



ESG of the FUTURE

A forward look at corporate greenhouse gas emissions, potential ESG Improvers

We expect increased focus on corporate emissions of greenhouse gases as ESG markets become more forward-looking and in response to both rising regulations including proposals from the SEC and carbon pricing considerations. Following the introduction of our analysts' estimates for Green Capex and Green Revenue in 2021, we introduce our analysts' estimates for Scope 1 and 2 greenhouse gas emissions for select companies in seven critical sectors. Our forecasts through 2025 imply that corporate emissions will remain below 2019 levels, but the reduction in corporate emissions intensity does not appear consistent with a path that limits global temperature rise to 1.5°C – as laid out in the Carbonomics analysis. We expect an ESG investor shift From Aspiration to Action to lead to valuation premiums over time for leaders in corporate decarbonization with favorable corporate returns.

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The following is a redacted version of a report originally published May 2, 2022. All company references in this note are for illustrative purposes only and should not be interpreted as investment recommendations

PM Summary

ESG of the Future represents the shift we see from predominantly backwards-looking ESG metrics towards integrating a forward view — we now add forecasts for select corporate Scope 1 and Scope 2 emissions. We see ESG investor focus on corporate decarbonization continuing to become more forward-looking due in part to new rules proposed by regulators in the US, Europe and Asia as well as a broader thematic investor shift From Aspiration to Action, further accelerated by the Russia/Ukraine war. We add greenhouse gas emissions to our forecasting tools to help investors consider the medium term direction of Scope 1 and 2 emissions on a macro and micro basis for companies in critical sectors. This should further help to identify ESG Improvers, complementing our forecasting tools for Green Revenue mix, Green Capex mix and select volumetric mix shifts (electricity generation, autos, steel, etc) introduced in our November 2021 ESG of the Future report.

Macro and micro bottom line. While our new greenhouse gas forecasts do not paint a full picture of overall emissions, our forecasts imply **Scope 1 emissions from companies in seven historically high-emitting sectors will remain below 2019 levels through 2025, implying a 1%-2% annualized decline vs. a 2019 base.** Emissions intensity is declining for each of the sectors we forecast, though there is no sector where the percentage reduction in emissions intensity through 2025 appears consistent with a path to a 1.5°C temperature rise (laid out by our colleagues' Carbonomics analysis) for covered companies. Emissions intensity is declining at the fastest pace for **Electric Utilities** and **Oil & Gas Producers** by 2025 vs. 2019 (intensities are referred to Scope 1 for Electric Utilities and Scope 1+2 for Oil & Gas Producers).

We continue to believe that equity investors focused on Sustainability and ESG issues will become more forward-looking in the coming years, a function of regulation, new sustainability bond issuance, focus on whether we are on track to meet key UN Sustainable Development Goals like decarbonization and understanding supply chain risks. Our November 2021 ESG of the Future report laid out analysts' forecasts for companies in 19 sectors for Green Revenue mix, Green Capex mix and select key volumetric indicators in an effort to track mix shift towards sustainable use case alignment, Green Capex and how transformational sectors like autos and power generation will become. As we highlighted, this was a first step given in part limited disclosures and basis for forecasting.

In this report, we take a first step at integrating forecasts for greenhouse gas emissions. We believe this will also become more in focus for both macro and micro reasons — to determine how companies are aiding the decarbonization effort and whether companies are on track to meet targets. We have asked analysts to forecast their covered companies Scope 1 and Scope 2 emissions annually in seven historically high-emitting sectors — Airlines, Chemicals, Construction Materials, Mining & Metals, Oil & Gas, Steel and Utilities. Together Scope 1 emissions from these sectors in 2019 represent 89% of overall Scope 1 emissions from the near 7,000 companies in our GS SUSTAIN database. As we discuss further, we

also view this as a start, because: (a) Not all corporates disclose emissions; (b) Scope 1 emissions from those that do represent a minority of total global emissions; (c) our analysts do not cover all the companies in the sectors we are focused on; and (d) there is need for further basis for analyst forecasts for some covered companies. Importantly, our analysts' forecasts do not include corporate Scope 3 emissions — emissions from consumers and suppliers. At the country level, we address where focus on consumer emissions vs. corporate emissions could have greater initial impact later in the report.

Key takeaways:

1. We do not see corporate emissions in the seven high-emitting sectors we forecast moving back up to 2019 levels through 2025, and our forecasts imply a relatively flattish emissions profile post-2021 with 2025 down 9% vs. 2019.
2. We see a more material reduction in emissions intensity, with median sector down 15% (on a market cap-weighted average basis — range -3% to -20%) in 2025 vs. 2019 levels (excludes Chemicals due to insufficient data).
3. Sectors where our analysts' forecasts imply the greatest reduction in emissions intensity in 2025 vs. 2019 are **Electric Utilities, Oil & Gas Producers, Diversified Metals & Mining** and **Aluminum** (intensities refer to Scope 1 emissions for Electric Utilities and Scope 1+2 for other sectors). We have compared the percentage reduction in emissions intensity through 2025 to the path needed longer term for a <2 degrees and 1.5°C temperature rise scenario laid out by our colleagues' Carbonomics reports. While there is no sector where the percentage emissions intensity reductions through 2025 appears consistent with a 1.5°C temperature rise scenario, based on our analysts' estimates, we see the percentage reduction in emissions intensity through 2025 most consistent with well below 2°C and 2°C scenarios for **Electric Utilities, Steel, Aluminum, Chemicals** and **Diversified Metals & Mining**.

Importantly, ESG ownership among these seven sectors is limited... ESG funds are 33% underweight on average the seven most emitting sectors on a market cap weighted basis when including all companies in our GS SUSTAIN database. We attribute this largely to the higher emissions intensity and the predominant focus of overweight positions in sectors levered to solar, water and wind.

... but we see rising interest over time among investors in ESG Improvers. As ESG investor focus shifts from Aspiration to Action, we believe investors will begin to consider owning companies that have historically been high emitters where there is confidence in a meaningful reduction in emissions or where their products contribute to meaningful avoidance of emissions relative to their emissions profiles. However, this requires sufficient engagement to forecast emissions and future product impact. Ultimately, company guidance of emissions targets is not enough; understanding pathways and drivers will be important for funds to make credible cases for impact to their investors, particularly if portfolios are being measured by their carbon footprint.

We note there are multiple limitations to our analysis which is why we view the work as a starting point. Our focus only goes through 2025 as most of our analyst teams' earnings models do not extend later. Much of the emissions intensity and potential absolute emissions reductions to meet Net Zero pathways are expected to accelerate beyond 2025, beyond where our analysts make annual financial forecasts. We note for those looking beyond 2025, our colleagues' Carbonomics report in October 2021 focused on management teams' long-term targets for emissions and implied emissions pathways for select companies to meet targets in select sectors. Additionally, our analysis focuses on Scope 1+2 emissions and not emissions by consumers/suppliers (Scope 3). As we highlight, overall corporate Scope 1 emissions from companies in all sectors in our GS SUSTAIN universe represents a minority of total global emissions as emissions from individuals, governments and privately-held companies are not included.

Exhibit 1: All key sectors included in our analysis are forecast to have emissions intensities on the decline by 2025E vs. 2019 — Electric Utilities are forecast to see the largest decrease

Change in absolute emissions and emissions intensities for key sectors in our analysis by 2025E vs. 2019

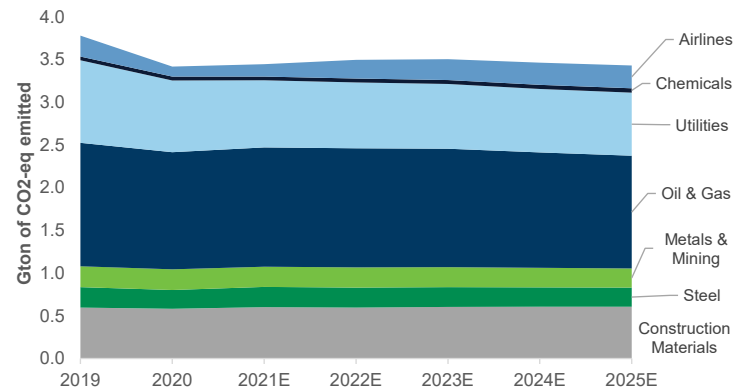
GS SUSTAIN Sector	Change in absolute emissions in 2025E vs. 2019	Change in Emissions Intensities in 2025E vs. 2019
Airlines	9%	-5%
Aluminum	-8%	-14%
Chemicals	10%	-12%
Construction Materials	2%	-12%
Diversified Mining & Metals	-6%	-14%
Oil & Gas Producers	-8%	-16%
Oil Refiners	-10%	-10%
Steel	-3%	-8%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

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

Exhibit 2: We see aggregate Scope 1 emissions from seven key sectors flattish with 2020 levels through 2025, down vs. pre-pandemic levels

Sector breakdown for Scope 1 emissions from corporates included in our analysis.



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. The same applies for 2019 and 2020 weighted average estimates. Sectors as defined in our GS SUSTAIN sector classification.

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

Implications for stocks: Finding ESG Improvers

We believe that over time ESG investors will look more towards impact themes and there will be rising willingness to invest in ESG Improvers — companies that may not traditionally have scored well on ESG metrics but where there could be recognition for a significant improvement towards Sustainable Development Goals. It is for this reason we have worked with our analysts to quantify improvement. While there are ultimately many different ways to measure improvement, in our ESG of the Future reports, we have focused on:

- **Green Revenue and Green Capex:** Companies with rising or high and rising percentages of Green Capex or Green Revenue as a percentage of the total. In our November 2021 ESG of the Future report, we introduced stock-specific estimates for Green Revenue and Green Capex mix for 19 sectors key in the Green Capex mosaic. Our takeaway was that we see the Green Capex and Green Revenue mix rising at a rate of about 1.0-1.5 percentage points per year.
- **Greenhouse Gas emissions:** Companies that are meaningfully lowering their emissions intensity. In this report, we introduce analysts' estimates for Scope 1 and Scope 1+2 annual greenhouse gas emissions for companies in 7 high-emitting sectors with a goal of assessing direction of overall corporate emissions but also in identifying companies helping to advance decarbonization goals by lowering their own emissions footprint on an intensity basis.

When will investors reward ESG Improvers? Over time, we expect a rising focus on ESG Improvers as more investors look to drive and measure impact. This is catalyzed both by: (1) a shift in stage of the ESG life cycle towards the Measurement phase as addressed in our PM's Guide to the ESG Revolution report; and (2) a shift From Aspiration to Action among ESG investors on the back of multiple energy reliability events over the last 18 months. However, Fear of Misaligned Exposure (FOME) among ESG investors could be a headwind to the timing and pace of focus on ESG Improvers. We focus this report on seven high emitting sectors that are largely underweight in ESG funds. Because of the wide range of focus among ESG funds, the timing of a shift towards improvers is somewhat opaque. Nevertheless, the increased focus on achieving goals like Net Zero, Infrastructure and Clean Water will likely over time lead to a greater diversification of investments across the supply chain that includes companies driving impact through improvement.

Corporate greenhouse gas emissions in numbers

9%

Reduction in global Scope 1 emissions from corporates by 2025E vs. 2019 base

18%

Scope 1 emissions reported by the 7,000 companies in the GS SUSTAIN database as percent of total global emissions in 2019

15%

Reduction (on average) in sectoral emissions intensities by 2025E vs. 2019 base

~90%

The share of corporate Scope 1 emissions from the 7 sectors in our analysis: **Airlines, Chemicals, Construction Materials, Metals & Mining, Oil & Gas, Steel and Utilities**

5

Sub-sectors where emissions intensity reductions through 2025 appear consistent with a below-2°C and 2°C scenario as laid out in Carbonomics: **Electric Utilities, Steel, Chemicals, Aluminum, Diversified Metals & Mining**

8

Companies with percentage emissions intensity reductions through 2025 consistent with a 1.5°C scenario laid out in Carbonomics, based on our analysts' estimates



US and India have similar greenhouse gas emissions per \$ of GDP, despite a wide disparity in emissions per \$ of revenue by companies selling in the US vs. India

Source: Goldman Sachs Global Investment Research

Putting corporate emissions in context: Highly concentrated but minority of total emissions

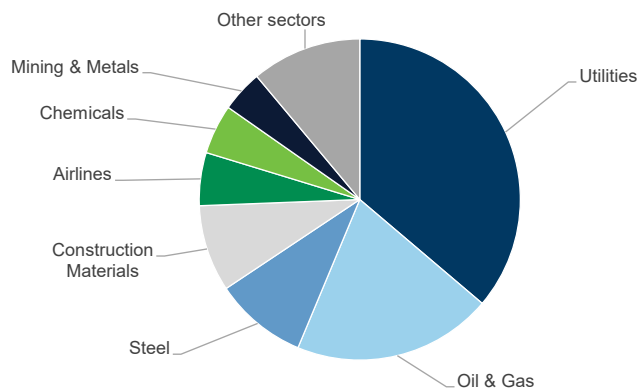
The seven sectors comprised in our analysis account for almost 90% of corporate Scope 1 emissions within GS SUSTAIN coverage. Corporate-level Scope 1 emissions are highly concentrated in a handful of sectors, which largely represent our focus for forecasts. The seven sectors we consider are: Airlines, Chemicals, Construction Materials, Mining & Metals, Oil & Gas (separated in Oil & Gas Producers and Oil Refiners), Steel and Utilities (broken down into Electric Utilities, Gas Utilities, Multi-Utilities and Water Utilities). Among those sectors, publicly listed companies from the corporate universe covered by GS SUSTAIN (about 7,000 publicly listed companies globally) account for 8.4 bn tons of CO₂-eq in 2019, representing 89% of emissions from publicly listed companies in GS SUSTAIN coverage.

Importantly, however, reported corporate Scope 1 emissions only account for 18% of total global GHG emissions. Global GHG emissions in 2019 — including land-use change and forestry — were about 51 bn tons of CO₂-equivalent — calculated from 2018 global total GHG emissions from [Emissions Database for Global Atmospheric Research \(EDGAR\)](#), to which we apply the 2010-2018 average p.p. contribution of CO₂ to total GHG to derive total global GHG emissions in 2019. We estimate that disclosed Scope 1 emissions from the corporate universe covered by GS SUSTAIN accounted for 18% of those GHG emissions in 2019 — or about 9.4 bn tons of CO₂-eq, of which as mentioned above almost 90% come from the seven sectors of our focus. We see companies focused on electricity/heat generation, transportation and buildings as the areas accounting for the highest share of emissions not captured by GS SUSTAIN coverage, per sector breakdown as reported by [Climate Watch](#).

Our equity research teams cover 70% of total Scope 1 disclosed emissions from the seven key sectors. Companies covered by our Global Investment Research teams account for about 6 bn tons of CO₂-eq in 2019, corresponding to 70% of total emissions from publicly listed corporates in GS SUSTAIN coverage in the seven key sectors, or 11% of global total GHG emissions. The remaining portion of emissions from corporates in the seven key sectors (5% of total global GHG emissions) come from companies not covered by our equity research teams.

Exhibit 3: Among the ~7,000 companies in our GS SUSTAIN database, the 7 key sectors we consider in our analysis represent almost 90% of reported Scope 1 emissions

Sector breakdown of global Scope 1 emissions from corporates in our GS SUSTAIN coverage (2019 data)

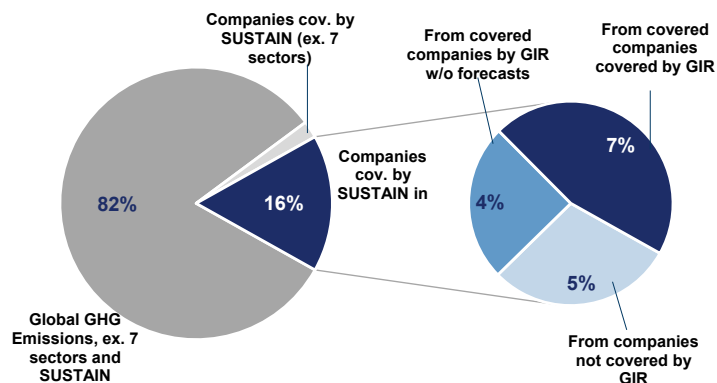


Sectors as defined in our GS SUSTAIN sector classification. Oil & Gas comprises Oil & Gas Producers and Oil Refiners. Utilities comprises Electric Utilities, Gas Utilities, Multi-Utilities and Water Utilities.

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

Exhibit 4: Out of global GHG emissions, the seven sectors considered account for only 16% of the total. Covered companies for which estimates have been provided cover 46% of those — or c.7% of total GHG emissions

Breakdown of global GHG emissions in 2019 with respect to the scope of coverage in our analysis



Data refers to 2019 global GHG emissions

Source: EDGAR, Goldman Sachs Global Investment Research

Our new bottom-up forecasts reflect a subset of companies in these seven sectors where our analysts see sufficient basis for forecasting.

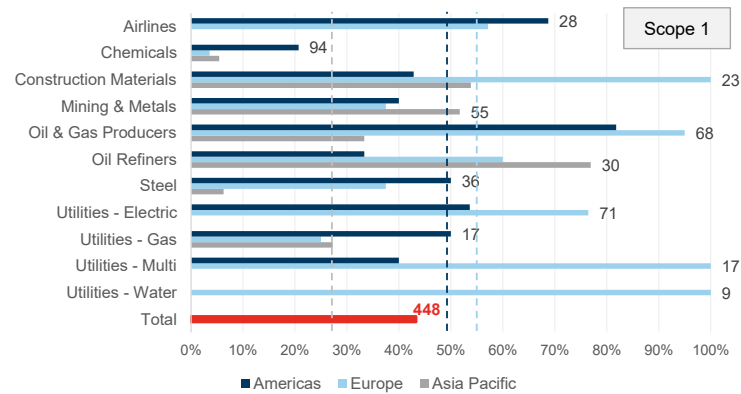
Companies for which we received GHG emissions forecasts represent 65% of emissions from corporates covered by our equity research teams in the seven key sectors, or 3.8 bn tons of CO₂-eq — corresponding to 7% of global total GHG emissions in 2019. While the overall percentage of both disclosed corporate Scope 1 emissions and emissions from companies where we have forecasts is low, we nevertheless believe the directional takeaways are important. We expect to grow the percentage of emissions forecasted over time.

Response rates from our analysts are the highest for Oil & Gas and the lowest for Chemicals.

As highlighted in [Exhibit 5](#), the number of estimates we received varied widely among sectors and regions. On a Scope 1-basis, response rates were the highest for the Oil & Gas sector (66% on average). We also note response rates for Utilities were 46% on average — 48% for Electric Utilities, 29% for Gas Utilities, 59% for Multi-Utilities and 44% for Water Utilities. The Chemicals sector is where response rates were the lowest — 10%, globally — due to a combination of (1) limited company disclosures regarding decarbonization pathways and (2) difficulty in forecasting emissions trajectories by our analysts, in our view.

Exhibit 5: Response rates for Scope 1 emissions estimates were the highest for Oil & Gas and Utilities, and vary significantly among regions of coverage — the highest in Europe (53%) and the lowest in Asia (24%), on a weighted average basis

Breakdown of response rates for Scope 1 emissions estimates by sector and region of coverage.



Inputs are counted in the response rate calculation when at least 2 years of estimates have been provided. Vertical dashed lines correspond to the weighted average response rates by region using number of companies in the sector as weights.

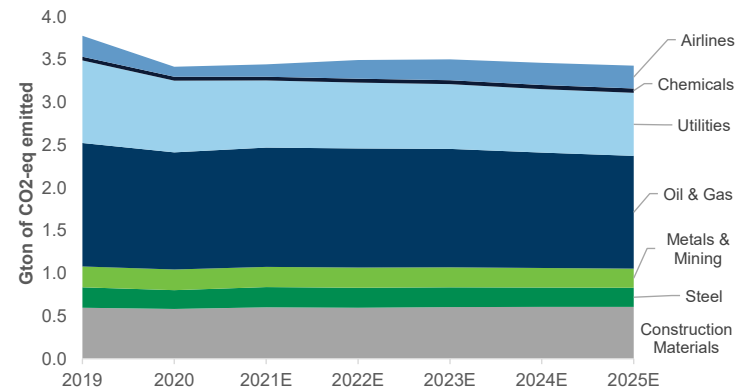
Source: Goldman Sachs Global Investment Research

Implications for overall corporate emissions: Flattish through 2025 vs. 2020

Our work suggests stabilization in absolute emissions across the seven key sectors considered post-2020, still down from pre-pandemic levels. The companies in our analysis accounted for 3.8 billion tons of CO₂-eq emitted in the atmosphere in 2019, with the Oil & Gas and Utilities sectors representing the majority of the total (39% and 25% of the total, respectively). As we detail in [Exhibit 6](#), COVID-related disruptions resulted in a steep decline in 2020 — down 10% YoY. Our analysts' estimates imply a slight pickup in overall Scope 1 emissions from the companies in our analysis in 2021E and 2022E, followed by a modest decline / stabilization in subsequent years, with 2025E down 9% vs. 2019 and up 1% vs. 2020. We note overall Scope 1 emissions for corporates in our survey are estimated to amount to 3.4 billion tons of CO₂-eq by 2025E, implying a 1.6% annualized reduction vs. 2019 levels. Notably, however, to stay on track with Net Zero goals, we would need to see a more meaningful acceleration in the pace of decarbonization post-2025E. Commentary from managements of companies with Net Zero or broader decarbonization goals suggests a more back-end loaded emissions decline, so our results through 2025 does not suggest we are definitively off track.

Exhibit 6: We see aggregate Scope 1 emissions from key sectors flattish with 2020 levels through 2025, down vs. pre-pandemic levels

Sector breakdown for Scope 1 emissions from corporates included in our analysis.



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. The same applies for 2019 and 2020 weighted average estimates. Sectors as defined in our GS SUSTAIN sector classification.

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

Among the seven sectors, we see absolute emissions from Steel, Mining & Metals, Oil & Gas and Utilities declining by 2025E vs. 2019. While overall Scope 1 emissions from corporates in our analysis are estimated to decline by 9% by

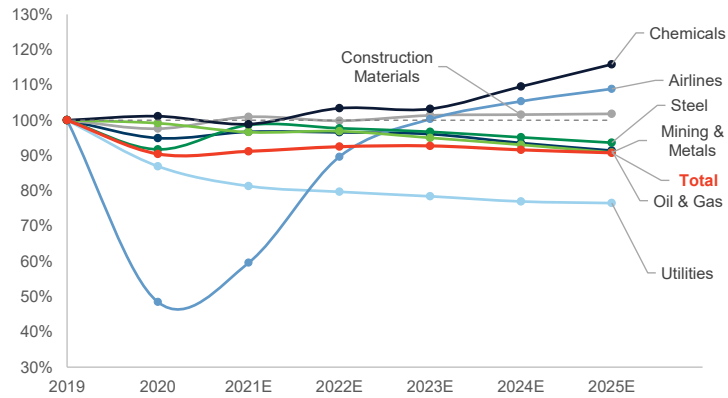
2025E vs. 2019 base, the sector-by-sector outlook is mixed, with 4 of the 7 key sectors projected on the decline and 3 on the rise. In particular, our estimates indicate a downward trajectory for absolute Scope 1 emissions from Steel, Mining & Metals, Oil & Gas and Utilities — down 6%, 10%, 10% and 23% by 2025E vs. 2019 base. Scope 1 emissions for the remaining 3 sectors — Airlines, Chemicals and Construction Materials — are estimated to be on the rise by 2025E vs. 2019 base.

Our analysis — even if partial — indicates significant discrepancies in overall emissions among regions. We note absolute Scope 1 emissions from companies in the seven key sectors in Americas and Europe are estimated to follow a similar trajectory, declining by about 14%-15% by 2025E vs. 2019 (see [Exhibit 8](#) and [Exhibit 9](#)) — despite different sector-by-sector outlooks for Chemicals, Metals & Mining and Steel. Absolute emissions in Asia Pacific are estimated to follow a different trajectory, increasing by 7% by 2025E vs. 2019 ([Exhibit 10](#)) — in particular, emissions from Chemicals, Construction Materials, Oil & Gas and Utilities are forecast on the rise among Asia Pacific companies. In our view, this stems in part from different positions on the cost abatement curve for Americas/Europe/Asia Pacific companies.

While our work provides views on only a part of corporate emissions, we believe this could be extrapolated to derive trends and trajectories. We recognize that companies in our analysis accounted for only 7% of global GHG emissions and 46% of global GHG emissions from publicly traded corporates in our GS SUSTAIN database — based on 2019 data. However, the importance of the seven key sectors we selected — which accounted for almost 90% of total direct GHG emissions from corporates in 2019 — jointly with the footprint of corporates covered in our analysis where we have forward-looking GHG emissions forecasts gives us confidence that our work could provide visibility into the trajectory of emissions among the seven sectors we focus on.

Exhibit 7: Absolute Scope 1 emissions are projected to decrease for 4 of the 7 key sectors considered — Steel, Oil & Gas, Mining & Metals and Utilities — by 2025E vs. 2019, and to increase for the remaining 3 — Airlines, Chemical and Construction Materials

Overall Scope 1 emissions for the seven sectors considered, indexed to 2019 as base-year

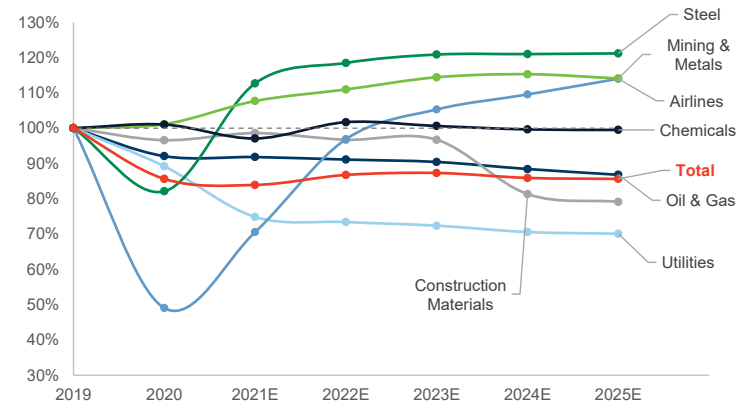


As not all analysts model through 2025, 2024E and 2025E reflect the weighted average yoy change for companies where the covering analysts have submitted data. The same applies for 2019 and 2020 weighted average estimates. Sectors are defined based on GS SUSTAIN sector classification — Oil & Gas includes Oil & Gas Producers and Oil Refiners, Utilities includes Electric Utilities, Gas Utilities, Multi-Utilities and Water Utilities

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

Exhibit 8: Among Americas companies where our analysts are estimating future greenhouse gas emissions, Scope 1 emissions from Oil & Gas, Construction Materials and Utilities are forecast to decline meaningfully

Trajectory of Scope 1 emissions for Americas companies in our analysis, broken down by sector. Indexed vs. 2019 base.

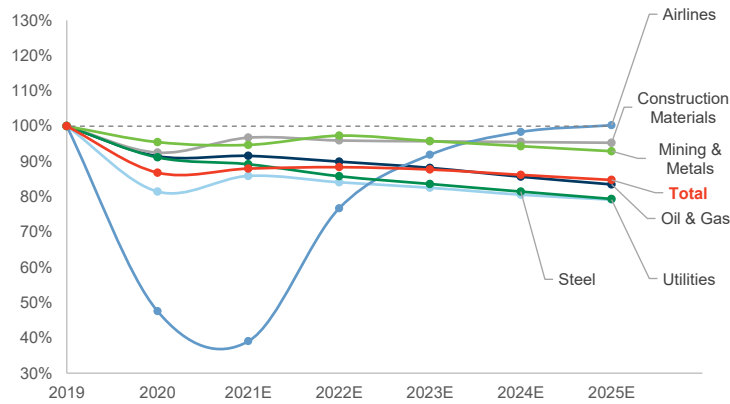


As not all analysts model through 2025, 2024E and 2025E reflect the weighted average yoy change for companies where the covering analysts have submitted data. The same applies for 2019 and 2020 weighted average estimates. Sectors are defined based on GS SUSTAIN sector classification — Oil & Gas includes Oil & Gas Producers and Oil Refiners, Utilities includes Electric Utilities, Gas Utilities, Multi-Utilities and Water Utilities

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

Exhibit 9: Among EMEA companies where our analysts are estimating future greenhouse gas emissions, the Construction Materials, Mining & Metals, Oil & Gas, Utilities and Steel sectors are forecast to have declining Scope 1 emissions by 2025E

Trajectory of Scope 1 emissions for Europe companies in our analysis, broken down by sector. Indexed vs. 2019 base.

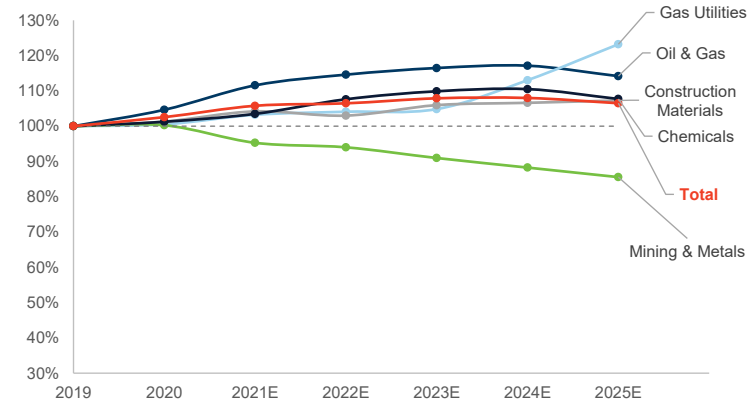


As not all analysts model through 2025, 2024E and 2025E reflect the weighted average yoy change for companies where the covering analysts have submitted data. The same applies for 2019 and 2020 weighted average estimates. Sectors are defined based on GS SUSTAIN sector classification — Oil & Gas includes Oil & Gas Producers and Oil Refiners, Utilities includes Electric Utilities, Gas Utilities, Multi-Utilities and Water Utilities

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

Exhibit 10: Among Asia Pacific companies where our analysts are estimating future greenhouse gas emissions, the Mining & Metals sector is forecast to have declining Scope 1 emissions by 2025E

Trajectory of Scope 1 emissions for Asia Pacific companies in our analysis, broken down by sector. Indexed vs. 2019 base.



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. The same applies for 2019 and 2020 weighted average estimates. Sectors are defined based on GS SUSTAIN sector classification — Oil & Gas includes Oil & Gas Producers and Oil Refiners, Utilities includes Electric Utilities, Gas Utilities, Multi-Utilities and Water Utilities. Airlines and Steel sectors not depicted due to no estimates/limited estimates.

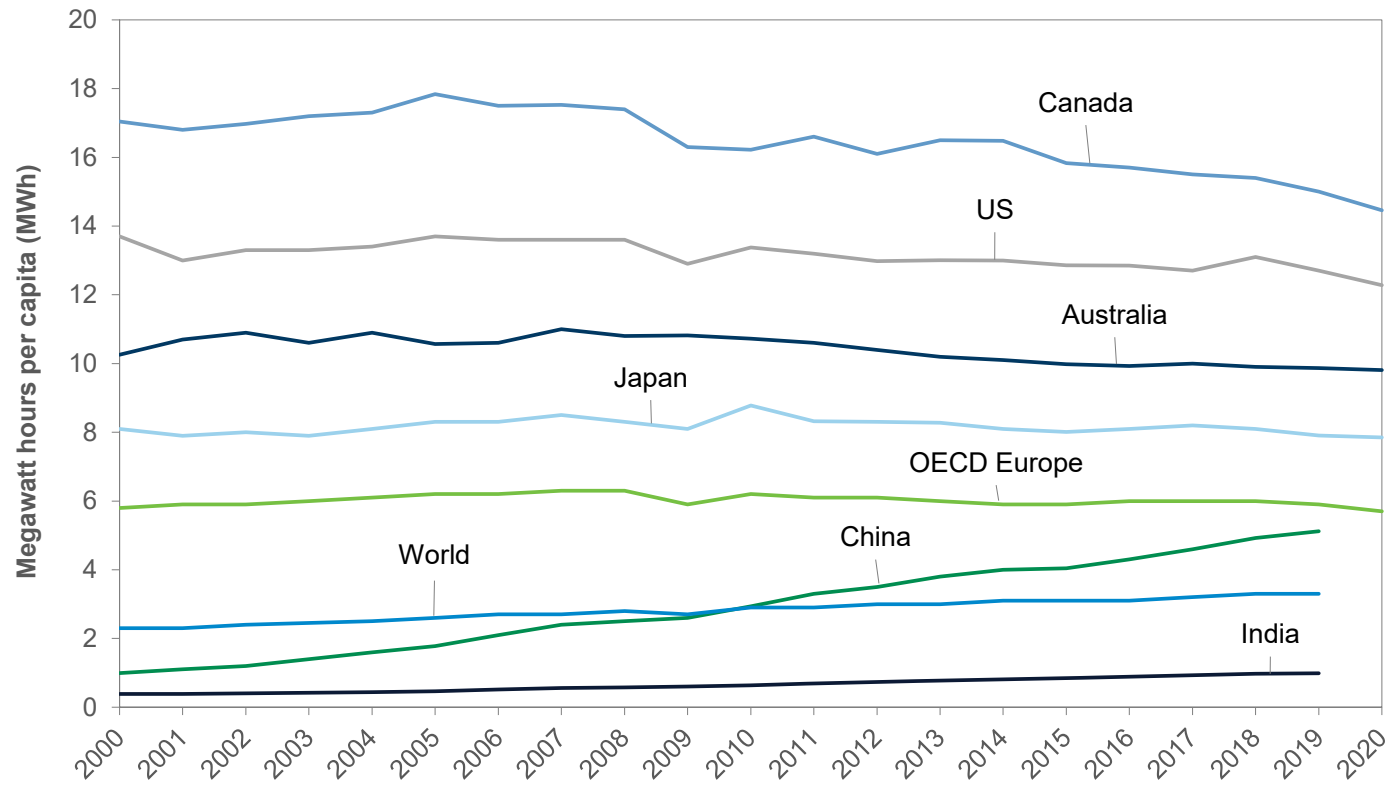
Source: Company data, Thomson Reuters, Bloomberg, Goldman Sachs Global Investment Research

Corporate emissions vs. Consumer emissions: Where could initial impact be the greatest?

We believe consideration of emissions intensity of corporates vs. emissions intensity of countries can be helpful to determine where investors and policy-makers should prioritize resources to drive the greatest impact. As we have written, we are seeing a greater focus of regulation in Europe, the US and Asia on disclosure of Scope 1, 2 and 3 emissions. There is an intense focus among policymakers, investors and other stakeholders in lowering corporate emissions. This has in part led to, as we have written, a transition catalyzed by lower supply that leads to underinvestment and higher prices of commodities. We believe greater focus on consumer demand can also play an important role in driving decarbonization. We believe an all-in approach towards lowering consumer and corporate emissions will be needed to achieve Net Zero goals — focused on finding ways to mitigate both corporate and consumer emissions. At the same time, our analysis suggests the initial weighting of focus on corporate vs. consumer emissions may drive greater impact if varied by country, depending on whether the outsized emissions intensity lies with corporates or consumers.

Electricity consumption per capita is highest in the US, followed by Japan and EMEA with China on the rise. Overall electricity demand on a per capita basis is greatest in developed countries, but even among developed countries the US is meaningfully above Japan which is meaningfully above EMEA. The global weighted average is meaningfully lower, a function of many countries and populations with more limited access or affordability for electricity consumption. We believe advancement towards No Poverty Sustainable Development Goals likely means that the global average for electricity consumption per capita will be on the rise in future years. This is another reason for financial market and policymaker consideration for corporate vs. consumer emissions. For some countries like Canada, the higher electricity consumption per capita is in part driven by severe weather — i.e., a greater number of population-weighted heating and cooling degree days. This is less the case based on IEA data for the US and Japan.

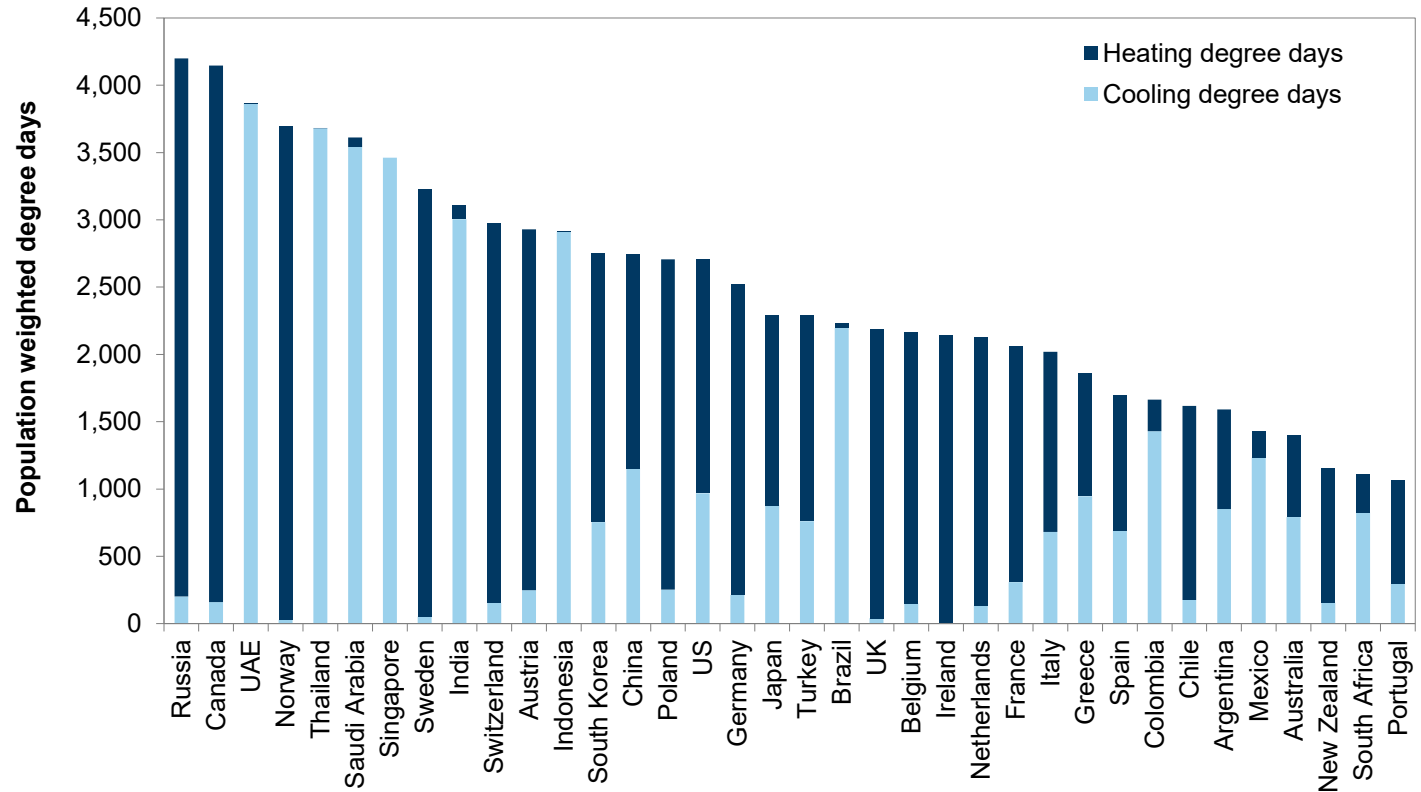
Exhibit 11: Higher-income countries consume much more energy than lower-income countries on a per-capita basis
 Per-capita electricity consumption by country



Source: IEA, Goldman Sachs Global Investment Research

Exhibit 12: While countries with more extreme weather have greater heating and/or cooling needs, this does not fully explain the greater electricity intensity in the US, Japan and Australia as examples

Number of population-weighted heating degree days and cooling degree days, 2019; heating degree days based on 16°C, cooling degree days based on 18°C



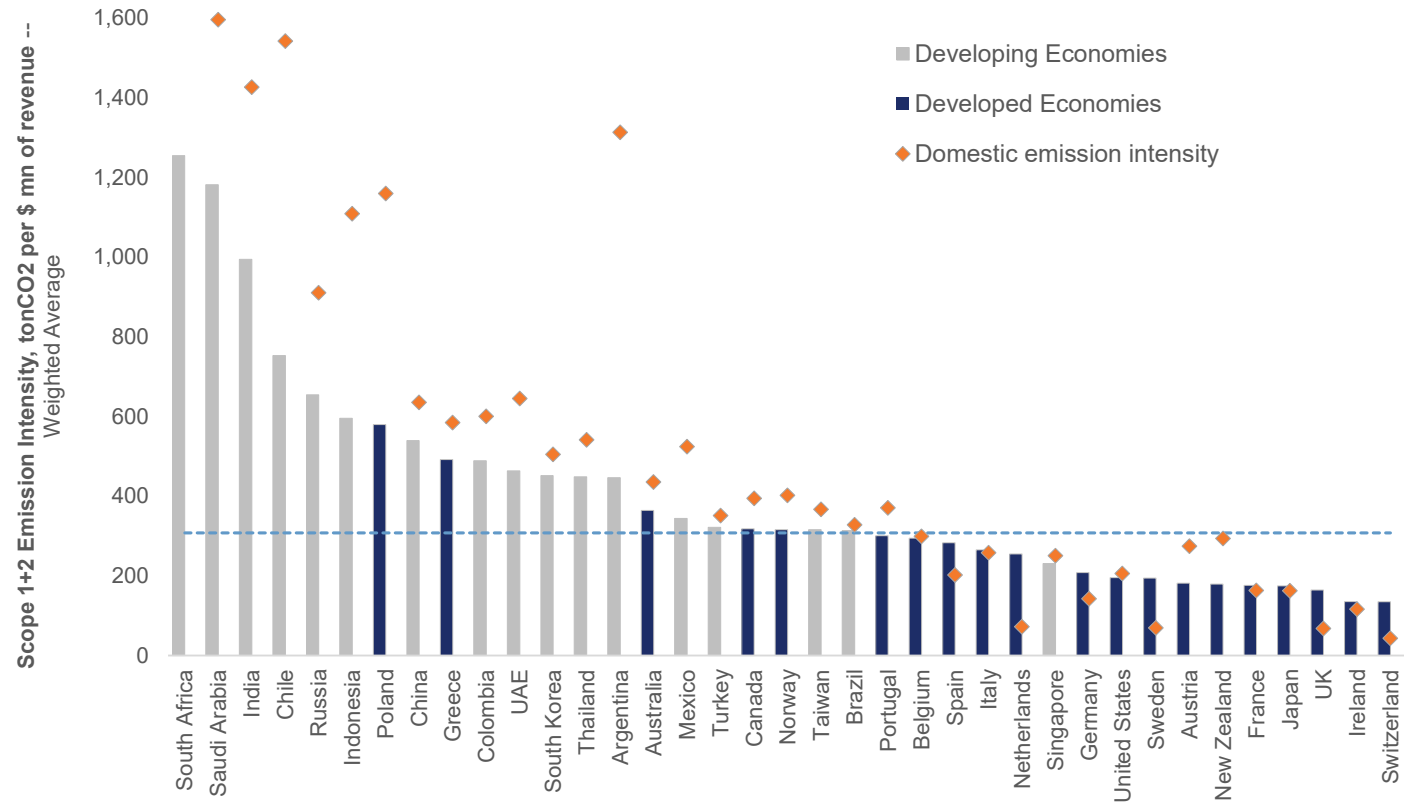
Source: IEA, Goldman Sachs Global Investment Research

Corporate emissions intensity on a revenue basis is greatest in emerging markets or those more dominated by energy-intensive industries. Exhibit 13 shows corporate level Scope 1+2 emissions per dollar of revenue by country. To derive this, we apply a company’s overall emissions intensity to a country based on what percent of revenue each company sells in a given country. So if a company sells 50% of its product into country A and 50% of its product into country B, both countries would be allocated half the company’s emissions and half the company’s revenue towards calculating country-level corporate emissions intensity. Looking at corporate emissions intensity in this way, countries like Saudi Arabia, India and Russia have the highest corporate emissions intensity. Corporate emissions intensity is lowest in Western European

countries (Switzerland, UK, Ireland, France among them), Japan and the US. We have also looked at the emissions intensities by country of domestically domiciled companies, which in most cases are above the corporate average for the country overall (with a few exceptions, largely where energy imports are meaningful in the overall economy). We note that not every company discloses emissions, and our dataset looks only at emissions at disclosed publicly traded companies (with select high-emitting private companies that disclose emissions also included).

Exhibit 13: Emissions intensities for publicly listed corporates based on our revenue-allocation method are higher in emerging markets

Publicly traded company Scope 1+2 emissions intensities, tons of CO2 per \$ of revenue allocated to country of sales, 2019. Sorted from highest (left) to lowest (right); domestic emissions intensity reflects in-country emissions intensity from companies headquartered in-country



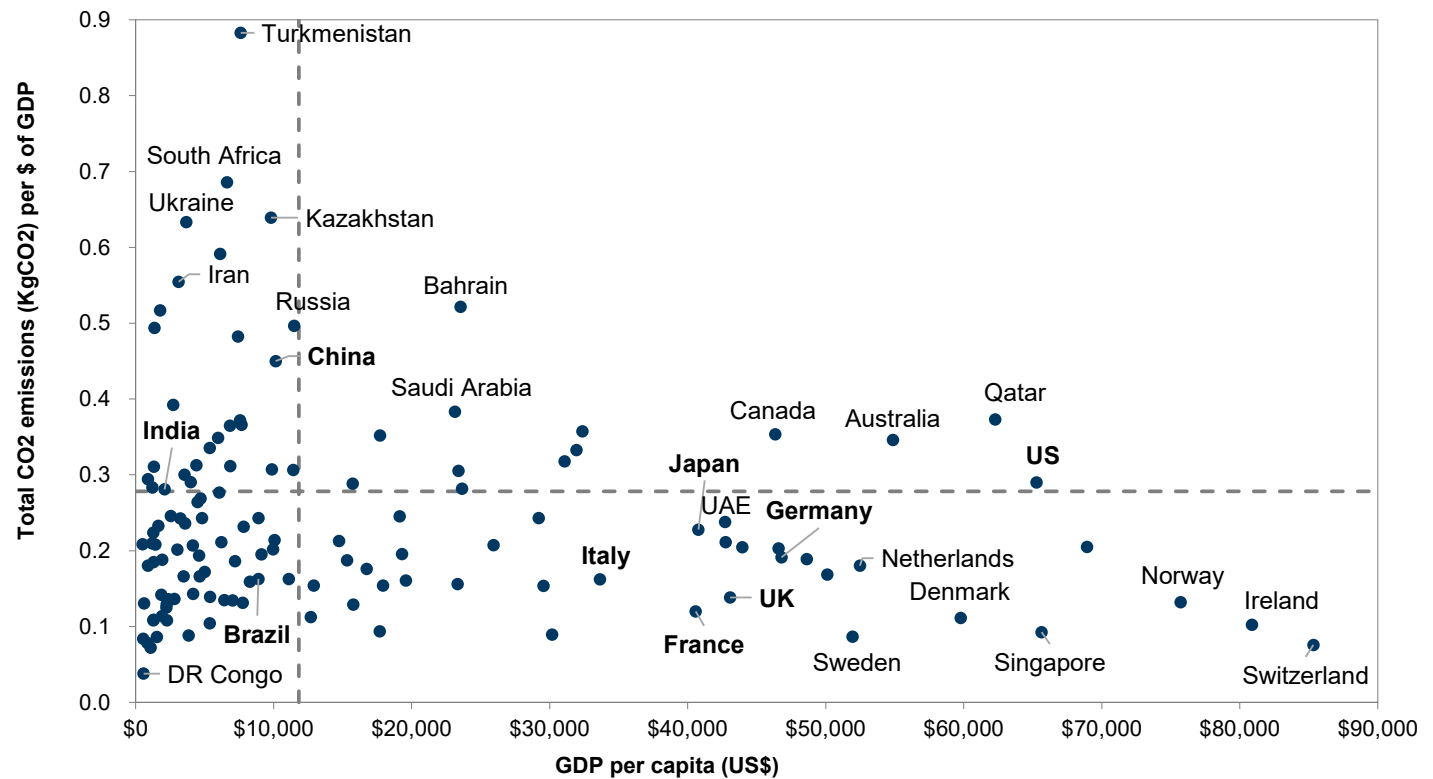
South Africa's domestic emissions intensity is implied at about 1,980 tonCO2 / \$ mn

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

Overall emissions intensity by country does not fully overlap with corporate emissions intensity by country. When looking at country-level emissions per dollar of GDP, the ranking/positioning of countries is not consistent with those with highest/lowest corporate emissions. As an example, the US and India both have similar levels of overall emissions per dollar of GDP (about the global average) even as India's corporate emissions intensity is among the highest and the US's corporate

emissions intensity is among the lowest. Japan’s overall emissions are slightly below the global average, while its corporate emissions are among the lowest. Only Switzerland and Ireland have among the lowest both corporate emissions and overall emissions intensities, while Russia, South Africa and Saudi Arabia are among the higher emissions intensities on a corporate and overall basis.

Exhibit 14: Overall country emission intensity of GDP is greatest in lower-income resource-producing countries
 CO2 emissions intensity per \$ of GDP and GDP per capita by country, 2019; top 10 countries based on GDP are bold



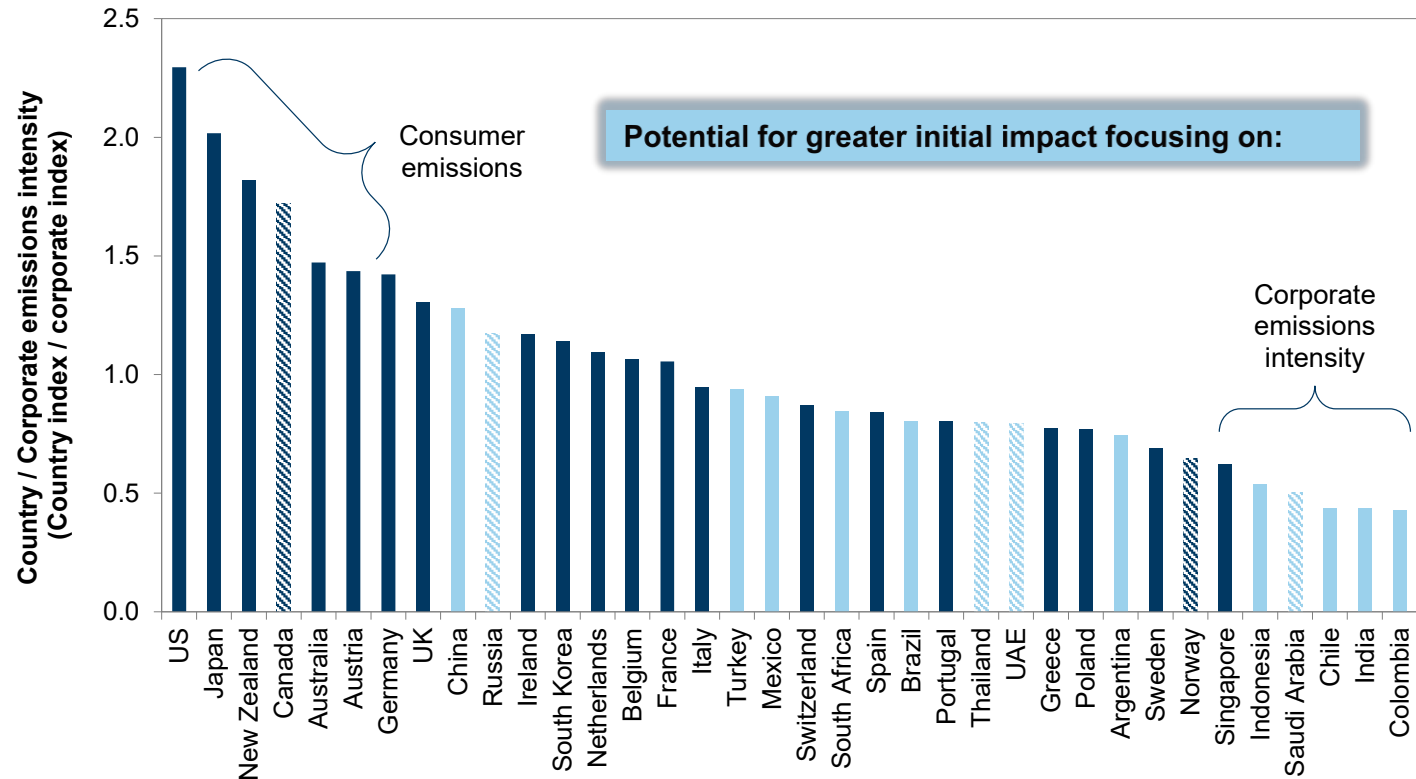
Source: World Bank, United Nations, Global Carbon Atlas, Goldman Sachs Global Investment Research

We believe this suggests the initial focus of investors and policy-makers towards decarbonization should be varied depending on the country to have the greatest impact. Our analysis suggests that there may be greater impact focusing in the United States and Japan on the consumer vs. the corporate, while there may be greater impact in India and Eastern

European countries focusing more on the corporate than the consumer. In [Exhibit 15](#) we have created an indicative index where policy/investor focus may initially be better directed towards the corporate vs. the consumer or equally to both.

Exhibit 15: Our indicative index that divides country emissions intensity per \$ of GDP by corporate emissions intensity per dollar of revenue suggests potential greater initial impact from focusing decarbonization efforts on consumers in the US and Japan and on corporates in India and other emerging markets

Country emissions intensity index / corporate emissions intensity index, 2019



Index values calculated by dividing a country's overall/corporate emissions intensity values by the median values of the comparison set. Dark blue bars represent developed countries, light blue bars represent developing countries, and stripped bars represent countries with more than 3500 degree days in 2019.

Source: Goldman Sachs Global Investment Research

Green Capex mosaic provides opportunities to reduce corporate emissions and consumer emissions

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 — in addition to meet Clean Water and Infrastructure goals. As we detailed in our Green Capex: Making Infrastructure Happen report, we see the need for \$2.8 trillion incremental annual investment on average this decade vs the 2016-20 average on path towards Net Zero, Infrastructure and Clean Water goals. As a result, Green Capex would need to step up to a total of \$6 tn annually in the 2020s. Green Capex for those 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 16](#)).

Net Zero goals will require annual investments to step up to \$3.0 trillion annually and will involve multiple technology verticals, in our view. We expect achieving Net Zero goals will require a step-up in investments to \$3.0 tn annually in the 2020s, up \$1.8 tn from the 2016-2020 annual average of \$1.2 tn. In our view, Green Capex needed on path to Decarbonization goals will embrace multiple technology verticals, from generation — e.g., Renewables, among others — to utilization — e.g., Electrification, among others. In addition, as detailed in [Exhibit 16](#), we also see mitigation — such as Carbon Capture Utilization & Storage — as well as energy storage technologies — e.g., Hydrogen and Battery Storage — as instrumental on path to Net Zero goals, to balance intermittency in energy supply from renewables assets.

We believe higher commodity prices could strengthen investor focus on energy reliability, particularly on Hydrogen and Energy Storage. As we recently described in our Supply-driven oil price spike: Sustainability implications report, we believe rising commodity prices could accelerate technology innovation and/or fuel transition — similarly to past spikes in oil price. While we do not view an inflationary commodities environment hampering Green Capex growth, we anticipate heightened focus on energy reliability and storage, potentially. Additional catalysts could be recent temporary power outages in major economies worldwide — namely, Texas, California, Europe and China — and the ongoing Russia/Ukraine conflict. The incorporation, in a limited way, of natural gas and nuclear into the EU Taxonomy at the beginning of 2022 is recognition of the need for Energy reliability to complement transition to clean energy. As such, we see Battery Storage and Hydrogen likely to receive greater focus given they are instrumental to address the intermittency of solar and wind. To this regard, we note recent policy initiatives (i.e., REPowerEU in Europe and Energy Security Strategy in UK) could potentially fast-track those technologies.

Technologies we are watching: disruptive innovations will be needed on path to Decarbonization goals. As stated above, the path to Net Zero will require breakthroughs across multiple green technologies, as decarbonizing harder-to-abate

emissions (e.g., emissions in industrial processes, long-haul transport) require solutions that are still relatively nascent and expensive to implement. Our Energy team's Carbonomics analysis, for example, suggests that the costs to decarbonize 50% of the world's emissions currently stand at nearly US\$80 or less per tonne, but decarbonizing beyond 75% of the world's emissions through advanced technologies (e.g., CCUS) could require between US\$150 to more than US\$1,000 per tonne based on current solutions. Cost deflation across various decarbonization technology verticals and innovating new solutions are why we believe companies exposed to our Green Capex themes — both public and private — will play an increasing role in a low carbon economy in the long-term. Below we highlight an ecosystem of seven critical technologies that could provide transformational and disruptive solutions to drive decarbonization in the long-term ([Exhibit 17](#)).

What can help lower consumer emissions: Energy efficiency and vehicle electrification. While there has been an understandable focus on the supply side of energy — shifting generation towards renewables and away from coal as an example — we believe there will be rising consideration for technologies and solutions that can mitigate demand as well or change the consumer emissions profile. As highlighted earlier, some countries — particularly developed economies like the US, Japan and Australia — have very high electricity per capita that does not uniquely appear attributable to extreme weather. We believe there is an opportunity for impact from technologies that can help mitigate emissions beyond corporate Scope 1 and 2. One area of focus is electrifying vehicles, which based on our ESG of the Future analysis should see an accelerated pace of adaptation. Another less discussed vertical that warrants focus and could see greater investor support is energy efficiency — appliances, HVAC, low/zero carbon buildings or improvements in internal combustion engine efficiency.

Exhibit 16: 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

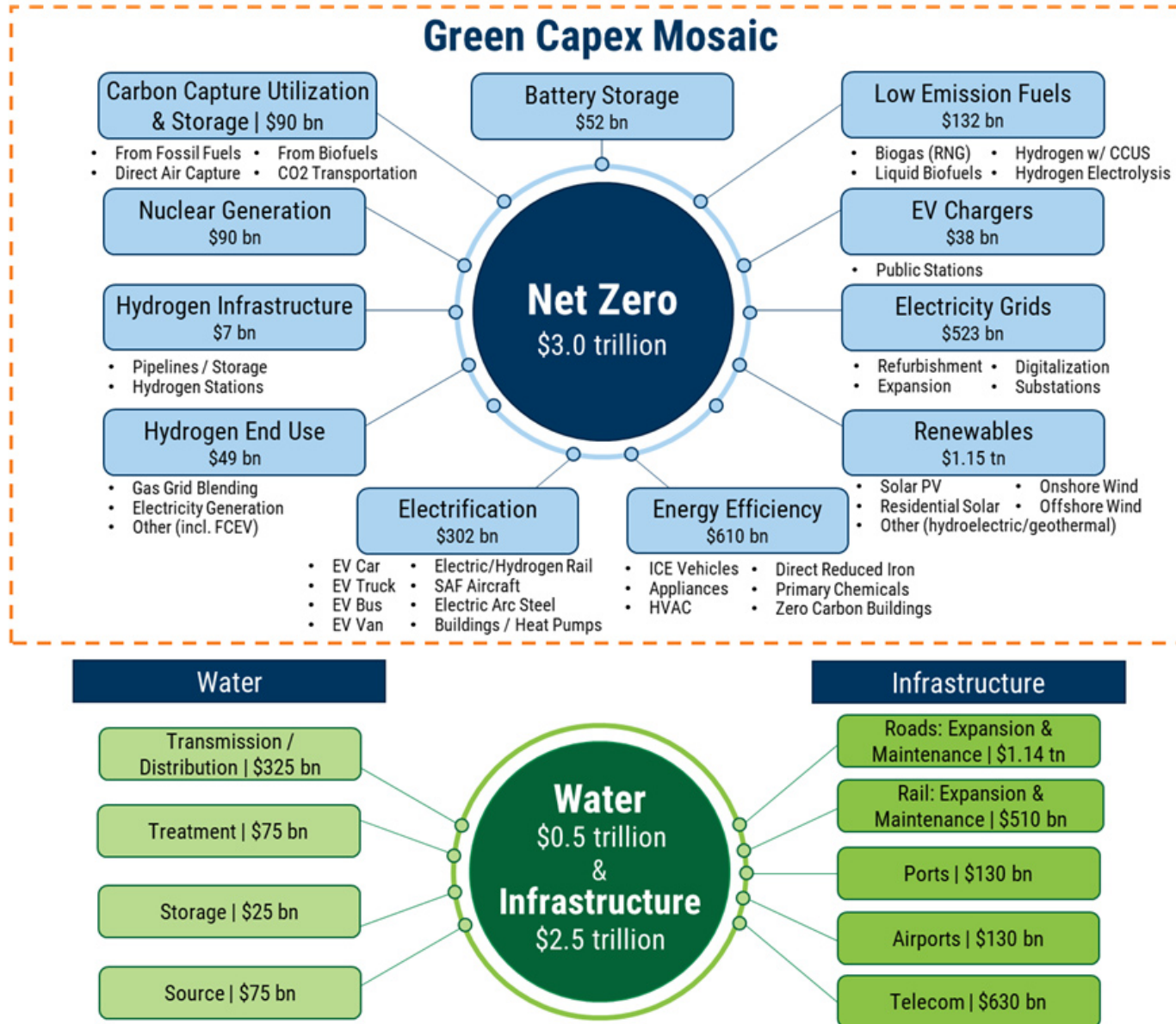


Exhibit 17: Innovations across multiple technologies could help lower the cost of decarbonization and introduce new climate solutions

Select focus areas for decarbonization technological innovation

Technologies	Innovation areas	Technologies	Innovation areas
Electrification	Next gen high cell efficiency technologies	Carbon Capture	New capture technologies
	Optimization of wafer size and thickness		Optimization of input costs
	Changes in module design		Localization of clean hydrogen ecosystems
Grid Transmission	Ultra-High Voltage (UHV) lines	Low Carbon Fuel	Fuel cell vehicles
	Equipment and software upgrades		Gas-fired distributed generation
Low Carbon Production & Energy Conservation	Electrification of construction equipment		Digitalization
	EAF and hydrogen steel production	Cost deflations in Silicon Carbide	
Battery Storage	Improvements in battery energy density		
	Graphene based super-fast charging		

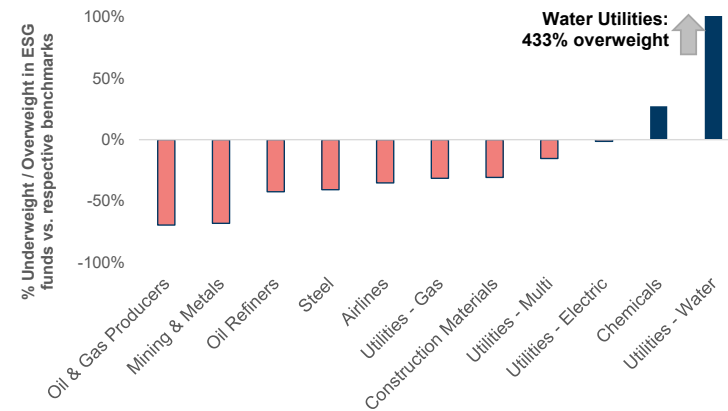
Source: Goldman Sachs Global Investment Research, Gao Hua Securities Research

Why emissions could begin to impact stock performance in select sectors

Because of their higher emissions profiles, companies in the seven sectors we are introducing emissions forecasts are highly underweight in ESG funds. On a weighted average basis by market cap, ESG funds are 35% underweight the 7 sectors that comprise 90% of corporate Scope 1 emissions vs. respective benchmarks ([Exhibit 18](#) — sectors as defined under SUSTAIN classification). Within these sectors, there are some overweight positions such as Chemicals (27% overweight) and Water Utilities (433% overweight). The most underweight of the seven sectors are Oil & Gas Producers, Mining & Metals and Oil Refiners — 70%, 68% and 42% underweight, respectively. In our view, companies in these sectors have potentially not been recognized in ESG funds partially due to their generally large emissions footprint, among other factors. We believe within these sectors as investors move From Aspiration to Action there may be greater rewards for companies that can successfully decarbonize their operations and demonstrate they are the low-cost/low-emissions supplier of their product if corporate returns/forward outlook remain favorable. Additionally, we believe EU Taxonomy-driven classification of Green Revenue and Green Capex mix could also help to drive a broader focus on ESG Improvers, with emissions/emissions intensity reduction one way in addition to revenue/capex mix of measuring impact.

Exhibit 18: All sectors in our analysis are underweight in ESG funds vs. respective benchmarks, except Chemicals and Water Utilities

Percentage underweight/overweight in ESG funds vs. respective benchmarks — data as of March 2022



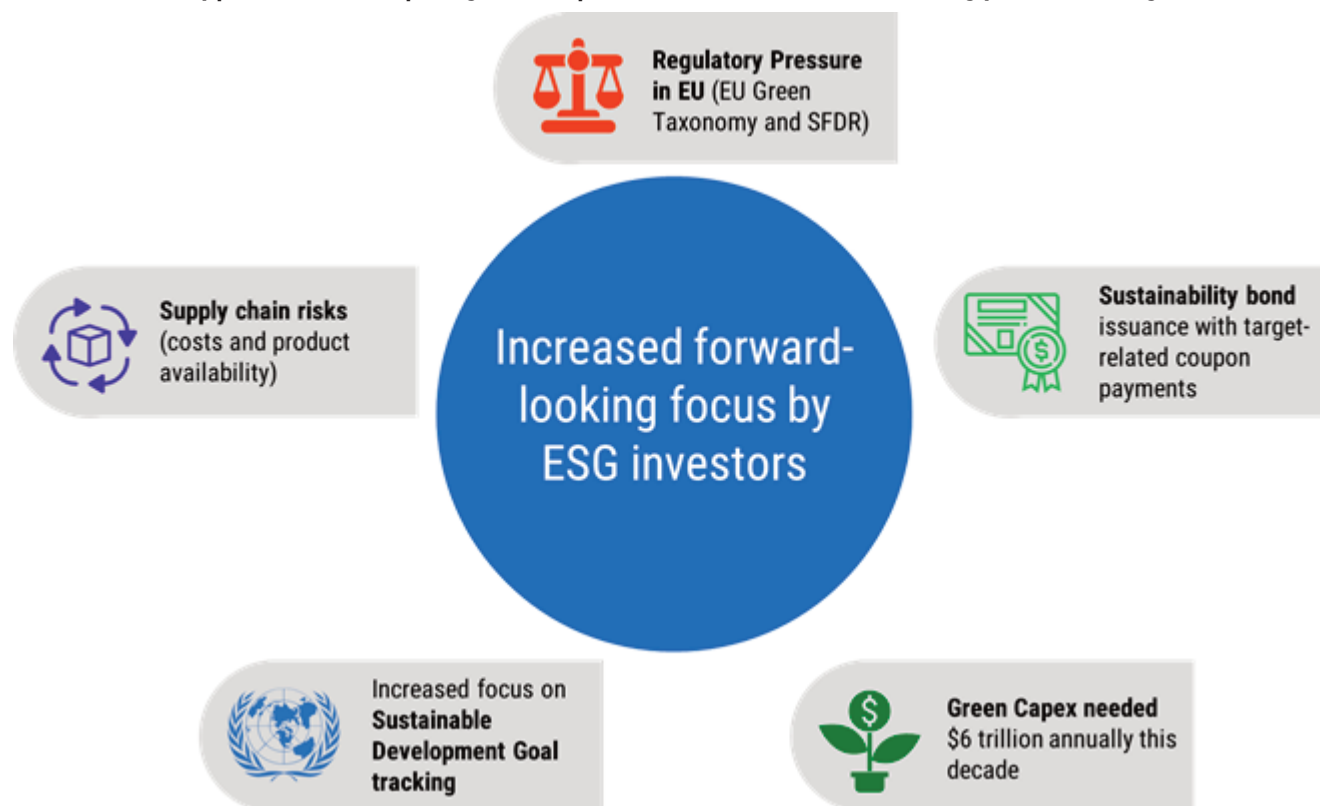
Sectors as defined based on GS SUSTAIN classification

Source: Morningstar, Thomson Reuters, Bloomberg, Goldman Sachs Global Investment Research

We continue to believe that equity investors focused on Sustainability and ESG issues will become more forward-looking in the coming years, a function of five factors:

- **Regulation** — particularly in Europe, under the influence of the EU Green Taxonomy framework and SDFR — but also in the US with proposed mandatory emissions disclosure.
- **New sustainability bond issuance** — with performance linked to sustainability targets.
- **Increase in capital required to be on track for Net Zero, Clean Water and Infrastructure goals** — see section “Theme 2: Green Capex beneficiaries — Innovation, Inflation, Policy key catalysts” for more details.
- **Increased focus on whether we are on track for other UN Sustainable Development Goals** — due to pressure from stakeholders to contextualize environmental and social impact of business activities and portfolios.
- **Supply chain risks** — due to potentially long lead-times for critical projects, timely investments are necessary.

Exhibit 19: Driven by pressure from multiple angles, we expect ESG investors to become increasingly forward-looking



Source: Goldman Sachs Global Investment Research

A shift towards looking at ESG Improvers is likely to lead to some increased interest in companies that are aggressively decarbonizing... Recent meetings with investors suggested largely broad support for our thesis encompassing key themes from our From Aspiration to Action 2022 outlook report of Green Capex, Greenablers, ESG Improvers, EU Taxonomy Beneficiaries and Inclusive Growth. While we remain positive on Clean Energy stocks and related Green Capex, we have highlighted that we see opportunities to own stocks more broadly across the supply chain vs. today's highly concentrated overweight positions in solar/wind/water stocks. Investor feedback — including from ESG investors in Europe — was largely supportive of this thesis, partly a function of concerns regarding returns/commoditization in solar/wind and partly because of perceived more attractive valuations and returns in other sectors. Investors in our discussions recognized the critical role that Greenablers such as Copper/Aluminum, Electricity transmission, Cybersecurity and Semiconductors play, the need for high-emitting sectors to decarbonize and the need for technologies like Carbon Capture and biofuels to be deployed.

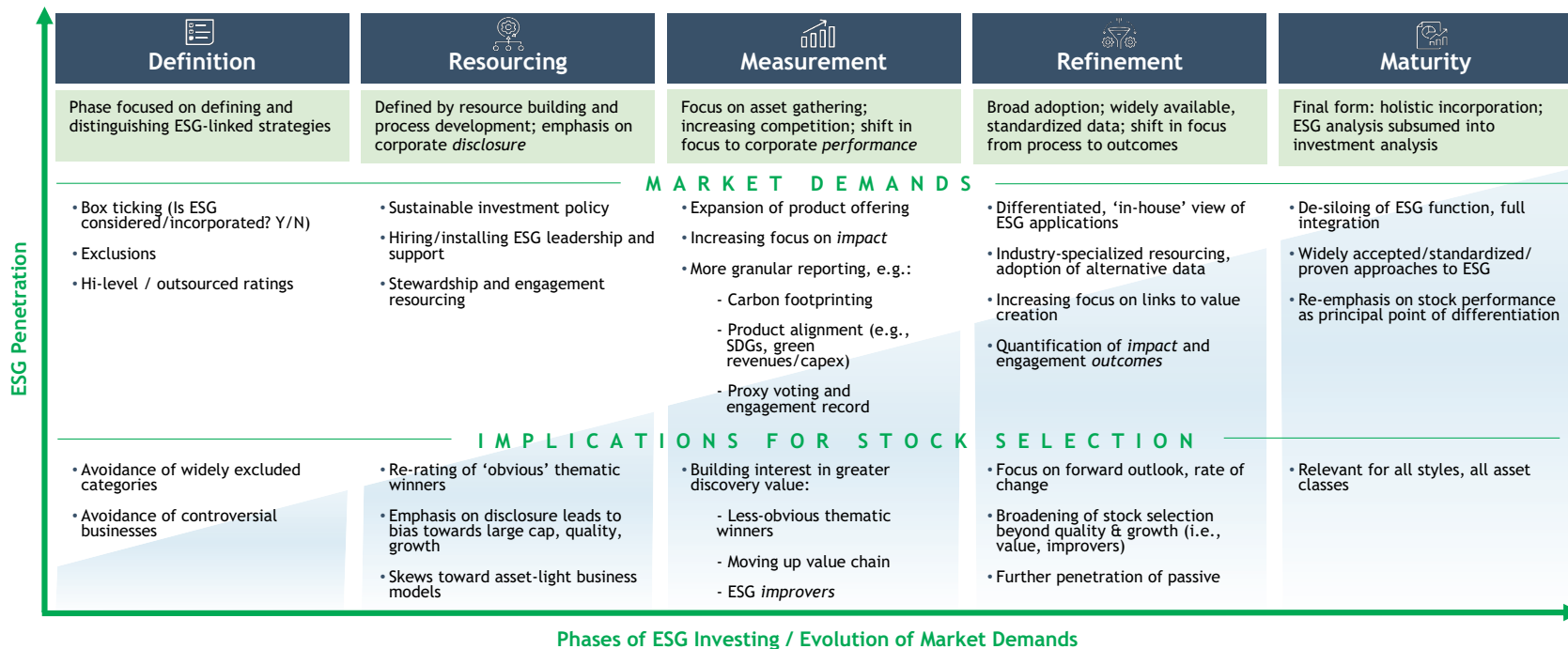
... but the timing of such a shift is less clear due in part to “Fear of Misaligned Exposure.” However, both fund managers and ESG specialists in recent meetings expressed significant fears of having to defend to their investors stocks perceived to be misaligned with ESG goals. In particular, investors highlighted high-emitting sectors such as oil/gas and metals/mining though also other Greenablers like Semiconductors. This “Fear of Misaligned Exposure (FOME)” is particularly intense among fund managers running or considering running Sustainable Finance Disclosure Regulation Article 9 funds which require greater disclosure on sustainable investments. Taxonomy eligibility covers a number of high-emitting sectors, and as the EU Taxonomy and SFDR are further rolled out, we see Taxonomy alignment becoming a driving factor behind ESG strategy, especially as Taxonomy disclosures are required for ESG funds under SFDR. While the investable universe under Taxonomy-alignment is not limited to solar/wind/water, the strict guidelines of the technical screening criteria may limit ownership in stocks initially perceived to be misaligned with ESG goals, emphasizing the Divestment Dilemma highlighted in our recent work.

Over time, we will likely see a pickup in ESG Improvers or Decarbonization funds, with goals/ownership expectations set up front in an attempt to mitigate FOME. This could be driven more significantly in the US before Europe, though the multiple energy reliability disruptions seen over the past year is driving a shift From Aspiration to Action among ESG investors and regulators. We have seen equity markets reward companies with attractive corporate returns vs. peers that have reinvested a high, rising or high+rising percentage of operating cash flow back into capex and R&D with revenue exposure to Green Capex-related Sustainable Development Goals. We believe over time we can see improved valuations for companies with strong fundamentals that are decarbonizing at a quicker pace vs. peers.

Over time, the market is likely to reward companies for impact vs. automatically rewarding divestment. We believe lower corporate emissions intensity via divestment (or via acquisition) does not automatically advance broader decarbonization Sustainable Development Goals. The impact from M&A-driven changes in intensity are a function of whether the buyer of assets accelerates or decelerates the pace of decarbonization and whether the buyer runs the asset with greater environmental efficiency than the prior owner. It is for this reason that we believe investors are more likely to reward organic decarbonization — for electricity generators as an example, coal retirements and renewables growth vs. coal plant divestitures and renewables acquisitions.

Exhibit 20: While approaches and stages vary, we view the preponderance of the market as entering 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

Emissions intensity projected paths through 2025 by sector vs. Carbonomics Net Zero carbon models

We believe investors will focus on both the absolute direction of emissions in a sector but also the emissions intensity. We believe companies with the greatest emissions intensity reductions may receive greater favor, particularly if their intensity reductions are consistent with a pathway to 1.5 degree or lower implied temperature rise. In 2021, our EMEA energy research team in its Carbonomics reports introduced three global sectoral paths to Net Zero carbon with global models of decarbonization by sector and technology leveraging its Carbonomics cost curve.

- **The GS 1.5° scenario is consistent with a 1.5°C global temperature rise.** This scenario implies reaching global net zero carbon by 2050, thus with limited temperature overshoot. For this scenario, our Carbonomics team assumed a carbon budget for remaining net cumulative CO₂ emissions from all sources from 2020 to be c.500 GtCO₂, in line with the *IPCC AR6 WGI Summary for Policymakers*¹, and consistent with a 50% probability of limiting warming to 1.5°C by 2100.
- **The GS <2.0° — or the “Paris Agreement” — scenario is consistent with a rise well below 2.0°C.** This scenario would be consistent with the aim outlined in Paris Agreement to keep global warming well below 2°C and achieve global net zero around 2060. For the purpose of this analysis, our Carbonomics team defined the cumulative remaining carbon budget for our GS <2.0° model to be 750 GtCO₂, consistent with around 1.65°C global warming with 50% probability.
- **The GS 2.0° scenario is consistent with a 2.0°C temperature rises.** This aims for global carbon neutrality by 2070 — and leads to a 50% probability of 2.0°C global warming to 2100. It has a cumulative carbon budget from 2020 of 1,350 GtCO₂, in line with the carbon budgets outlined in the *IPCC AR6 WGI Summary for Policymakers*¹.

Below, we detail percentage changes in emissions intensities by sector through 2025 based on our analysts' Scope 1+2 forecasts, plotted against the percentage reductions by sector implied by our energy team's Carbonomics research for the three scenarios above.

¹ IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [MassonDelmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press

Electric Utilities

We take into account forecasts for 71 Electric Utilities in our analysis, the majority of which are based in Americas.

Our survey comprises 71 Electric Utilities — 41 in Americas, 17 in Europe and 13 in Asia Pacific. In addition to those, we consider other eight publicly listed Electric Utilities based in China and India not covered by Goldman Sachs to provide a more accurate representation of GHG emissions intensities in 2019 and 2020. Consistent with our colleagues' Carbonomics work, we derive emissions intensity for Electric Utilities dividing amount of Scope 1 CO₂-eq emitted (in grams) by the electricity generated (in kWh).

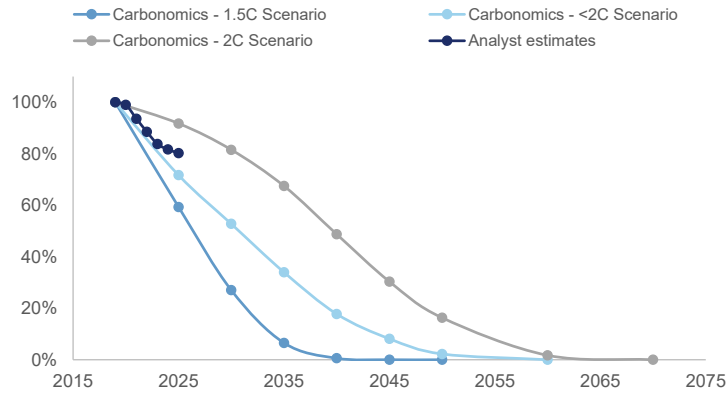
Our estimates indicate a c.20% reduction in Scope 1 emissions intensity by 2025E vs. 2019 base. This is on a weighted average basis — using electricity generated as weights — for Electric Utilities covered in our analysis. Please see [Exhibit 21](#) for more details. We note a flat profile in emissions intensity in 2020 vs. 2019, followed by a c.6% YoY reduction in 2021 — primarily attributable to US Electric Utilities' declining intensities.

Why we believe this will matter for investors. Electricity generation is a key area of focus for decarbonization efforts. We note a bullish outlook for zero-carbon generation assets (renewables), as described by our colleagues, as well as increased focus on nuclear — which can provide zero-carbon generation — as indicated by the recent proposals to include nuclear in the EU Taxonomy framework. Heightened by current geopolitical events and the inflationary environment for commodity prices, our Utilities teams expect an acceleration in renewables development to address concerns related to security of energy supply. This is of particular importance in Europe — the area most impacted by disruptions related to the Russia/Ukraine conflict — where policy initiatives such as REPowerEU outline pathways towards increased energy independence/flexibility in energy supply, electrification and acceleration in renewables developments.

Investment Implications. We note that Utilities are modestly underweight in ESG funds (1% vs. respective benchmarks). We highlighted in our Investing in Green Capex and initial ESG of the Future reports that the range of ownership in ESG funds for Utilities is significantly wide, and we note ESG Improvers in the sector are generally more underweight than companies which already have high mix of Green Revenue/Capex. **We continue to believe investors will reward Utilities that can successfully transition and decarbonize their generation fleet, and we continue to see further opportunities for greater appreciation among ESG investors.**

Exhibit 21: Our analysts estimates indicate Scope 1 emissions intensities declining by 20% in 2025E vs. 2019, mainly driven by US Electric Utilities

Emissions intensities profile for Electric Utilities, calculated as Scope 1 GHG emissions divided by electricity generated. Indexed to 2019 base.

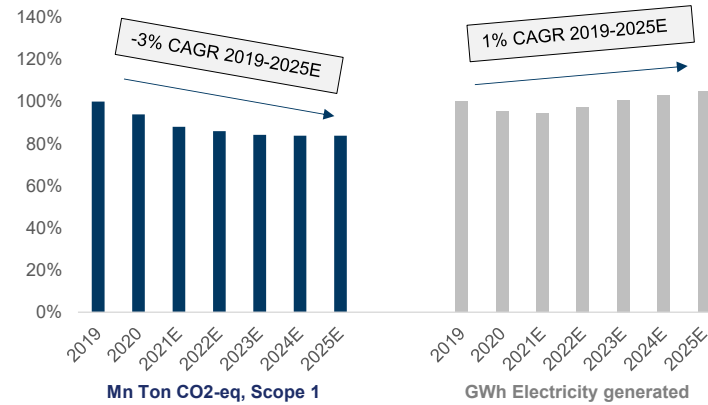


As not all analysts model through 2025, 2024E and 2025E reflect the weighted average yoy change for companies where the covering analysts have submitted data. The same applies for 2019 and 2020 weighted average estimates. The Electric Utilities sector is as defined based on GS SUSTAIN sector classification.

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

Exhibit 22: The decline in emissions intensities for Electric Utilities in our analysis stems from Scope 1 emissions forecast to decline at a 3% CAGR through 2025E (vs. 2019 base), while electricity output if estimated to increase at a 1% annual pace through 2025E (vs. 2019 base)

Change in Scope 1 emissions (left) and electricity generated (right) for Electric Utilities in our work — vs. 2019 base



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

Steel

Our analysis comprises 36 Steel producers, globally. We include 12 Steel companies in Americas, 8 in Europe and 16 in Asia Pacific. We received GHG emissions estimates from our analysts for 11 of the 36 companies. We derive emissions intensity for the Steel sector dividing amount of Scope 1+2 CO₂-eq emitted (in tons) by steel production (in tons), consistent with our colleagues' Carbonomics work.

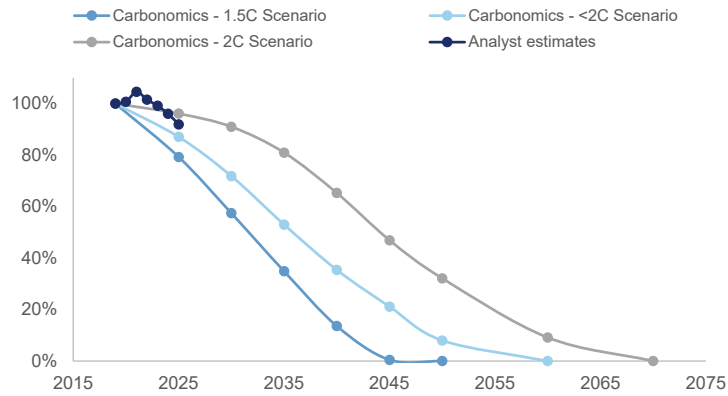
Scope 1+2 emissions intensities in the Steel sector are estimated to decline by 8% in 2025E vs. 2019 levels. Our analysis suggests Scope 1+2 GHG emissions are estimated on the rise YoY in 2020 and 2021E (+1%-4%) — potentially due to COVID-related disruptions in operational efficiencies — but from 2021E throughout 2025E are projected on the decline (2%-4% YoY). Please see [Exhibit 23](#) for more details. We note the main driver behind the decline in overall Scope 1+2 emissions intensities is steel production growing at a 1% CAGR between 2019-2025E, while absolute Scope 1+2 emissions are estimated to decrease at a slightly slower pace vs. 2019 levels (see [Exhibit 24](#)).

Why we believe this will matter for investors. We expect steel to be a key material on path to Net Zero, Clean Water and Infrastructure goals, transversal across the vast majority of verticals in the Green Capex mosaic. Decarbonizing the Steel sector likely involves higher penetration of Electric Arc Furnace (EAF) technologies, as the industry faces increasing scrutiny over its environmental footprint, and EAFs are among the least carbon-intensive technologies to produce steel. As described in our ESG of the Future report, our analysts' estimates point towards a percentage of steel from EAF to grow to 32% of the total in 2025E (vs. 28% in 2020) among covered companies — though, we note the change is driven by a handful of companies for which estimates indicate rising EAF mix, while for the majority steel production from EAF either stays very low or very high. We note that Electrification-related investments — among which EAF capex — would need to amount to more than \$300 bn annually in the 2020s, on path to Net Zero targets.

Investment Implications. The Steel sector is currently 41% underweight in ESG funds vs. respective benchmarks (based on SUSTAIN classification, as reported in [Exhibit 18](#)). Given the criticality of steel on path to Net Zero, Clean Water and Infrastructure goals, we believe there is room for further appreciation of companies that can successfully transition to a higher share of EAF and decarbonize their operations among Steel manufacturers, as we detailed in our ESG of the Future report.

Exhibit 23: Steel companies in our analysis are forecast to have Scope 1+2 emissions intensities declining by 8% in 2025E vs. 2019 base...

Emissions intensities profile for Steel companies, calculated as Scope 1+2 GHG emissions divided by steel production. Indexed to 2019 base

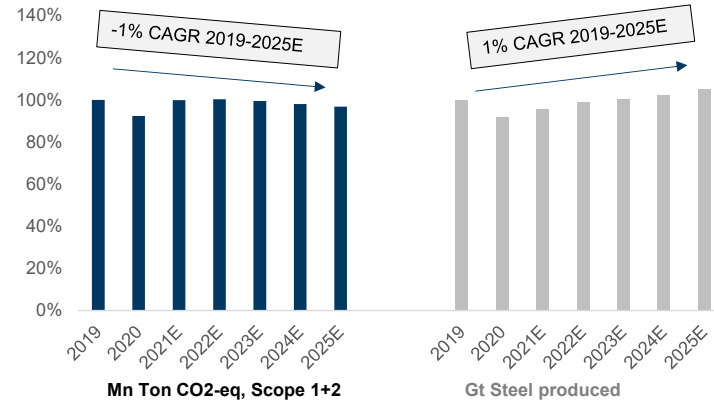


As not all analysts model through 2025, 2024E and 2025E reflect the weighted average yoy change for companies where the covering analysts have submitted data. The same applies for 2019 and 2020 weighted average estimates. The Steel sector is as defined based on GS SUSTAIN sector classification.

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

Exhibit 24: ...driven by a 1% CAGR in steel output, with Scope 1+2 emissions projected to be falling slightly by 2025E

Change in Scope 1+2 emissions (left) and steel throughput (right) for Steel companies in our work — vs. 2019 base



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

Aluminum

Among Metals & Mining companies, we break out the Aluminum sector using estimates for 9 companies, globally.

Those comprise 4 companies in Americas, 2 in Europe and 3 in Asia Pacific. We received GHG emissions estimates from our analysts for 5 of the 9 companies. We calculate GHG emissions intensities for the Aluminum sectors dividing Scope 1+2 CO₂-eq emissions (in tons) by the amount of aluminum produced in a given year (in tons). This is in-line with our colleagues' Carbonomics work.

We estimate Scope 1+2 emissions intensities in the Aluminum sector will decline by about 14% by 2025E vs. 2019.

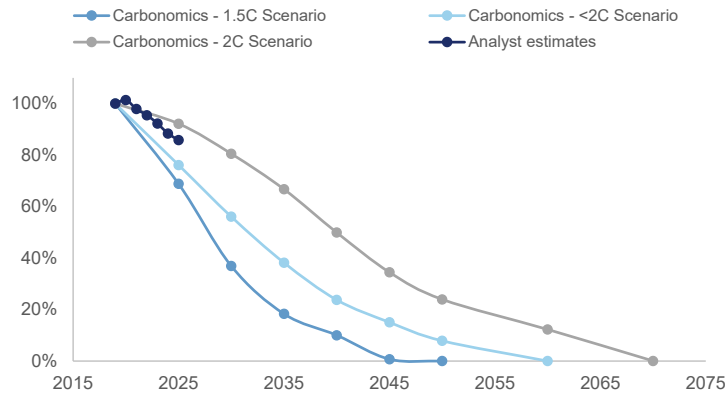
Our analysis indicates Scope 1+2 GHG intensities declining consistently within 2021-2025E (2%-4% YoY), and by 14% in 2025E vs. 2019 levels. Please see [Exhibit 25](#) for more details. We note this is due to a combination of absolute emissions reduction in the sector (declining at a 1% CAGR between 2019 and 2025E) and an increase in production throughput (rising at 1% CAGR through 2025E) — see [Exhibit 26](#). The reduction in Scope 1+2 emissions intensities is primarily driven by European and Chinese Aluminum manufacturers (whose Scope 1+2 intensities are estimated to decline by 13%-21% by 2025E vs. 2019).

Why we believe this will matter for investors. We highlighted Aluminum as a key Greenabler — i.e., a sector for which investments are needed more urgently and timely due to long lead-times in capacity expansions — in our Green Capex report. In our view, aluminum will be needed/critical across the majority of verticals in the Green Capex mosaic. We note that our Commodities analysts are bullish on the outlook for Aluminum, on the back of rising demand for “Green” end-uses, among other drivers — now estimated to rise from below 3,000 kton in 2021 to almost 7,000 kton in 2025E.

Investment Implications. While metals and mining stocks broadly are underweight in ESG funds vs. respective benchmarks (as seen in [Exhibit 18](#)), the Aluminum sector specifically (based on GICS 4 classification) is 55% overweight. We see potential for further room for appreciation of its critical role on path to Net Zero, Clean Water and Infrastructure goals among ESG investors — particularly for companies that can successfully decarbonize their operations in coming years.

Exhibit 25: Analysts estimates indicate emissions intensities decreasing by 14% in 2025E vs. 2019...

Emissions intensities profile for Aluminum companies (based on GICS 4 classification), calculated as Scope 1+2 GHG emissions divided by aluminum production. Indexed to 2019 base.

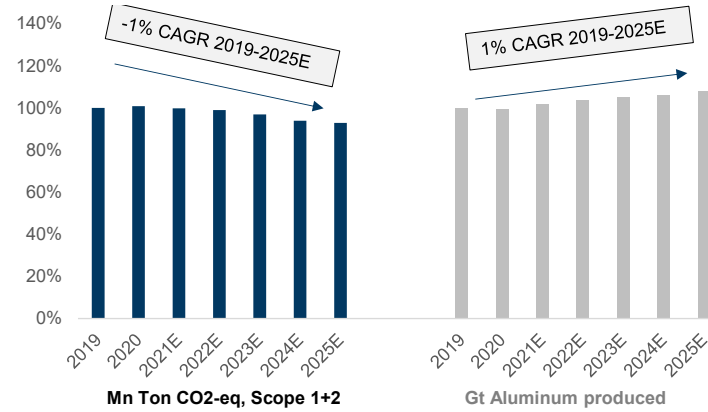


As not all analysts model through 2025, 2024E and 2025E reflect the weighted average yoy change for companies where the covering analysts have submitted data. The same applies for 2019 and 2020 weighted average estimates. The Aluminum sector is as defined based on GICS 4 classification (sub-segment of Metal & Mining GICS 3).

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

Exhibit 26: ...as a result of emissions decreasing at a 1% CAGR through 2025E, with production acceleration at a 1% annual pace in the same period

Change in Scope 1+2 emissions (left) and Aluminum throughput (right) for Aluminum companies in our work — vs. 2019 base



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

Airlines

Our analysis comprises 28 Airlines, globally, though highly skewed towards Americas. Our work encompasses 16 companies in Americas, 7 in Europe and 5 in Asia Pacific. We received GHG emissions estimates from our analysts for 15 of the 28 companies. We calculate GHG emissions intensities for the Airlines sectors dividing Scope 1+2 CO₂-eq emissions (in tons) by revenue-passenger-kilometers (RPKs, in millions). This is in-line with our colleagues' Carbonomics work.

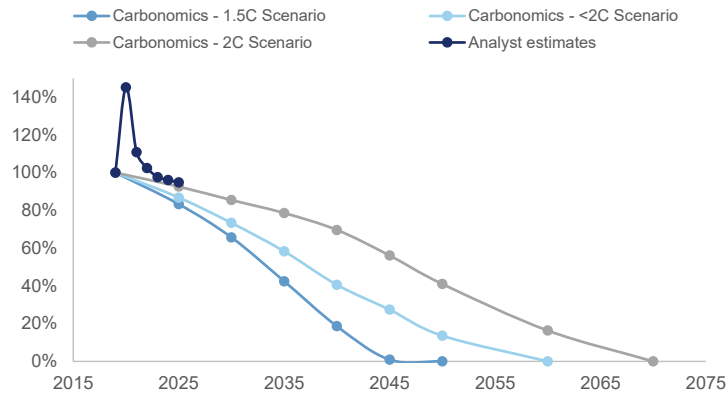
We see Scope 1+2 emissions intensities for the Airlines sector declining 5% by 2025E vs. 2019. Our estimates indicate only a slight reduction in emission intensities by the end of our forecast period (2025E) vs. base-year (2019) — see [Exhibit 27](#) for more details. We note a 45% YoY increase in Scope 1+2 intensities in 2020 due to COVID-related disruptions and subsequent lower capacity factors for Airlines (our estimates indicate a 51% decline YoY in absolute Scope 1+2 emissions, while RPKs declined by 66%). Following a re-adjustment in 2021E (intensities down 24% YoY), our analysis indicates a slower pace in Scope 1+2 intensities decrease. At the end of the forecast period, we note absolute Scope 1+2 emissions and RPKs higher than pre-COVID levels ([Exhibit 28](#)).

Why we believe this will matter for investors. We believe decarbonization efforts in the Airlines industry will be a key area of focus in coming years. As we heard during our Global Sustainability Forum, one of the main pathways to abate emissions in the sector is a mix shift towards higher utilization of Sustainable Aviation Fuel (SAF). As the panelists noted, wider adoption of SAF is still constrained by limited supply and high costs. The ability to limit higher costs pass through to customers as SAF adoption grows will be crucial to preserve cost-competitiveness and affordability, in our view. We also note opportunities in decarbonization of ground fleets, though with an impact secondary to SAF, in our view.

Investment Implications. We see opportunities for greater recognition of Airlines companies that can successfully transition towards a higher mix of SAF vs. conventional fuels limiting pass through of higher input costs — or for those that can find credible sources of decarbonization alternatives (some airlines or related suppliers are partnering towards Direct Air Capture plants as an example). We note the Airlines sector is currently 35% underweight in ESG funds vs. respective benchmarks (sectors as defined under SUSTAIN classification, see [Exhibit 18](#)), highlighting room for further appreciation — particularly of transition stories — among ESG investors.

Exhibit 27: Following a 45% yoy increase in 2020, emissions intensities for the Airlines sector are forecast to decline 1%-8% yoy post-2021E, resulting in a 5% decrease by 2025E vs. 2019 base

Emissions intensities profile for Airlines, calculated as Scope 1+2 GHG emissions divided by Revenue-Passenger-Kilometers. Indexed to 2019 base.

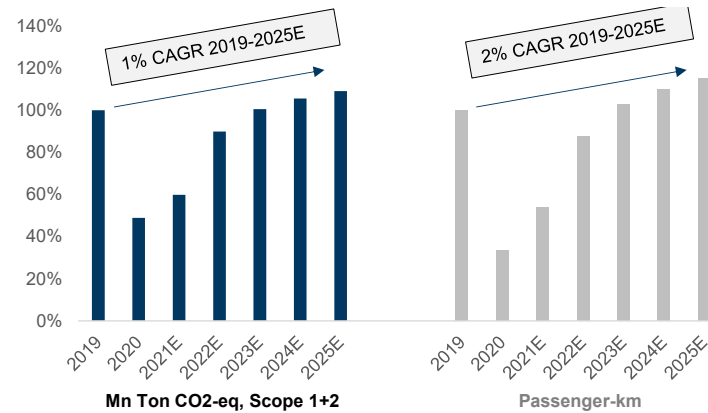


As not all analysts model through 2025, 2024E and 2025E reflect the weighted average yoy change for companies where the covering analysts have submitted data. The same applies for 2019 and 2020 weighted average estimates. The Airlines sector is as defined based on GS SUSTAIN sector classification.

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

Exhibit 28: The emissions intensities profile stems from a combination of Scope 1+2 emissions accelerating at a 1% CAGR in the forecast period and Revenue-Passenger-Kilometer increasing at a 2% annual pace

Change in Scope 1+2 emissions (left) and Revenue-Passenger-Kilometers (right) for Airlines companies in our work — vs. 2019 base



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

Oil & Gas

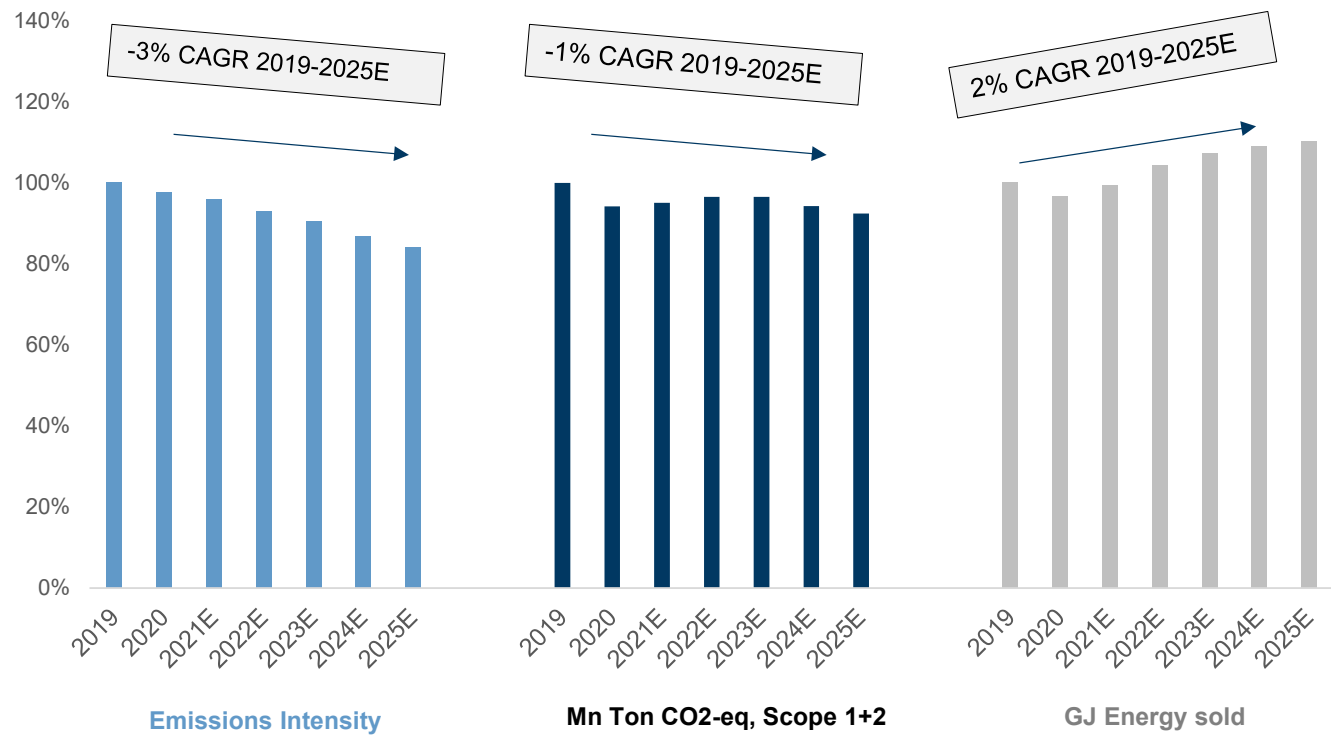
We consider 98 Oil & Gas companies in our analysis, almost half of which are based in Americas. Within the Oil & Gas sector, our analyst survey comprises 45 companies in Americas, 25 in Europe and 28 in Asia Pacific. We received estimates for 64%, 88% and 50% of those in Americas, Europe and Asia Pacific, respectively. We calculate GHG emissions for the Oil & Gas sector dividing Scope 1+2 CO₂-eq emissions by energy sold (as a result of upstream operations and/or refining). As mentioned earlier, while our estimates are for Scope 1 and 2 emissions, our colleagues' Carbonomics emissions intensity path for Oil & Gas also includes Scope 3 emissions.

Our analysis indicates Scope 1+2 emission intensities for the Oil & Gas sector declining by 10%-16% by 2025E vs. 2019. Our analyst estimates point towards a 16% reduction in Scope 1+2 emissions intensities for Oil & Gas Producers and a 10% reduction for Oil Refiners by 2025E vs. 2019. On Oil & Gas Producers, our analyst estimates imply a 2% YoY reduction of intensity in 2020, followed by subsequent 2%-4% YoY decline from 2021E on. On Oil Refiners, emissions intensities increased ~18% YoY in 2020 and are expected to pivot to a downward trajectory in subsequent years (3%-8% YoY decline from 2021E on). Please see [Exhibit 29](#) for more details on Oil & Gas Producers, [Exhibit 30](#) for more details on Oil Refiners.

Why we believe this will matter for investors. As we detailed in our Green Capex report, the Oil & Gas sector holds the greatest share of Green Capex "spare capacity" — via higher reinvestment rate of Capex and R&D and higher leverage on the balance sheet — on path to Net Zero, Clean Water and Infrastructure goals. Additionally, on the back of ongoing geopolitical events, we believe the shift in free cash flow towards commodity producers may increase the willingness of some investors to own stocks in these sectors for the purpose of helping to influence where the FCF gets redirected — either via reinvesting or returning to shareholders. While we do not believe every mandate is set up to make this shift — and ESG funds will likely need to make a quantified case for impact to their investors — we see the case for engagement vs. exclusion growing over time. In our view, engagement will be crucial to the deployment of the spare capacity for additional Green Capex, and we believe investors will tend to gravitate towards companies able to successfully abate emissions, in addition to favorable returns.

Investment Implications. While Oil & Gas companies have historically been avoided/excluded in ESG funds — the sector is currently underweight in ESG funds (70% and 42% underweight for Producers and Refiners, respectively, as shown in [Exhibit 18](#)) — we see opportunities for greater recognition of transition stories and companies able to successfully decarbonize their operations. In addition, we note the Russia/Ukraine conflict is helping to bring some added balance to the exclusion vs. engagement debate, which in our view is a key catalyst for potential further appreciation of Oil & Gas companies among ESG investors. To that regard, we have already seen some isolated evidences of potential change in attitudes — e.g., Sweden's SEB bank recently reversed a defense industry exclusion policy for six of its funds, while in the US, CalSTRS' board voted to oppose a bill that would require divestment from fossil fuels.

Exhibit 29: Emissions intensities for Oil & Gas Producers — referred to Scope 1+2 — are forecast to decline at a 3% CAGR through the forecast period
 Oil & Gas Producers: profiles 2019-2025E for emissions intensities (calculated dividing Scope 1+2 emissions by energy sold), Scope 1+2 emissions and Energy sold from production and refining. Indexed to 2019 base.

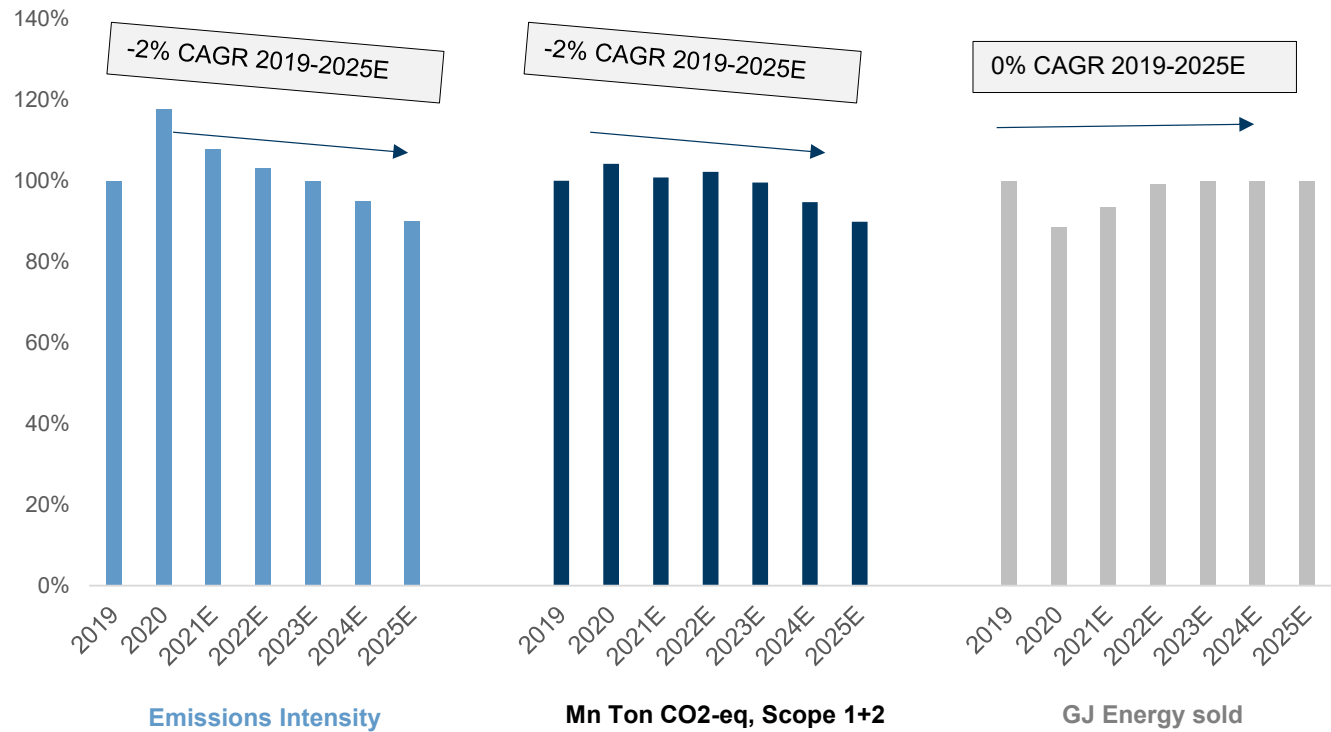


As not all analysts model through 2025, 2024E and 2025E reflect the weighted average yoy change for companies where the covering analysts have submitted data. The same applies for 2019 and 2020 weighted average estimates. The Oil & Gas Producers sector is as defined based on GS SUSTAIN sector classification.

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

Exhibit 30: Scope 1+2 emissions intensities for Oil Refiners are forecast to decline at a 2% annual rate through 2025 vs. a 2019 base

Oil Refiners 2019-2025E emissions intensities (calculated dividing Scope 1+2 emissions by energy sold), Scope 1+2 emissions and Energy sold from production and refining. Indexed to 2019 base.



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. The same applies for 2019 and 2020 weighted average estimates. The Oil Refiners sector is as defined based on GS SUSTAIN sector classification.

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

Diversified Metals & Mining

From a universe of 46 companies globally, our analysis relies on GHG emissions estimates for 18 companies in the Diversified Metals & Mining sector. We asked for GHG estimates from our analysts for 6 companies based in Americas, 14 based in EMEA and the remaining 26 based in Asia Pacific. We received emissions estimates for 18 companies in the sector, globally — or about 40% of the total. We calculate emissions intensities relying on Scope 1+2 emissions, divided by total production of the company, measured in copper equivalent (CuEq). We derive a CuEq production from the production mix — as forecast by our analysts — and prices for those metals/commodities. On the latter, we consider fixed prices referred to 2019, allowing CuEq productions to vary only based on changes in products mix.

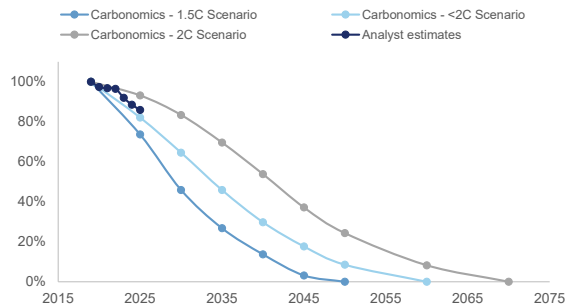
Our analysts' estimates point towards a 14% reduction in emissions intensities by 2025E vs. 2019. Scope 1+2 emissions intensities for Diversified Metals & Mining companies — calculated as defined above — indicate a 1%-5% YoY decrease in the 2020-2025E period. On a net basis, our analysts expect Scope 1+2 emissions intensities to decline by about 14% in 2025E vs. 2019. See [Exhibit 31](#) for more details. The emissions intensities profile stems from a reduction in overall emissions (projected to decline at a 1% CAGR within 2019-2025E) combined with CuEq expected to accelerate at a 2% CAGR in the same period ([Exhibit 32](#)).

Why we believe this will matter for investors. As we detail in our Green Capex report, Copper and Aluminum are key Greenabler sectors, i.e., those sectors where investments are needed more urgently due to longer project lead-times in order to avoid supply chain bottlenecks. Our Commodities team is particularly bullish on Copper and Aluminum and expects supply crunches going forward, in their view, in part due to rising Green demand without requisite increase in supply. Given the tightening of supply-demand dynamics, we believe investors will tend to reward those companies able to successfully decarbonize their operations while improving their positioning to meet increased levels of demand.

Investment Implications. As stated above, ESG investors will tend to gravitate towards those companies that are able to curb their carbon footprint, while at the same time meeting rising demand, in our view. We also expect investors to favor companies able to ensure strong corporate returns — please note the Metals & Mining sector has above average corporate returns.

Exhibit 31: Our analysts estimates point towards a 14% decrease in emissions intensities for Diversified Metals & Mining by 2025E vs. 2019 base

Emissions intensities profile for Diversified Metals & Mining, calculated as Scope 1+2 GHG emissions divided by copper equivalent total production. Indexed to 2019 base.

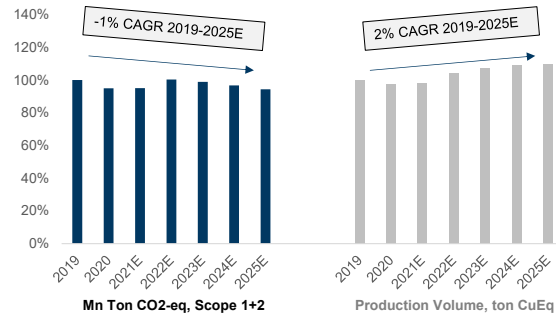


As not all analysts model through 2025, 2024E and 2025E reflect the weighted average yoy change for companies where the covering analysts have submitted data. The same applies for 2019 and 2020 weighted average estimates. The Diversified Metals & Mining sector is as defined based on GS SUSTAIN Metals & Mining sector classification — ex. Aluminum companies based on GICS 4 categorization.

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

Exhibit 32: The reduction in emissions intensities forecast originates from a decline in Scope 1+2 emissions at a 1% CAGR pace, combined with CuEq production growing at a 2% CAGR in the forecast period

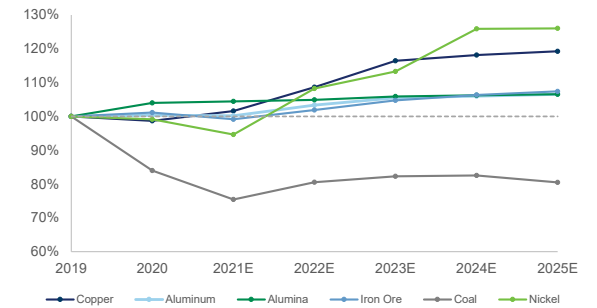
Change in Scope 1+2 emissions (left) and volume production index (right) for Diversified Metals & Mining companies in our work — vs. 2019 base.



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

Exhibit 33: Among companies in our analysis, Coal production is expected to decline by 20% in 2025E vs. 2019, while Copper and Nickel volumes are projected to increase by 20% and 26%, respectively

Breakdown of change in production volume by select commodity produced in 2025E, indexed to 2019. Based on analyst estimates.



Source: Company data, Goldman Sachs Global Investment Research

Chemicals

Our analysis comprises 94 companies in the Chemicals sector, though the response rates was the lowest among the seven sectors. We consider 29 companies based in Americas, 28 based in EMEA and 37 based in Asia Pacific. However, we note that our analysis relies on GHG emissions estimates for only 9 of those companies. In our view, this is due to a combination of (1) difficulty by our analysts to forecast emissions given limited visibility into products mix and (2) lack of disclosures of emissions intensities on a product-by-product basis. Based on our colleagues' Carbonomics work, given the impossibility to adopt a single activity metric in such a heterogenous sector, we define an activity metric index — referred to 2019 base. Scope 1+2 emissions for Chemicals companies are then divided by such index to obtain comparable emissions intensities among different operations. We note our analysis for Chemicals excludes US and EU commodity Chemicals due to limited analyst visibility in forecasting emissions: our data reflects largely Fertilizers/Agricultural Chemicals trends.

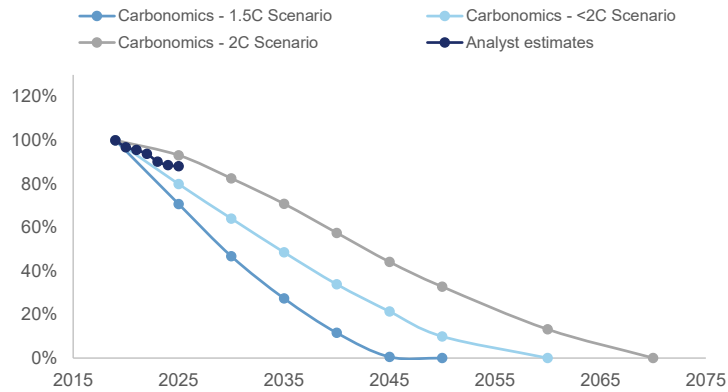
We see emissions intensities for the Chemicals companies we forecast declining by about 12% in 2025E vs. 2019, while absolute emissions are projected to increase by 10% in the same period. On a market cap weighted average-basis, Scope 1+2 emissions intensities are forecast to see YoY declines between 1%-4% in 2020-2025E. See [Exhibit 34](#) for more details. On an absolute basis, we see Scope 1+2 emissions in the Chemicals sector to increase by about 10% in 2025E vs. 2019 — or a 2% CAGR in the same period — but were more than offset by rising production volumes, resulting in a decrease of emissions intensities on a net basis (see [Exhibit 35](#)).

Why we believe this will matter for investors. In our view, the Chemicals sector could be a potential key area of focus for investors due to hydrogen and ammonia, among other key products. We believe investors will increasingly be willing to reward Chemicals companies that are exposed to those verticals and are able to successfully decarbonize their operations. On hydrogen, as recently detailed, our Carbonomics team anticipates global demand for hydrogen to increase 2x-7x by 2050 vs. 2020 base — depending on the scenario considered. In addition, further acceleration — particularly on Green Hydrogen — could be seen on the back on policy initiatives such as REPowerEU and general heightened focus on renewables stemming from the Russia/Ukraine conflict.

Investment Implications. As reflected in [Exhibit 18](#), the Chemicals sector is modestly overweight (27%) in ESG funds vs. respective benchmarks. We believe investors could potentially reward those companies that are able to successfully decarbonize their operations, leading to higher recognition among ESG funds. Given the heterogeneity of the sector, we see exposure to the hydrogen or biofuels supply chain as potential catalysts for greater appreciation by ESG investors.

Exhibit 34: Scope 1+2 emissions intensities in the Chemicals sector are forecast to decline by 12% in 2025E vs. 2019...

Emissions intensities profile for Chemicals, calculated as Scope 1+2 GHG emissions divided by the production index (referred to 2019 base). Indexed to 2019 base. Weighted average using market caps as weights.

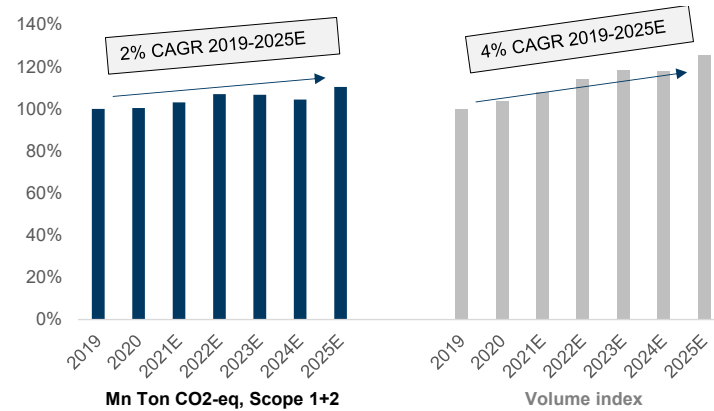


As not all analysts model through 2025, 2024E and 2025E reflect the weighted average yoy change for companies where the covering analysts have submitted data. The same applies for 2019 and 2020 weighted average estimates. The Chemicals sector is as defined based on GS SUSTAIN sector classification.

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

Exhibit 35: ...on the back of rising production volumes, which more than offset increasing absolute emissions.

Change in Scope 1+2 emissions (left) and volume production index (right) for Chemicals companies in our work — vs. 2019 base. Production indexes reported here are weighted average on market caps.



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

Construction Materials

Our analysis considers 23 companies — skewed towards Asia Pacific — and we received emissions estimates for about 50% of them. Our work comprises 7 companies in Americas, 3 in Europe and the remaining 13 in Asia Pacific. Covering analysts provided GHG emissions estimates for 12 of them — or 52% of the total. Emissions intensities are calculated dividing Scope 1+2 emissions by a volume production index — built from total volume produced or YoY p.p. change in production, depending on the company. This differs from our colleagues' Carbonomics work, where Construction Materials companies — primarily active in cement — are benchmarked based on cement production. To represent the sector, emissions intensities are weighted average of market cap.

Analysts estimates indicate a 2% CAGR reduction in emissions intensities among Construction Materials companies.

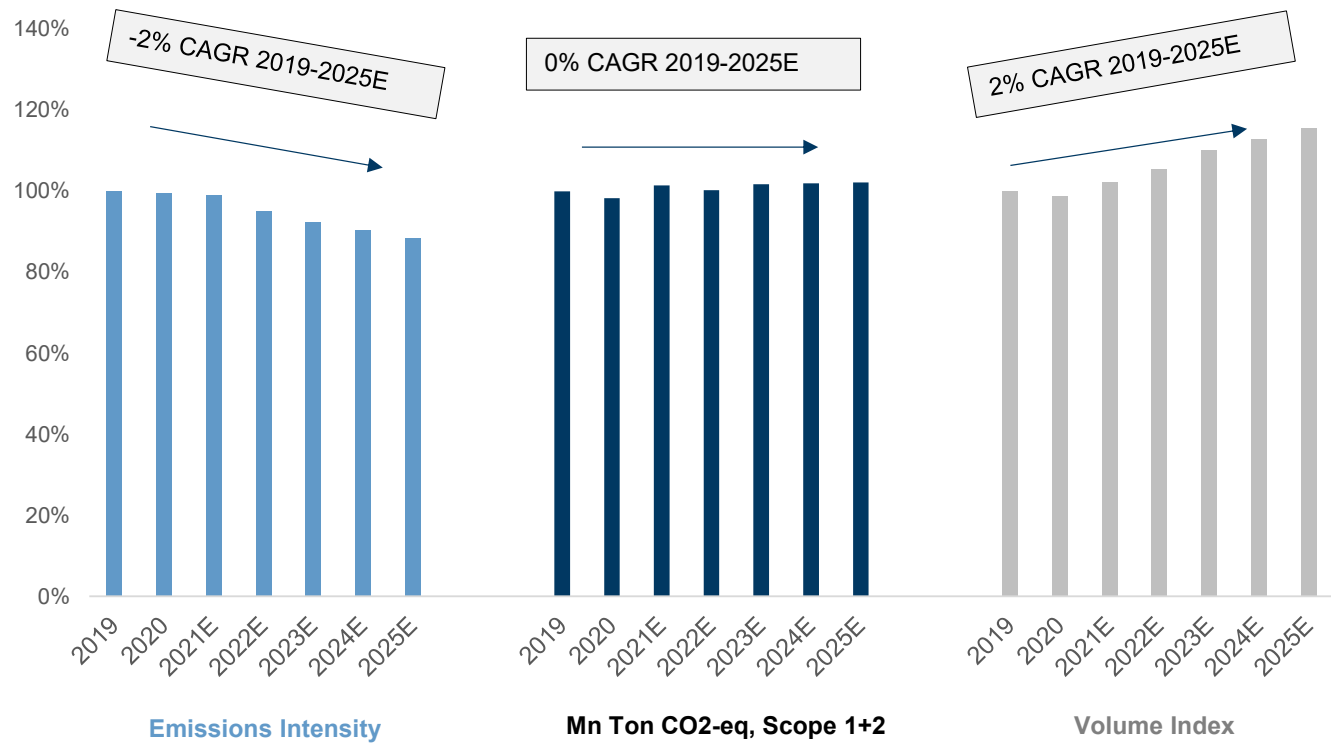
GHG estimates we received suggest a reduction in Scope 1+2 emissions intensities by 2025E vs. 2019 base — about 2% CAGR — on a market cap-weighted average basis. The flattish outlook for emissions intensities originates from Scope 1+2 emissions projected on a modest rise (below 1% CAGR in 2025E vs. 2019), offset by increasing volumes — captured through the production volume index. Please see [Exhibit 36](#) for more details.

Why we believe this will matter for investors. The Construction Materials — which, while not exclusively, primarily consists of cement companies — is the fourth highest emitting sector among the seven key sectors in our analysis. As highlighted in our Green Capex: Making Infrastructure Happen, annual global investments on path to Infrastructure goals would need to rise to \$2.5 tn — of the \$6.0 tn annual investments required on path to Net Zero, Clean Water and Infrastructure objectives — vs. the 2016-2020 average of \$1.7 tn (see [Exhibit 16](#)). In our view, Construction Materials companies will be instrumental in achieving those goals, and we expect investors focus to increase on the ability of companies in the sector to meet demand while successfully curb their carbon footprint. In 2021, our research colleagues highlighted the potential for existing technologies to help reduce carbon intensity of cement by 40% (cement accounts for c.8% of total global emissions). To achieve this, we would need to see an acceleration in emissions intensity reductions in the second half of the decade.

Investment Implications. As stated above, we believe investors will gravitate towards those Construction Materials companies that are successfully able to decarbonize their operations while maintaining the ability to meet demand. In addition, we also note the Construction Materials sectors is characterized by below-average corporate returns, and we thus expect investors to privilege those companies that are capable of ensuring a favorable profile in corporate returns while reducing their GHG footprint.

Exhibit 36: Our analysts' GHG emissions estimates indicate emissions intensities among Construction Materials companies declining at a c.2% annual pace between 2019 and 2025E

Construction Materials 2019-2025E emissions intensities (market cap-weighted, calculated dividing Scope 1+2 emissions by the volume production index), Scope 1+2 emissions and Volume Production Index (Market cap-weighted). Indexed to 2019 base.



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. The same applies for 2019 and 2020 weighted average estimates. The Construction Materials sector is as defined based on GS SUSTAIN sector classification.

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

Methodologies to forecast GHG emissions

Our analysts forecast GHG emissions mainly relying on two alternative methodologies: (1) via emissions intensities; or (2) using percentage changes vs. historicals. While the difficulty to forecast emissions varies widely across sectors — with heterogeneous sectors such as Chemicals and Construction Materials likely the most difficult to forecast emissions due to multiple distinct output streams — our analysts primarily followed these two methodologies to derive Scope 1 and Scope 1+2 emissions in 2021E-2025E. In all cases, our analysts started from historical emissions or emissions intensities per companies disclosures — e.g., sustainability reports or [CDP reports](#) — and projected emissions in the forecast period, overlaying companies' own emissions targets with various degrees of confidence, depending on the level of granularity provided by corporates in terms of strategic initiatives to achieve those decarbonization targets. Generally, we note analysts often looked for more details regarding medium-term pathways/catalysts before giving companies credit for GHG emissions targets.

- **Emissions forecast using emissions intensities.** Relying on historical emissions intensities per company disclosures and from analysts estimates for the corresponding sector-specific activity metric, our colleagues derive emissions intensities in the forecast years 2021E-2025E. As stated above, these also factor in companies' emissions targets to various degrees, depending on the confidence level regarding pathways and strategies to meet those decarbonization objectives. Emissions intensities in the forecast period are then multiplied by the corresponding activity metric to obtain absolute emissions. We note analysts tend to apply this methodology to Scope 1 and Scope 1+2 emissions, most commonly not calculating Scope 2 emissions as a separate component.
- **Emissions forecast via percentage changes vs. historical emissions.** Particularly for heterogeneous sectors, some analysts calculated Scope 1 or Scope 1+2 emissions based on the YoY percentage change vs. 2019/2020 historical emissions per company disclosures, relying on total volumes/productions — or, alternatively, rates of change in those metrics — as proxies to derive emissions.

Disclosure Appendix

Reg AC

We, Brian Singer, CFA, Enrico Chinello, Ph.D., Michael Hao Wu, CFA, Derek R. Bingham, Evan Tylenda, CFA, Sharmini Chetwode, Ph.D., Brendan Corbett, Emma Jones, Madeline Meyer, Keebum Kim, Grace Chen, Michele Della Vigna, CFA, Neil Mehta, Umang Choudhary, Michael Lapides, Joy Zhang, Nina Dergunova, Alberto Gandolfi and Pedro Manfredini, 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).

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

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Goldman Sachs Investment Research global Equity coverage universe

	Rating Distribution			Investment Banking Relationships		
	Buy	Hold	Sell	Buy	Hold	Sell
Global	50%	35%	15%	65%	57%	45%

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Price target and rating history chart(s)

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