 16

Source: Refinitiv, FactSet, Goldman Sachs Global Investment Research

Exhibit 22: Stocks levered to the Food Security theme and ESG Improvers have outperformed stocks exposed to Clean Reliable Energy, Circular Economy and Energy Efficiency since the beginning of 2021
Average relative stock performance vs. MSCI ACWI since the start of 2021 for stocks highlighted for Clean Reliable Energy, Energy Efficiency, Food Security, Circular Economy and ESG Improvers themes in our 2021-present Green Capex, ESG of the Future, From Aspiration to Action and Circular Economy reports



Data as of August 16

Source: Refinitiv, Goldman Sachs Global Investment Research

Key debates

The investable universe and investment performance. We have seen rising debate on what should be included in ESG funds, ESG indexes and the investable universe. This is driving greater discussion over the variable weightings among ESG strategies towards product alignment vs. Environmental & Social performance vs. Governance performance vs. controversies. Additionally, there is also greater focus on ESG performance/fees as well as fund objectives. Investors continue to have "FOME" — Fear of Misaligned Exposure — worrying that there could be pushback on stocks in their funds from investors and regulators. Over time we believe this will lead to a wider investable universe but narrowed fund objectives (i.e., more Circular Economy, Renewables, Decarbonization, ESG Improvers, etc funds).

Level of tolerance of companies with temporary vs. longer-term lower corporate returns. We expect rising debate over how to measure corporate returns and what level of tolerance there should be for lower returns or not as companies pursue longer lead time expansion projects towards Sustainable Development Goals. Given the broader market focus on profitability, we believe investors will look for companies where corporate returns are resilient, attractive and have favorable momentum. Please see our Green Capex: Greenflation, Returns and Opportunity report for more details.

Reinvestors vs. Revenue Beneficiaries: while we believe the need for increased Green Capex is secular, we see normal investor debates over whether equity outperformance can occur during the capex phase vs. harvest phase. As highlighted in our latest Green Capex report, companies in Green Capex-critical sectors for which consensus Capex + R&D expectations have increased in recent months have not been rewarded by investors vs. their sector peers. This is consistent with the analysis reported in our Semiconductors Greenablers report, where we highlight that Semis companies have lagged sector peers in the days following announcements of capex commitments. In our view, this suggests that presently investors are rewarding revenue beneficiaries over re-investors, judging capex — Green or not — commitments with a cyclical framework and fearing capex increases would signal peak cycle. We believe for companies increasing capex (particularly on longer lead time projects), investors are likely to focus on:

- Whether the increased capex will lead to similar vs. greater vs. lower corporate returns; and
- The time horizon of the investment cycle and when a company would shift from investment mode to harvest mode (when projects come online).

How GS SUSTAIN can help

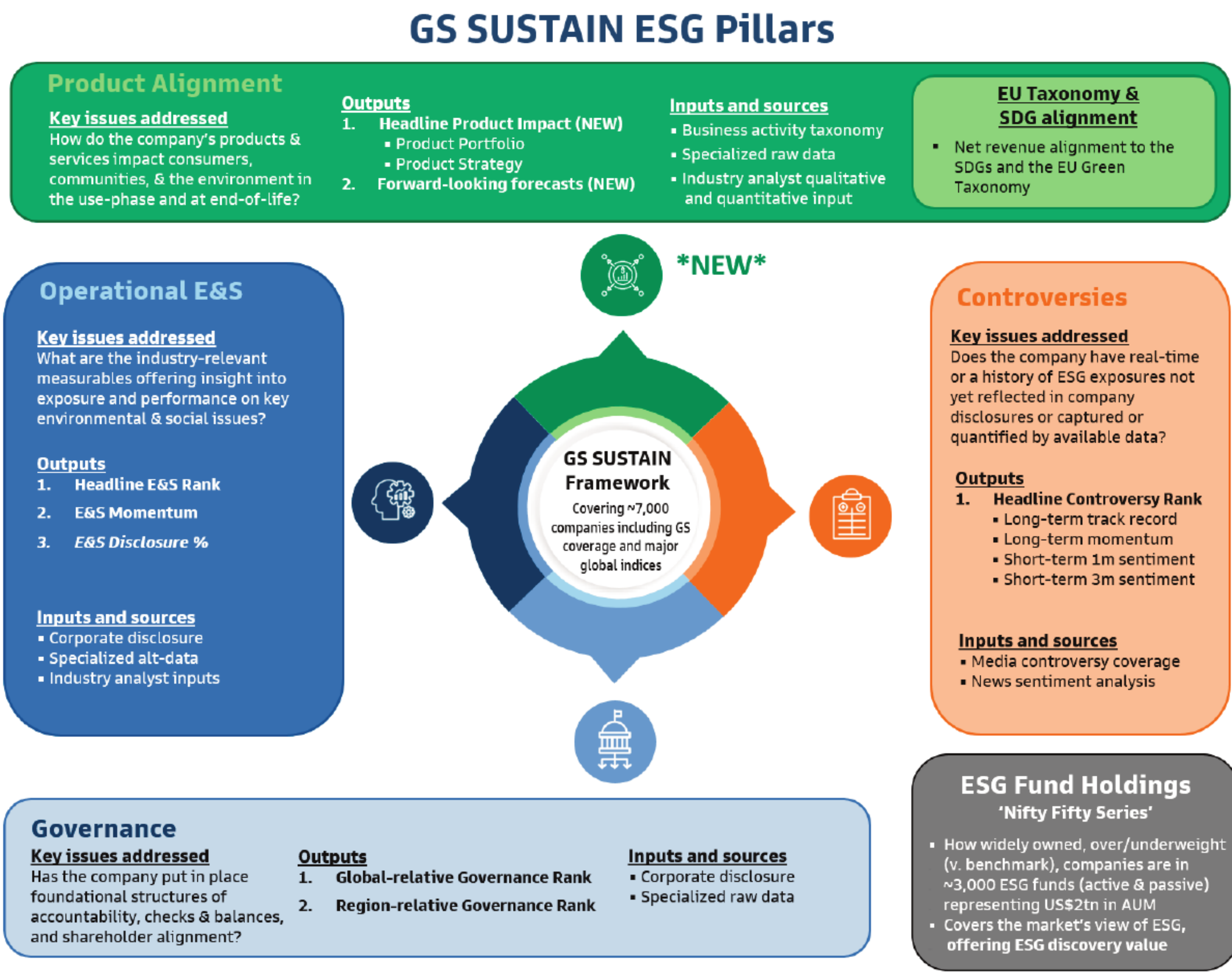
GS SUSTAIN provides access to proprietary tools and resources to quantify impact and identify ESG Improvers, enabling greater recognition of underappreciated opportunities across sectors. Our offering of SUSTAIN tools can help investors to answer ESG questions at the portfolio and security levels, enabling 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, based on the SDGs, EU Taxonomy and GS analyst views, 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. 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. 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 23:

Source: Goldman Sachs Global Investment Research



Source: Goldman Sachs Global Investment Research

Appendix

Exhibit 24: Company name, ticker and close price as of Aug. 16 for companies mentioned in Exhibit 20

Company Name	Ticker	Close Price As of Aug 16	Company Name	Ticker	Close Price As of Aug 16
ABB	ABBN.S	SFr 29	Industrie De Nora	DNR.MI	€ 14.82
Advanced Micro Devices	AMD	$ 100.2	Jiangxi Copper	600362.SS	Rmb 17.19
AGCO	AGCO	$ 113.07	KB Home	KBH	$ 33.09
Air Liquide	AIRP.PA	€ 136.22	Keyence	6861.T	¥ 57180
Analog Devices	ADI	$ 179.04	LG Chem	051910.KS	W 662000
Anglo-American	AAL.L	£ 3002.5	Midea Group	000333.SZ	Rmb 52.6
Baker Hughes	BKR	$ 25.06	Nel	NEL.OL	Nkr 15.85
BP Plc	BP.L	£ 426.5	Okta	OKTA	$ 106.02
Carrier Global	CARR	$ 44.39	Oriental Yuhong	002271.SZ	Rmb 38.11
Cemig	CMIG4.SA	R$ 12.35	Orsted A/S	ORSTED.CO	Dkr 802
Ceres Power	CWR.L	£ 713.8	Palo Alto	PANW	$ 524.55
CNH Industrial	CNHI.MI	€ 12.76	Pioneer Natural Resources	PXD	$ 229.12
Constellium	CSTM	$ 14.91	Rexel	RXL.PA	€ 17.68
Costa Group	CGC.AX	A$ 2.82	Samsung SDI	006400.KS	W 632000
Daifuku	6383.T	¥ 8530	Sangfor	300454.SZ	Rmb 102
Daikin Industries	6367.T	¥ 25285	Siemens AG	SIEGn.DE	€ 112.04
Dassault Systemes	DAST.PA	€ 42.75	Siemens Energy	ENR1n.DE	€ 16.47
Deere	DE	$ 369.98	Sika	SIKA.S	SFr 243.4
Delta Electronics	2308.TW	NT$ 272.5	SK Innovation	096770.KS	W 203500
Dollar General	DG	$ 256.78	SMC	6273.T	¥ 68250
Eaton Corp.	ETN	$ 153.1	SolarEdge	SEDG	$ 311.27
Elders	ELD.AX	A$ 11.64	SSAB	SSABa.ST	Skr 53.12
Emerson Electric	EMR	$ 89.95	STEM	STEM	$ 15.76
Enel SpA	ENEI.MI	€ 5.102	Sungrow	300274.SZ	Rmb 131.5
Energias de Portugal	EDP.LS	€ 5.126	Tenable	TENB	$ 43.85
ENI	ENI.MI	€ 11.578	Tesla	TSLA	$ 919.69
Enphase	ENPH	$ 292.94	TotalEnergies SE	TTEF.PA	€ 51.5
EQT Corp.	EQT	$ 47.19	Trimble	TRMB	$ 71.91
Fortinet	FTNT	$ 52.94	Walmart	WMT	$ 139.37
Freeport-McMoran	FCX	$ 31.39	Yili Industrial	600887.SS	Rmb 36.31
Hess Corp.	HES	$ 110.88	Zijin Mining	2899.HK	HK$ 9.29

Source: FactSet, Goldman Sachs Global Investment Research

Disclosure Appendix

Reg AC

We, Brian Singer, CFA, Derek R. Bingham, Evan Tylenda, CFA, Insoo Kim, CFA, Brian Lee, CFA, Brendan Corbett, Emma Jones, Michael Hao Wu, CFA, Enrico Chinello, Ph.D., Madeline Meyer, Keebum Kim, Rachit Aggarwal, Grace Chen, Varsha Venugopal and Miguel De Jesus, CFA, 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.

Unless otherwise stated, the individuals listed on the cover page of this report are analysts in Goldman Sachs' Global Investment Research division.

GS Factor Profile

The Goldman Sachs Factor Profile provides investment context for a stock by comparing key attributes to the market (i.e. our coverage universe) and its sector peers. The four key attributes depicted are: Growth, Financial Returns, Multiple (e.g. valuation) and Integrated (a composite of Growth, Financial Returns and Multiple). Growth, Financial Returns and Multiple are calculated by using normalized ranks for specific metrics for each stock. The normalized ranks for the metrics are then averaged and converted into percentiles for the relevant attribute. The precise calculation of each metric may vary depending on the fiscal year, industry and region, but the standard approach is as follows:

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).

For a more detailed description of how we calculate the GS Factor Profile, please contact your GS representative.

M&A Rank

Across our global coverage, we examine stocks using an M&A framework, considering both qualitative factors and quantitative factors (which may vary across sectors and regions) to incorporate the potential that certain companies could be acquired. We then assign a M&A rank as a means of scoring companies under our rated coverage from 1 to 3, with 1 representing high (30%-50%) probability of the company becoming an acquisition target, 2 representing medium (15%-30%) probability and 3 representing low (0%-15%) probability. For companies ranked 1 or 2, in line with our standard departmental guidelines we incorporate an M&A component into our target price. M&A rank of 3 is considered immaterial and therefore does not factor into our price target, and may or may not be discussed in research.

Quantum

Quantum is Goldman Sachs' proprietary database providing access to detailed financial statement histories, forecasts and ratios. It can be used for in-depth analysis of a single company, or to make comparisons between companies in different sectors and markets.

Disclosures

Distribution of ratings/investment banking relationships

Goldman Sachs Investment Research global Equity coverage universe

	Rating Distribution			Investment Banking Relationships		
	Buy	Hold	Sell	Buy	Hold	Sell
Global	50%	35%	15%	65%	58%	45%

As of July 1, 2022, Goldman Sachs Global Investment Research had investment ratings on 3,132 equity securities. Goldman Sachs assigns stocks as Buys and Sells on various regional Investment Lists; stocks not so assigned are deemed Neutral. Such assignments equate to Buy, Hold and Sell for the purposes of the above disclosure required by the FINRA Rules. See 'Ratings, Coverage universe and related definitions' below. The Investment Banking Relationships chart reflects the percentage of subject companies within each rating category for whom Goldman Sachs has provided investment banking services within the previous twelve months.

Regulatory disclosures

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