

Task Force on Climate-related Financial Disclosures

Goldman Sachs 2023 TCFD Report

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A Letter from Our CEO



In the two years since we issued our last firmwide TCFD report, the macro environment has grown more complex. Tighter monetary policy, geopolitical tensions, and energy supply shocks have disrupted markets while also making the climate transition that much more challenging.

But sustainability continues to be a priority for our clients — ranging from corporates decarbonizing their businesses to investors in new, clean-energy technologies, and we're well-positioned to support them.

After all, we've long thought the climate transition would be a long-term effort and every business would face trade-offs. In such an uncertain environment, we believe the greatest contribution we can make to the climate transition is to help our clients achieve their sustainability goals.

It's also clear that financial institutions must continue to work with critical sectors across the economy including energy, transport, and heavy industry. It's the only way to ensure affordable and reliable energy while new, cleaner technologies continue to develop and scale.

Based on these principles, our sustainability strategy consists of three pillars: our work with our clients, the management of our firm, and our partnerships with other organizations to address market gaps.

Since our last TCFD report, we've been focused on execution. In Global Banking & Markets, we've served as bookrunner on General Motors' first green bond and in Asset & Wealth Management, we've developed our Horizon platform to give our clients investment opportunities in a range of climate and environmental solutions.

In addition, we've continued to embed climate-related expertise into our businesses, advance our climate-risk management capabilities across the firm, and work with our clients in high-emitting sectors to lower their emissions profiles, as we discuss in the update on our 2030 sector targets.

Beyond our commercial work, we've continued to mobilize private and public capital alike for climate solutions in emerging markets. The Climate Innovation and Development Fund, our blended finance facility partnership with Bloomberg Philanthropies and the Asian Development Bank, has directed capital to clean-energy projects across South and Southeast Asia, from an 88-Megawatt wind farm in Vietnam to the electrification of busing in both Vietnam and India.

That said, we still have a long way to go. Two areas that need continued focus are data and policy. First, thanks in part to our internal engineering initiatives, we have enhanced our climate data capabilities. But there's still room for improvement in data availability and quality. Second, policymakers need to continue creating long-term incentives for investment in sustainable solutions. In the US, for instance, the Inflation Reduction Act (IRA) promises to provide tax credits and other incentives for low-carbon technologies such as hydrogen and carbon capture. But it is not yet certain how quickly the law will be implemented or how U.S. companies will respond.

Despite all the disruption of the past two years, we're moving in the right direction. Progress is never a straight line, and the path to our shared climate objectives will not be linear. Still, we remain committed to our sustainability targets along with helping our clients achieve their sustainability goals, and we are well-positioned to support them as they continue their journey.

David Solomon
Chairman and Chief Executive Officer

Section I

Introduction

At Goldman Sachs, we aspire to be the world’s most exceptional financial institution, united by our shared values of partnership, client service, integrity, and excellence.

These core shared values have guided us over the years to help our clients seize opportunities and address challenges — including climate change — through our capital, advice, and innovative solutions.

Our firm has had a long-standing commitment to address the impacts of a changing climate. As a financial institution, we believe the most meaningful role Goldman Sachs can play in the climate transition is driving decarbonization in the real economy in partnership with our clients. As one of the first US banks to acknowledge the scale and complexity

of climate change in 2005, our firm has been helping our clients and partners achieve their sustainability objectives for nearly two decades. During this time, we have helped our clients access sustainable finance, identify and capture climate-related opportunities, and manage climate-related risks. To do this, we leverage the depth and breadth of our climate expertise and capabilities across the firm. Alongside our support of our clients, we apply this approach to our own business to help the firm better manage its own climate transition.

In this section:

- 5 About Goldman Sachs and this Report
- 6 Historical Milestones
- 7 Key Updates Since Our 2021 TCFD Report

About Goldman Sachs and this Report

Goldman Sachs is a leading global financial institution that delivers a broad range of financial services to a large and diversified client base that includes corporations, financial institutions, governments, and individuals.

We operate two core businesses: Global Banking & Markets and Asset & Wealth Management.

Global Banking & Markets (GBM) provides financing, advisory services, risk distribution, and hedging for our institutional and corporate clients. GBM includes our Investment Banking, Fixed Income, Currency and Commodities (FICC), and Equities businesses.

Asset & Wealth Management (AWM) provides investment services to help clients preserve and grow financial assets and achieve their financial goals. We manage assets across a broad range of investment strategies and asset classes, including equity, fixed income, and private markets. Our Private Markets Investing activities, which are typically longer-term, include investments in private equity, private credit, real estate, and infrastructure assets. Within Private Wealth Management (PWM), we provide tailored wealth advisory services to clients.

For additional information on climate-related risks and opportunities within AWM, please see the Asset & Wealth Management TCFD Report 2022.¹



¹ The Asset & Wealth Management Task Force on Climate-Related Financial Disclosures 2022 Report ("AWM TCFD 2022 Report") was published in June 2023 and developed in line with the United Kingdom Financial Conduct Authority rules and guidance as set out in the Environmental, Social, and Governance Sourcebook. The legal entities in-scope for that report are Goldman Sachs International ("GSI") and Goldman Sachs Asset Management International ("GSAMI"). The AWM TCFD 2022 Report is separate from this Goldman Sachs 2023 TCFD Report, which is produced voluntarily and focuses on a broader scope of business activities from a firmwide perspective. For more information, please see the [AWM TCFD 2022 Report](#).

Historical Milestones

Since becoming one of the first US banks to develop an Environmental Policy Framework (EPF) in 2005, we have been building our climate capabilities and partnerships to support our clients. Following the Goldman Sachs TCFD Report 2021, we have continued to advance our commercial capabilities and further supported our clients in their climate ambitions through our investing, financing, and advisory activities, and by operationalizing climate transition capabilities in our businesses with several key **milestones**.



² NN Investment Partners was rebranded to Goldman Sachs Asset Management B.V. on March 6, 2023.

³ AM refers to Asset Management within Asset & Wealth Management (AWM). AM Sustainability and Impact Solutions is a new group created after the June 2023 publication of the AWM TCFD 2022 Report.

Key Updates Since Our 2021 TCFD Report

Since publication of the Goldman Sachs TCFD Report 2021, we have made progress on several key initiatives related to our climate practices, detailed in this report.

1. Update on Our 2030 Sectoral Targets

In 2021, we set ranged, physical emissions intensity-based targets related to our financing activities in Energy,^{4,5} Power, and Auto Manufacturing⁶ using 2019 data. These sectors reflect where we saw the greatest opportunity to proactively engage clients, to deploy capital required for the transition, and to invest in new commercial solutions to help decarbonize the real economy. This report provides an update on our 2030 sectoral targets.⁷

The table below shows the intensities of our 2021 financing portfolios. We are reporting 2021 data as that is the most current year of data that exists for company-reported intensities, vendor production data, and vendor estimates of company emissions. With two years of data now available, we have identified challenges in the data landscape across all sectors, but these challenges have been most acute in the Energy sector.

Further details on our target-setting framework and sector-specific considerations can be found in the Goldman Sachs TCFD Report 2021. A sample of transactions from our 2021 financing portfolios as well as a discussion of data challenges can be found in the Metrics and Targets section of this report (p. 43).

In 2024, we plan to provide another update on progress toward our 2030 sectoral targets as well as assess and set targets for additional carbon-intensive sectors. We also plan to provide other disclosures as related regulatory guidance is finalized.

2. Enhancement of Our Climate Data and Tooling Capabilities

In recent years, we have continued to develop and deliver advanced data and metrics, including proprietary solutions to support monitoring and reporting, inform our climate risk management, and strengthen our forward-looking planning and analysis. We also provide our investor and corporate clients with proprietary tools to help them understand sustainability performance, identify opportunities, and allocate capital to meet their objectives.

We are working with our clients and partners to mobilize the development of solutions to capture meaningful, decision-useful metrics to help companies, asset managers, and investors more consistently and effectively evaluate progress, particularly against their decarbonization goals. For further details on our data tools and solutions, refer to the Strategy section of this report (p. 13).

3. Integration of Climate Risk into Our Risk Program

Over the past two years, we have continued to make enhancements to our climate risk management framework, including steps to further integrate climate into the firm's broader risk management processes. As part of this integration, we have enhanced our climate risk quantification and assessment capabilities through climate scenario analysis. For example, climate scenario analysis is integrated into our broader risk analysis efforts and helps to inform our assessment of transition

2030 Sectoral Targets and Intensities of Our 2021 Financing Portfolios

Sector	Metric	2019 Baseline	2021 Intensity ^a	2021 vs. 2019	2030 Sectoral Targets
Energy	gCO ₂ e / MJ	72	72	0%	56 – 60 (17 – 22%) ^b
Power	kgCO ₂ e / MWH	417	296	-29%	147 – 219 (48 – 65%) ^b
Auto Manufacturing	gCO ₂ e / km	152	119	-22%	70 – 77 (49 – 54%) ^b

^a Majority of vendor data was pulled during the month July 2023.

^b Reduction percentage from 2019 baseline to 2030 sectoral target.

⁴ Includes all liquid and gaseous fuels, such as oil, natural gas, hydrogen, biofuels, and sustainable aviation fuel.

⁵ Energy has been renamed from Oil & Gas in the Goldman Sachs TCFD Report 2021.

⁶ Our target is specifically focused on light duty vehicle auto manufacturing, including both cars and light trucks for passenger and commercial uses.

⁷ Emission scopes vary across sectors: Energy and Auto Manufacturing encompass Scopes 1, 2, and 3, while Power focuses solely on Scope 1 emissions. For detailed methodology and rationale on scope inclusion/exclusion in each sector, please refer to pages 44-46 of the Goldman Sachs TCFD Report 2021.

and physical risks in new transactions during due diligence processes, as well as in ongoing credit risk assessments during the transaction lifecycle. Please see the Strategy section of this report (p. 13) for additional details on scenario analysis, and the Risk Management section (p. 35) for more information on the integration of climate risk into our risk management processes.

4. Strengthening of Climate Finance Expertise and Expanded Climate Solutions

We completed the acquisition of NN Investment Partners (NN IP) in April 2022, which was subsequently re-branded as Goldman Sachs Asset Management B.V. (GSAM B.V.). GSAM B.V. is a leading European asset manager based in The Hague, Netherlands, which at the time of acquisition managed \$340 billion in assets for institutions and individual investors worldwide.⁸ We have been working together to leverage our combined climate-related expertise and capabilities to further develop and embed a sustainable investing approach in certain strategies and offerings.

Within our GBM segment, we have created the Sustainable Banking Group (SBG). SBG provides tailored analytics advice, commercialization, and capital solutions to clients focused on energy transition and decarbonization, helping them to advance their sustainability goals. In addition, our Investment Banking Services teams engage with clients to support them on their decarbonization journeys.

These strategic developments reinforce our growing climate finance expertise and position us to better support our clients in achieving their climate goals. For more information on our growing climate finance expertise, please see the Governance (p. 9) and Strategy (p. 13) sections of this report.

5. Addressing Investment Gap in Emerging Markets through Blended Finance Facility

In 2021, we announced the launch of the Climate Innovation and Development Fund, a blended finance facility designed to deploy private and public sector capital and catalyze investment in first-of-their-kind or demonstrative climate-focused projects across India and Vietnam. Managed by the Asian Development Bank and seeded with concessional capital from Goldman Sachs and Bloomberg Philanthropies, the Fund invested across seven projects throughout 2022 and 2023. For more information on the Climate Development and Innovation Fund and the more than \$500 million of blended private and public sector finance it helped catalyze for these projects, please see the Strategy section of this report (p. 13).

⁸ [Goldman Sachs Completes Acquisition of NN Investment Partners.](#)

Section II

Governance

We seek to help our clients manage climate-related risks and opportunities and to do the same within our operations.

We integrate climate-related risks and considerations into our governance structures, including within our Board of Directors, senior management committees, and other business and functional groups.⁹ These governance forums are part of our centralized governance, where we manage a broad spectrum of financial and non-financial risks across

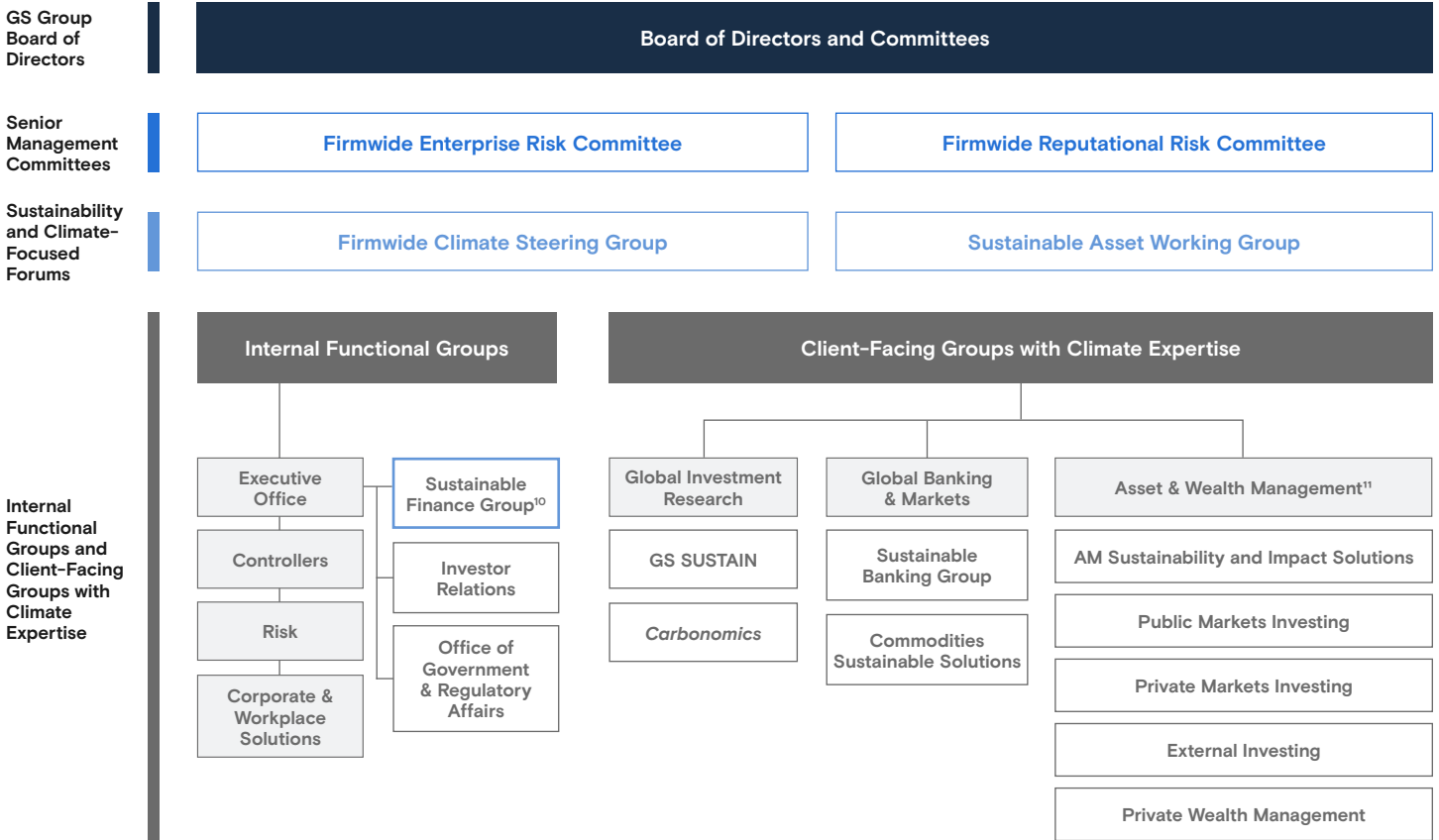
our businesses. At all levels of the firm, we recognize that responsibly managing our business is paramount, and our people are critical to this effort. We focus on providing our businesses with the tools and resources they need to effectively identify and escalate potential climate-related risks in their day-to-day activities.

In this section:

- 10 Goldman Sachs Climate-Related Organizational Structure
- 12 Governance of Targets

⁹ For information on the Asset & Wealth Management governance structure, please see the AWM TCFD 2022 Report.

Goldman Sachs Climate-Related Organizational Structure



Board of Directors

The Goldman Sachs Group, Inc. Board of Directors and its committees are responsible for overseeing the management of the firm’s most significant risks. Given the interdisciplinary nature of the oversight of sustainability risks, including climate-related risks, the Board carries out its oversight of these matters directly, at the full Board level, as well as through its committees, in particular its Risk and Public Responsibilities Committees.

This may include periodic updates on the firm’s sustainability strategy, including the firm’s approach, objectives, and progress as well as incentives related thereto, discussions regarding the climate models the firm utilizes to assess physical and transition risks; and reviews of our sustainability- and climate-related targets, reporting, and attendant controls.

Risk Committee

The Risk Committee of the Board oversees firmwide financial and non-financial risks. This includes the firm’s overall risk-taking tolerance and management of such risks, including climate risk. In this respect, the Risk Committee provides oversight of the firmwide Risk Appetite Statement (RAS). The RAS describes the levels and types of risks the firm is willing to accept or avoid, to achieve the objectives in our strategic business plan, while remaining in compliance with regulatory requirements, including climate-related guidance. As part of its oversight, the Risk Committee of the Board receives updates on our climate risk management approach, including scenario analysis capabilities and integration into existing risk management processes.

¹⁰ The Sustainable Finance Group drives both internal climate and sustainability strategy across the firm as well as engages directly with clients.

¹¹ The AWM Sustainable Investing Executive Group serves as the ultimate arbiter of climate, sustainability, and impact decisions for AWM. For more information on AWM’s governing bodies, please see the AWM TCFD 2022 Report.

Public Responsibilities Committee

The Public Responsibilities Committee of the Board assists the Board in its oversight of our firmwide sustainability strategy and sustainability issues affecting the firm, including climate change. As part of its oversight, the Public Responsibilities Committee receives periodic updates on our sustainability strategy, and also periodically reviews our governance and related policies and processes for sustainability and climate-related matters.

Senior Management Committees

Various senior management committees oversee our transaction selection decisions and risk management processes.

Firmwide Enterprise Risk Committee

The firmwide Enterprise Risk Committee (ERC) is responsible for overseeing all of our financial and non-financial risks, including climate-related risk. The ERC, through its oversight of the Enterprise Risk Management Framework, monitors the firm's risk profile on both an aggregate and segment level, inclusive of key trends, top and emerging risks, and significant events that potentially affect the firm's risk profile. The ERC is co-chaired by the Chief Risk Officer (CRO) and Chief Operating Officer (COO). The Chief Financial Officer (CFO) is Vice-Chair, and the Committee also includes senior firm leaders, many of whom are also members of other firmwide risk committees.

Firmwide Reputational Risk Committee

Our firmwide Reputational Risk Committee is responsible for assessing reputational risks arising from transactions identified as having potential heightened reputational risk, including those driven by climate-related issues, pursuant to the criteria established by the firmwide Reputational Risk Committee and as determined by committee leadership.

Sustainability and Climate-Focused Forums

In addition to our senior management committees, several firmwide forums are focused on convening key senior stakeholders from across our businesses and functional groups to oversee climate and sustainability issues.

Firmwide Climate Steering Group

The firmwide Climate Steering Group convenes key senior stakeholders, including those from the Sustainable Finance Group (SFG), Risk, Controllers, Global Banking & Markets (GBM), and Asset & Wealth Management (AWM). This group

provides guidance on key climate risk and opportunity decisions, including interim goal setting to achieve our long-term net zero by 2050 pathway commitment. The group reviews progress and provides feedback on climate strategy, risk management, integration, and climate-related capabilities more broadly. This includes oversight of our 2030 sectoral targets in Energy, Power, and Auto Manufacturing, and associated reporting (as described in the Governance of Targets section on the next page).

Sustainable Asset Working Group

The Sustainable Asset Working Group (SAWG) discusses, guides, and validates sustainable client offerings and attributions at the transaction and product-level, as well as applies our allocation methodology for transactions that contribute toward our firmwide \$750 billion sustainable finance commitment. This commitment is built on commercial activity that is aligned with our firm's Sustainable Finance Framework. SAWG also governs the firm's Sustainability Issuance Framework and sustainability issuances. Finally, SAWG serves as an internal control group to help ensure accuracy and accountability for our firmwide \$750 billion sustainable finance commitment and consists of members from our businesses, SFG, and control-side personnel.

Internal Functional Groups

We embed climate responsibilities within various firmwide functional teams that support our businesses and clients. In addition, a group of senior leaders from across the firm reviews and provides feedback prior to climate and other sustainability report disclosures.

Executive Office

Our Executive Office (EO) plays an integral role in setting and advancing Goldman Sachs' corporate strategy and in preserving the firm's distinctive culture. The EO is responsible for safeguarding the firm's relationship with alumni, clients, shareholders, policy makers, and the broader public, while ensuring our own people remain informed about the firm's priorities, including climate and other sustainability-related priorities. The EO also partners with the businesses to source high-impact opportunities in line with the firm's climate objectives. EO groups with climate-related responsibilities include SFG, Investor Relations, and Office of Government & Regulatory Affairs.

Sustainable Finance Group

SFG partners with the firm's businesses to operationalize and coordinate the firm's climate and broader sustainability strategy across Goldman Sachs. This includes ongoing efforts to integrate sustainability-related expertise and capabilities into our business and develop external partnerships to help address

Governance

market gaps. SFG is also responsible for engagement with the firm's stakeholders on climate finance, support of the firm's approach to climate-related policy and reporting, and oversight of the firmwide Environmental Policy Framework (EPF).

Investor Relations

The Investor Relations team works closely with senior management to shape the firm's external engagement with equity and debt investors, research analysts, rating agencies, credit counterparties, and climate- and ESG-focused stakeholders. Investor Relations also collaborates with key internal constituents on competitive positioning, firmwide strategic initiatives, and capital and resource management.

Office of Government & Regulatory Affairs

The Office of Government & Regulatory Affairs manages relationships with regulatory and legislative officials around the world, while also advancing a public policy agenda in support of the firm and our clients. This includes discussions on climate-related topics, where applicable.

Other Internal Functional Groups

Controllers

Controllers is responsible for the tracking and review of progress toward select firmwide sustainability-related targets, including the 2030 sectoral targets. This team also coordinates with SFG and various functional teams to ensure the consistency, accuracy, and completeness of reporting toward these targets and other climate-related disclosures.

Risk

Risk is the independent risk oversight and control function of the firm and is responsible for the effective identification, monitoring, evaluation, and management of the firm's financial and non-financial risks. At an operational level, Risk specialist teams are responsible for the development of the firm's climate-related and environmental risk program, including setting and evaluating risk appetite, quantifying climate-related risk, and integrating that risk into business and risk management practices. Select teams within Risk also guide environmental, health, and safety standards for our investing activities and perform due diligence on proposed investment transactions to help business teams identify and mitigate potential climate and sustainability risks.

Corporate and Workplace Solutions

Corporate and Workplace Solutions (CWS) is responsible for the firm's global workplace, its corresponding suite of solutions intended to maximize our people's productivity and experience, the firm's sustainability initiatives across our operations and supply chain, spend management functions aligned to the firm's operating efficiency, and our global security function.

Client-Facing Groups with Climate Expertise

Further details are provided in the Strategy section (p. 16).

Governance of Targets

Since the publication of the Goldman Sachs TCFD Report 2021, we have continued to evolve and embed our climate-related governance processes across our board, management, and firmwide groups. As part of the ongoing monitoring of progress, several groups have oversight responsibilities for the firm's targets and commitments. These include:

- The Firmwide Climate Steering Group oversees our 2030 sectoral targets in Energy, Power, and Auto Manufacturing. As part of our progress on these targets, described in this report, client-level and aggregated portfolio metrics are subject to a review process prior to disclosure. This involves senior stakeholders across our business segments, SFG, and key support functions, including Risk and Controllers. The final sectoral portfolio metrics are then approved by the Firmwide Climate Steering Group.
- SAWG oversees our firmwide \$750 billion sustainable finance commitment.

Section III

Strategy

We seek to drive long-term value for shareholders by managing climate-related risks and capturing climate-related opportunities.

The potential impacts of climate change are wide-ranging, from physical risks to operations and supply chains, to challenges in navigating the transition to a low-carbon economy.

Given the scale and complexity of the global climate transition, we seek to drive long-term value for shareholders by managing climate-related risks and capturing climate-related opportunities in a pragmatic, client-centric way.

We acknowledge a transition to a low-carbon economy will take time and require balancing trade-offs along the way. As a result, we take both a short- and long-term view to the transition. We are committed to leveraging our financial resources and expertise to provide secure, reliable, and

affordable energy today while simultaneously supporting the transition to long-term sustainable technologies. This approach addresses both immediate climate change impacts and our long-term vision for scaling innovative solutions in today's hardest-to-abate sectors, including energy, transport, and heavy industry.

Our firm's approach to climate is aligned with the three foundational levers of our Sustainable Finance Strategy: working with clients, addressing market gaps, and managing our firm. With these three levers, we seek to simultaneously manage climate-related risks while also capturing climate-related opportunities.

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Introduction to Our Sustainable Finance Strategy

As described in the [Goldman Sachs 2022 Sustainability Report](#), *Navigating Complexity: A Client-Centric Approach to Sustainability*, the three levers of our sustainable finance strategy — Working with Clients, Addressing Market Gaps, and Managing Our Firm — help drive long-term value for our shareholders. This section details our work across these three levers, including examples and case studies.

Working with Clients

Our sustainability strategy is centered on how we can help our clients achieve their sustainability objectives. We have developed and continue to refine our firmwide *One Goldman Sachs* commercial model that leverages the full depth and breadth of our franchise, with the goal of bringing the best of Goldman Sachs and our sustainable finance capabilities to our clients.

Addressing Market Gaps

When we identify gaps in the marketplace, we seek to address them by leveraging our existing capabilities and those of our strategic partners. Our external partnerships and strategic philanthropy support our work with clients to develop innovative solutions that help solve for gaps in the marketplace. The lessons we learn further inform the development and execution of our sustainable finance capabilities and the solutions we bring to our clients and to markets.

Managing Our Firm

We promote an inclusive workforce, providing our people with the tools, resources, and support they need to serve our clients. Our people actively protect the value of our firm, taking care to manage our own global footprint. By extending our commitments and tending to our supply chain, we strive to lead through action to advance sustainable business outcomes over the long term.

Our Sustainable Finance Framework

As part of this broader Sustainable Finance Strategy, our Sustainable Finance Framework includes two investing themes where we expect to have the greatest impact through our commercial work with clients and strategic partners — advancing Climate Transition and driving Inclusive Growth. Five sub-themes within Climate Transition and four sub-themes within Inclusive Growth help us prioritize how we develop and refine our sustainable finance capabilities to meet both current and future client demand. We include further details on our progress against these themes in the Metrics and Targets section of this report (p. 44).

Climate Transition

Clean Energy

Enable renewable energy generation, energy efficiency, and grid services.

Sustainable Transport

Shift modes of transit through electric vehicles, connected services, autonomous driving, and public transportation development.

Sustainable Food and Agriculture

Enable green agricultural production, storage, processing, and distribution to feed the world.

Waste and Materials

Promote sustainable production and consumption, along with responsible waste management.

Ecosystem Services

Contribute to the sustainable management of natural resources and monetize the value of forests, water, and biodiversity.

Inclusive Growth

Accessible and Innovative Healthcare

Enable the use of digital technology, advanced devices, and diagnostics for better outcomes.

Financial Inclusion

Advance financial inclusion for all, including underserved populations, by promoting access to capital, financial technology, and products that increase access, support financial health, and drive more equitable economic growth.

Accessible and Affordable Education

Enable greater access to education, improve learning outcomes, and help close opportunity gaps for learners of all ages.

Communities

Enable infrastructure development, affordable housing, and livelihood advancement.



Working with Clients

Our climate strategy is centered on helping our clients achieve their climate objectives. We deliver for our clients through our *One Goldman Sachs* commercial model that leverages the depth and breadth of our franchise, with the goal of bringing the best of Goldman Sachs and our sustainable finance capabilities and solutions to our clients. Since the Goldman Sachs TCFD Report 2021, we have continued to advance our climate transition insights, capabilities, and solutions to help our clients achieve their climate transition objectives. These include client financing, advisory, M&A, research, portfolio analytics, and cross-business segment capabilities.

Key Climate Transition Capabilities and Solutions Across Our Businesses

Global Banking & Markets	Asset & Wealth Management
<ul style="list-style-type: none"> • Sustainability Advisory: Advisory, M&A, IPO, Activism, and Decarbonization strategies • Transition Capital and Financing with Sustainable Themed Products: Early-stage growth equity, financing for legacy asset conversion, project financing for green capex initiatives, tax equity, sustainable urban development, and sustainable themed products such as structured notes, custom baskets, and portfolio transition trades • ESG Financing and Investor Connectivity: Traditional and innovative debt and equity financing products, ESG investor connectivity • Sponsor/Client Coverage and Analytics: Coverage resources for ESG content and support for ESG-oriented investors and emerging energy transition companies, bespoke investor analytics, including carbon, climate transition, and ESG portfolio analytics • Environmental and Raw Material Markets: Renewable energy and renewable energy certificates supply, procurement, and risk management, principal financing across environmental product and carbon markets, trading and risk management in raw material markets relevant to climate transition, e.g., battery metals 	<ul style="list-style-type: none"> • Sustainability Advisory: Client advisory in developing organizational approach and portfolio, asset class, and thematic investing strategies • Research, Data, and Analytics: Analyses and tools to help clients analyze their portfolios, and climate intelligence to support investment decision making • Client Products and Solutions: A growing range of products and custom capabilities for clients that include: <ul style="list-style-type: none"> • integration of climate considerations in certain funds and products • development of dedicated internally managed, comingled, and custom options spanning both public and private markets • extensive range of external/open architecture public and private investment options through Imprint • Ongoing Engagement: Dedicated transition-focused resources for portfolio companies (e.g., Value Accelerator), public company engagement on policy and disclosure, timetable of expectations for emissions disclosure and targets for relevant verticals, and portfolio companies GHG¹² measurement support program

Firmwide Resources
<ul style="list-style-type: none"> • Sustainable Finance Group: Coordination of the firm’s climate and broader sustainability strategy across Goldman Sachs, including ongoing efforts to integrate sustainability-related expertise and capabilities into our business and develop external partnerships to help address market gaps, engagement with the firm’s stakeholders on climate finance, support of the firm’s approach to climate-related policy and reporting, and oversight of the firmwide Environmental Policy Framework (EPF). • Global Investment Research – GS SUSTAIN and Carbonomics: Research and insights to inform sustainable investment decisions

¹² Greenhouse gases (GHG) are defined as gases that trap heat in the atmosphere and include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and fluorinated gases. Each gas, when combusted, has a different warming impact on the atmosphere, otherwise known as Global Warming Potential (GWP). In our metrics, we use CO₂ equivalents (CO₂e) to capture the contributions of all greenhouse gases in our physical intensities.

Client-Facing Groups with Climate Expertise

We deliver our climate transition products and capabilities through client-facing climate and sustainability groups across our businesses. These teams provide climate expertise and resources to support our business activities and clients.

Global Investment Research

Our Global Investment Research (GIR) team's research is instrumental in informing and educating our clients and investors about the transition toward a low-carbon economy. Within GIR, two key research initiatives, GS SUSTAIN and *Carbonomics*, provide invaluable insights to inform sustainable investment decisions.

GS SUSTAIN

GS SUSTAIN, established in 2007, provides research and data tools to clients exploring how innovation, regulation, and implementation of environmental, social, and governance (ESG) topics will impact sustainable investing and broader capital flows.

Carbonomics

Carbonomics, launched in 2019, is GIR's flagship series dedicated to examining the economics of decarbonization and sustainable growth, providing in-depth analysis of costs, incentives, and financing options for key technologies underpinning the paths to net zero carbon.

For more information about GS SUSTAIN and *Carbonomics*, please see dedicated sections later in the Strategy section of this report.

Global Banking & Markets

Our Global Banking & Markets (GBM) franchise provides climate and sustainability-related financing, advisory services, and risk management. Within GBM, there are several key groups that contribute to our sustainable finance initiatives.

Sustainable Banking Group

The Sustainable Banking Group (SBG) specializes in delivering bespoke analytics, advice, commercialization, and capital solutions for clients focused on energy transition and on advancing their decarbonization goals and sustainability profiles.

Commodities Sustainable Solutions

The Commodities Sustainable Solutions team helps to drive our climate objectives across commodities markets by providing principal financing and trading solutions in areas such as clean power and carbon markets and working with our clients to help them achieve their net zero climate transition objectives.

Asset & Wealth Management

Asset & Wealth Management (AWM) provides clients breadth via climate-related capabilities, across public and private markets, proprietary and third-party products, portfolio strategy and implementation, and depth, with specialist climate teams and strategies.

AM Sustainability and Impact Solutions

The Sustainability and Impact Solutions is a dedicated team within AWM that mobilizes the full range of insights, advisory services and investment solutions across our client segments.

Public Markets Investing

Public Markets Investing has certain investment teams and capabilities as well as support roles which may focus on climate change, from research and data; to investment teams; to stewardship. The Sustainable Investing and Innovation Platform acts as a central resource for Sustainable Investing (SI) within Public Markets and provides enhanced SI-tooling, data, and research capabilities.

Private Markets Investing

Private Markets Investing has teams specializing in climate. The Sustainability & Impact team focuses on institutionalizing and scaling sustainability practices across the Private Markets Investing business. The Sustainable Investing Group invests across Climate Transition and Inclusive Growth thematic in private markets and partners with clients through a series of Goldman Sachs Horizon strategies.

External Investing

Our External Investing Group (XIG) is responsible for identifying, researching and selecting leading third-party investment managers. Imprint is a dedicated team within XIG focused on thematic research, manager selection and co-investments across sustainable growth themes.

Private Wealth Management

Within our Private Wealth Management (PWM) business, the Sustainable Solutions Group (SSG) provides clients access to our sustainable investing capabilities across their multi-asset class portfolios.

For more information on AWM's climate strategy, please see the AWM TCFD 2022 Report.

Strategic Focus Areas

Our climate transition products and capabilities are delivered through our client facing groups across four strategic focus areas: supporting client transition in critical sectors, climate transition enabling technology and infrastructure, research and insights on climate transition, and innovative tools and analytics to help inform better decision-making.



1. Supporting Client Transition in Critical Sectors

We acknowledge the transition to a low-carbon economy is complex and will take time. As capital helps sectors critical to the transition move toward decarbonization, there will be trade-offs along the way. At Goldman Sachs, our approach to climate transition is pragmatic. Moving from an emissions-intensive economy to a low-carbon economy will involve participation from companies in currently high-emitting sectors. Supporting today's hardest-to-abate sectors — including energy, power, transport, and heavy industry — is crucial to help ensure the inputs powering the economy remain affordable and reliable as market dynamics evolve and new, innovative technologies scale. We support these clients across a range of their activities and are committed to supporting their climate transition strategies by providing tailored financing structures, investment vehicles, custom products, and advice, leveraging our deep expertise and array of climate research and tools.

CASE STUDY

Chevron

Global energy leaders are charting their own paths to a low-carbon economy, including by scaling investments in renewable fuels such as biodiesel and renewable diesels, which are expected to serve an important role in decarbonizing transport industries. However, production lags anticipated demand and requires an 11% annualized growth in production to meet estimated 2030 needs.¹³

In February 2022, Goldman Sachs served as financial advisor to Chevron in its acquisition of Renewable Energy Group (REG), a leading innovator in the renewable fuels industry, producing over 500 million gallons of renewable fuels in 2020, leading to 4.2 million metrics tons¹⁴ of CO₂e emissions reductions. The transaction created Renewable Fuels-REG, Chevron's new renewable fuels business, which aims to scale more quickly and efficiently across the renewable fuels value chain. The new business combines REG's growing renewable fuels production, including 11 biorefineries across the US and Europe, and leading feedstock capabilities, with Chevron's large manufacturing, distribution, and commercial marketing position.

The transaction is expected to help expand Chevron's carbon solutions offering to customers, accelerate Chevron's progress

toward its goal to grow its renewable fuels production capacity to 100,000 barrels per day by 2030, and build Chevron's market presence in renewable fuels.

CASE STUDY

Enel

The largest power generation companies are increasingly turning to sustainability-linked financing to advance initiatives directly linked to their climate transition plans. Enel — one of the largest power companies in the world — became the first issuer of sustainability-linked bonds (SLBs) in 2019, and has continued to utilize this type of financing to fuel its sustainability strategy, including its net zero by 2040 decarbonization target.

In February 2023, Enel issued the first sustainability-linked bond coupling key performance indicators (KPIs) linked to the EU Taxonomy with KPIs linked to the United Nations Sustainable Development Goals. One tranche of the €1.5 billion bond includes financing linked directly to KPIs related to the proportion of capex aligned to the EU Taxonomy and the Scope 1 emissions intensity of Enel's power generation activities. The second tranche of the bond is directly linked to two KPIs related to Enel's net zero decarbonization path — Scope 1 and 3 emissions intensity for integrated power activities and absolute Scope 3 emissions related to gas retail.¹⁵ Goldman Sachs acted as joint bookrunner on the successful transaction¹⁶ and on each of Enel's sustainability-linked bonds (SLBs), which totalled €13.4 billion equivalent since 2022.¹⁷

CASE STUDY

General Motors

In July 2022, GS acted as an Active Bookrunner on General Motors' (GM) first \$2.25 billion green bond offering, alongside other financial institutions. This was the second-largest green bond offering ever from a U.S. non-banking entity at the time and was selected the Deal of the Year for Americas Corporate Bonds by The Banker magazine. This dual-tranche bond was issued as part of GM's Sustainable Finance Framework — developed in alignment with the Green Bond Principles — and represented their first capital markets activity specifically supporting the company's electric vehicle strategy and targets (e.g., eliminating tailpipe emissions from new U.S. light-duty vehicles by 2035 and

¹³ [International Energy Agency, "Tracking Clean Energy Progress 2023," July 2023.](#)

¹⁴ [REG: Renewable Energy Group Reports Fourth Quarter and Full Year 2020 Financial Results, 2021.](#)

¹⁵ The GHG Protocol Corporate Standard classifies a company's GHG emissions into three "scopes." Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions are all indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.

¹⁶ [Enel, "Enel Successfully Launches a Dual-Tranche 1.5 Billion Euro, Sustainability-Linked Bond, in the Eurobond Market," February 2023; Bloomberg, March 2023.](#)

¹⁷ As of November 29, 2023, taking foreign exchange rates at respective issuance dates.

achieving carbon neutrality in global products and operations by 2040). GM allocated the proceeds from the offering to two projects in the GM Green – Clean Transportation category: capital expenditures toward Factory ZERO Assembly Center in Detroit-Hamtramck, Michigan, and Orion Assembly, in Orion Township, Michigan. Both facilities once produced gasoline-powered vehicles and will be dedicated to building EVs.

CASE STUDY

Fixed Income Climate Transition Alignment Strategy

To align investments with clients' climate goals, the AWM Public Markets Investing group's Fixed Income team collaborates closely with clients to understand their climate goals and design bespoke portfolios tailored to their unique objectives and constraints. Dutch client NN Group has set an ambition to transition its proprietary assets to net-zero greenhouse emissions by 2050, matching the objective to limit global warming. NN Group has set intermediate targets for multiple portfolios against which progress and effectiveness are measured. We have co-created a tool that assesses alignment of issuers with the goals of the Paris Agreement. Corporate issuers are assessed on real-world decarbonization efforts and forward-looking elements such as long-term ambition, short- and medium-term targets, decarbonization strategy, and capital allocation plans among others. This is in line with the goals set by the Institutional Investors Group on Climate Change (IIGCC). The tool is used in the portfolio construction process to align with the client's objectives.

2. Climate Transition-Enabling Technology and Infrastructure

In addition to our work helping clients in hard-to-abate sectors transition, we recognize there is a need to rapidly scale global investments in technologies and infrastructure, which directly contribute to or enable emissions reductions. To help address the scope of the investment required, we think it is important to take a comprehensive approach — identifying, acquiring, developing, owning, financing, investing in, and operating innovative companies and technologies to address a broad range of climate transition-related challenges.

We believe there is a significant opportunity for private capital in particular to advance emerging technologies and benefit from long-term investment opportunities. Within our AWM segment, we have developed the Horizon platform, which includes strategies that seek to identify investments that have the potential to disrupt and positively transform industries through

decarbonization, risk mitigation, and adaptation. Through the Horizon Platform, the Sustainable Investing Group has invested in grid-scale battery storage assets and has continued to move capital into innovation such as building energy management, cold chain shipping, wind power drone inspections, and energy grid storage. In addition, our Private Infrastructure team has recently established a company that designs and builds biomethane plants across Europe.

Within our GBM segment, we have continued our work developing technological platforms to support efficient and effective climate-related markets, which are a critical mechanism to help support the climate transition.

CASE STUDY

GS Pearl Street

The climate transition is driving a significant global build-out of intermittent renewable power generation, such as wind and solar. In turn, these accelerated shifts in the global energy mix are leading to market imbalances and the need for more flexible power capacity, as well as presenting challenges for system operators in maintaining grid stability. In recent years, this has intensified the demand for clean power technologies such as energy storage and other grid stability technologies.

To help meet these demands and challenges, the Commodities Sustainable Solutions team within the Commodities Group (part of GBM) is developing GS Pearl Street — a platform to provide trading, route-to-market, and principal financing solutions for clean power technologies. GS Pearl Street builds on our 20 years of experience in trading and financing in power markets, and will support owners of clean power assets and system operators, as they manage the transition to renewable power generation.

As part of this innovative platform, we are offering the owners of grid-scale energy storage systems a route-to-market solution combined with long-term project financing.

CASE STUDY

Xpansiv

The voluntary carbon credit market, which in 2022 was worth approximately \$2 billion, has vast growth potential and could reach approximately \$50 billion annually by 2030.¹⁸ However, most environmental commodity markets are still in their infancy in terms of transparency and efficiency.

To help address this gap, we helped to finance Xpansiv — a high-growth, vertically integrated market platform connecting

¹⁸ Bloomberg NEF: "Carbon Offset Market Could Reach \$1 Trillion With Right Rules," January 2023.

buyers and sellers of environmental commodities such as voluntary carbon credits, renewable energy credits, and low-carbon fuel certificates. This transaction is an important milestone in the development of key market infrastructure for environmental commodities.

Xpansiv's growing ecosystem supports companies seeking to meet sustainability goals with various business lines that cover the environmental commodity lifecycle from inception at registries to trading, market data, and ongoing portfolio management. To support Xpansiv's acquisition and growth strategy, Goldman Sachs helped finance the business through a strategic investment alongside other financial institutions. As part of the investment, Goldman Sachs participates in Xpansiv's Advisory Council.

CASE STUDY

Verdalia Bioenergy

As part of the ongoing transformation of the global energy supply, alternative fuels such as biomethane – a low-carbon natural gas produced through the anaerobic digestion of organic waste – can serve an important role. Biomethane is particularly relevant for Europe's decarbonization and energy security plans given it provides the benefits of fossil fuel natural gas with lower lifecycle carbon emissions, while being produced domestically and leveraging the large gas infrastructure already in place. The environmental benefits of biomethane are amplified as it prevents methane emissions that could otherwise be released into the atmosphere from the decomposition of organic waste.

To capitalize on this opportunity, our Infrastructure Investing Group within AWM has established Verdalia Bioenergy, a new business focused on developing, building, owning, and operating biomethane plants across Europe with the aim of deploying in excess of €1bn over the next 3.5yrs. The company already has a presence in Spain and Italy and is considering expanding in other European countries.

CASE STUDY

Horizon Platform

To help bridge the capital gap needed to scale early-stage solutions for climate transition, our Sustainable Investing Group works with clients through a series of strategies across the Horizon platform.

The Horizon platform includes strategies which seek to identify investments that have the potential to disrupt and positively transform industries through decarbonization, risk mitigation,

and adaptation. Consistent with firmwide themes, the Horizon Platform invests in the five climate transition themes within our Sustainable Finance Framework (Clean Energy, Sustainable Transport, Sustainable Food & Agriculture, Waste and Materials, Ecosystem Services). This Platform seeks to invest in solutions that can be integrated into supply chains and business operations, so positive impacts can accrue at meaningful levels in the short term. These investments span markets in North America and Europe and include leading manufacturers in lithium-ion batteries, sustainable packaging materials, and high-quality recycled cotton fibers; businesses aiming to increase efficient water usage in agriculture; and, businesses increasing energy efficiency in commercial and industrial buildings.

Our Horizon strategies seek to address a number of key issues related to the climate transition, including the following examples:

- As the world increasingly relies on renewable electricity, battery storage infrastructure is expected to grow in tandem by a factor of 15 times by 2030¹⁹ to correct for the intermittent nature of renewable energy sources. To help meet growing demand for grid-scale batteries and renewable energy sources, the Horizon Platform invested in EPC Power, which designs and manufactures inverters for grid-scale renewable energy storage, solar power, and micro-grid applications, among other end marks. EPC differentiates its US-made inverters via software-defined advanced functionality, including industry leading response times that enable participation in critical ancillary grid services.
- Increasing renewables penetration creates energy supply intermittency, which is driving a heightened need for energy storage to provide grid system reliability and resiliency. This trend is accelerated by the US Inflation Reduction Act (IRA), which provides 30%–50% investment tax credits for eligible project costs for stand-alone energy storage projects.

In 2022, the Horizon platform and infrastructure investing team established GridStor as the operating company to acquire, develop, and operate stand-alone battery energy storage projects. Such energy storage systems expect to charge electricity during hours with relatively high renewable energy supply and low power prices; the systems then discharge electricity during hours with low renewable energy supply, high demand, or when the grid needs instant response capacity for reliability. The battery storage assets are expected to play a critical role in providing grid reliability and help attenuate price volatility. Since launching in April 2022, the GridStor team has grown to 36 employees, with its first 60 MW facility online, another 1.9 GW of utility-scale energy storage projects under development in California, and more than 1 GW of additional positions across regions in the central and western U.S.

¹⁹ BloombergNEF. "Global Energy Storage Market to Grow 15-Fold by 2030." October 12, 2022.



3. Research and Insights on Climate Transition

To help guide clients through their transition to a low-carbon economy, we believe research is essential to understanding the economics and technology shaping the transition. The proprietary research from GIR – including *Carbonomics*, GS SUSTAIN – and our market surveys help our clients and investors understand decarbonization trends and the impact of sustainable growth on the real economy. Ultimately, we aim for this information to help drive better decision-making for our clients.

CASE STUDY

Carbonomics

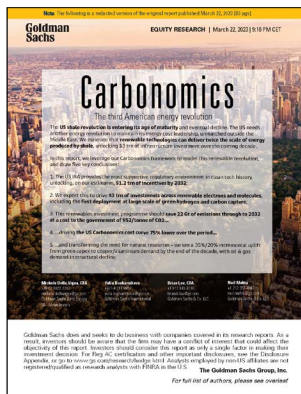
Launched in 2019, *Carbonomics* is GIR’s flagship series focused on the economics of decarbonization and sustainable growth. The *Carbonomics* research series includes detailed analysis into a variety of key topics, such as decarbonization cost curves,²⁰ climate finance transition capital gaps,²¹ implications of policies and legislation such as the IRA,²² and roadmaps to net zero for the world’s largest economies.²³

In the past year, *Carbonomics* has developed a number of important research pieces related to the climate transition including Affordability, Security, and Innovation; and The Third American Energy Revolution.

Affordability, Security, and Innovation (November 2022)

As part of the annual updating of the *Carbonomics* cost curve (i.e., cost curve of decarbonization for GHG emissions), several key conclusions arose:

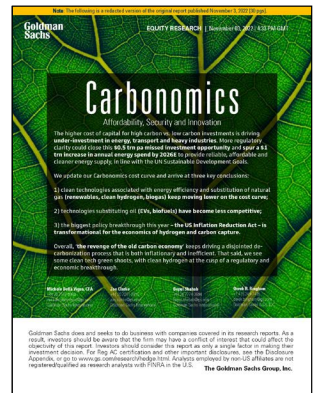
- Clean technologies associated with energy efficiency and the substitution of natural gas (e.g., renewables, clean hydrogen, and biogas) continue to move lower on the cost curve. Meanwhile, technologies that substitute for oil (e.g., electric vehicles and biofuels) have become less competitive comparatively, leading to a lower carbon abatement price for power generation, industry, and buildings, but a higher price for transport.



- The higher cost of capital for high carbon investments along with higher regulatory uncertainty is driving under-investment in energy, transport, and heavy industries, resulting in a disjointed energy transition (i.e., the most and least emitting fuels – coal and renewables – are on a growth trajectory) with an affordability crisis (i.e., direct energy cost per capita has reached the highest level in over two decades). More regulatory clarity could help close this \$500 billion per year missed investment opportunity and spur a \$1 trillion increase in annual energy spend by 2026.
- The IRA – a critical piece of legislation related to the climate transition passed in 2022 – is transformational for the economics of hydrogen, energy efficiency and storage, and carbon capture.

The Third American Energy Revolution (March 2023)

As the US shale industry approaches its age of maturity, the country needs another energy revolution to maintain its energy cost leadership. To meet this challenge, renewable technologies appear poised to deliver twice the scale of energy produced by shale, unlocking \$3 trillion of infrastructure investment in the coming decade. Several key conclusions arose when leveraging the *Carbonomics* framework to model this renewable revolution.



- The IRA provides the most supportive regulatory environment in clean tech history, unlocking – by *Carbonomics* estimates – \$1.2 trillion of incentives by 2032, which in turn would unlock \$3 trillion of infrastructure investments to 2032. Incentives for renewable investment would mostly impact the transport sector and include the first large-scale deployment of blue and green hydrogen and carbon capture.
- The CO2e savings from the IRA incentives is estimated at 22 Gt, implying a \$52/ton cost of CO2 abatement. In turn, *Carbonomics* estimates this will transform the US decarbonization cost curve, driving the curve 75% lower.
- Electrification and clean energy are expected to transform American demand for natural resources, and in particular aluminium demand, and significant increases in demand for lithium, cobalt, and nickel by the end of the decade.

²⁰ [Carbonomics: Affordability, Security and Innovation.](#)

²¹ [GS SUSTAIN: Green Capex - Accelerating the Energy Transition - Stimulating Capital and Return on Capital.](#)

²² [GS SUSTAIN: Green Capex - US Inflation Reduction Act - What’s Transformational, What’s Supportive, What’s Underappreciated.](#)

²³ [Carbonomics: Affordability, Security and Innovation.](#)



Alongside their research series, GIR holds an annual *Carbonomics* conference, which convenes investors, company management, regulators, and industry experts on climate transition.

CASE STUDY

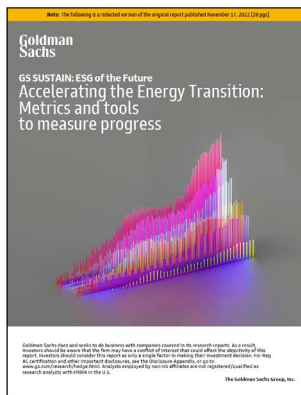
GS SUSTAIN

Launched in 2007, GS SUSTAIN provides global research and data tools to clients exploring how innovation, regulation, and implementation of ESG topics will impact sustainable investing and broader capital flows. GS SUSTAIN's data and research is utilized by both clients and internal teams to help quantify the impact and upside of potential investments. For example, a selection of their recent efforts includes back-testing of environmental scoring tools, quantifying revenue exposure for more than 7,000 public companies to the UN Sustainable Development Goals, estimating forward-looking green revenues and green capex for sectors relevant to the energy transition, estimating forward-looking emissions for companies in high emitting sectors, building a Climate Transition Tool (see the next sub-section for further details), and analyzing avoided emissions for select transition enabling sectors.

In the past year, GS SUSTAIN has developed a number of important research pieces related to the climate transition including:

Accelerating the Energy Transition: Metrics and Tools To Measure Progress (November 2022)

There is a need for quantifiable, forward-looking metrics that can help management teams and investors evaluate corporates' climate transition progress. To successfully measure the transition of corporates, GS SUSTAIN highlights the importance of five key metrics including green revenue, green capex, GHG emissions intensity, emissions avoidance, and management accountability.



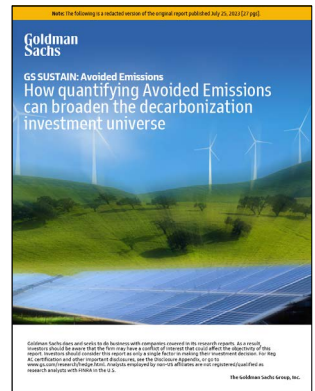
GS SUSTAIN also issued five key related recommendations.

- Companies can demonstrate transparency on their climate transition plans by providing interim targets, disclosing transparently on carbon offsets, and disclosing annual progress on targets and key milestones.
- Investors should engage/work with regulators to establish a common global definition of sustainable use cases.

- Companies seeking greater credit for sustainable business lines should provide more detailed disclosure on revenue and capex mix.
- Companies should provide annual reporting of emissions data and consistent operational data to enable greater comparability of emissions intensity figures.
- Climate transition progress metrics should be paired alongside financial performance when evaluating investments.

How Quantifying Avoided Emissions Can Broaden the Decarbonization Investment Universe (July 2023)

Climate solutions investments have continued to focus on “pure-play” solutions providers in renewable energy (i.e., wind, solar, and water) rather than other industries such as industrials, materials, and technology which have contributed (and will continue to contribute) significantly to enabling the climate transition. GS SUSTAIN's research demonstrates that, for example, improvements in energy efficiency have helped to reduce 50% more carbon emissions than renewable generation additions. To better identify and capitalize on the potential for underappreciated enabling sectors such as this, investors should consider incorporating avoided emissions into their investment decisions. This piece demonstrates that both building insulation and semiconductors are two important examples, with the potential to avoid significantly more emissions than they emit (20x-100x for building insulation and at least 5x for semiconductors).

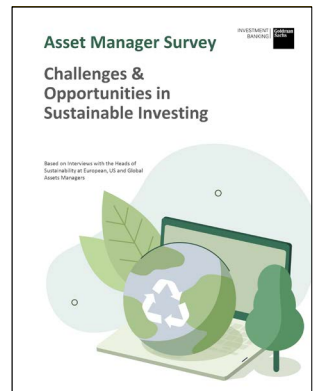


In addition to their data and research offerings, GS SUSTAIN holds an annual Global Sustainability Forum, which features investor and corporate panels and presentations.

CASE STUDY

GBM's Asset Manager Survey

In 2023, our GBM segment conducted its second survey of asset managers, which included 25 large institutions across the globe. The survey focused on assessing asset managers' current sustainable investing focus, the key drivers of their decision-making, and future challenges.



Some key findings from this survey include the following:

- Overall assets under management contracted due to market conditions, but most asset managers continued to experience inflows into their sustainable investing focused products, mainly driven by continued client interest and changing regulatory drivers.
- While overall sustainable investing-related assets under management and inflows remain positive, this has largely been driven by European asset managers due to regulatory factors and continued investor preference for sustainable assets, particularly Article 8 or Article 9 funds under the European Union Sustainable Finance Disclosure Regulation (SFDR).
- Over the last year, many asset managers have been focusing on preparing their operations to meet regulatory reporting requirements. As these reporting elements are embedded, many have shifted focus to ongoing challenges with climate data, including consolidation of data providers and integration of decision-useful data.
- Expectations for corporates are continuing to evolve, with a significant focus on increased and better reporting of data, concrete and actionable target setting and transition plans, and evidence of delivery on transition plans.

4. Innovative Tools and Analytics to Help Inform Better Decision-Making

Today's climate-related data landscape is complex. The reliability of climate-related data remains a key challenge for many companies, institutions, and investors in implementing their climate strategies and monitoring progress against targets and commitments.

To meet these key challenges, we strive to provide our clients and businesses with the best data available, leveraging our in-house proprietary solutions and external resources. Internally, we use data tools and solutions to drive our decarbonization efforts, support our monitoring and reporting, and inform our forward-looking planning and analysis. Simultaneously, we aim to provide our investor and corporate clients with proprietary tools and decision-useful metrics to help them consistently and effectively evaluate their climate performance and progress, identify opportunities, and allocate capital to meet their objectives. Examples of our data-related tools and solutions include centralized data hubs, climate transition assessments of specific companies, and forward-looking alignment tools.

CASE STUDY

ESG Beacon

In 2021, Goldman Sachs launched ESG Beacon, a centralized sustainability data hub that originated out of GS Accelerate, the firm's internal incubator and innovation platform. ESG Beacon builds on the firmwide data platform, Legend, that was open sourced in 2020. ESG Beacon provides access to sustainability data and shared tooling to streamline use and ensure strong governance. A dedicated team sources, ingests, models, and delivers shared sustainability data to businesses across the firm.

Examples of shared data range from external data (e.g., emissions) to internal GS data (e.g., output from the GS SUSTAIN Climate Transition Tool). This data can be accessed as appropriate across the firm's various businesses. Examples of shared solutions include analytics (e.g., portfolio aggregation), tools (e.g., data comparison), and quality control (e.g., safeguards checks and lineage tracking).

Example Use Cases

- **External reporting:** The ESG Beacon team was closely involved with sourcing data to calculate progress against Goldman Sachs' 2030 sectoral targets (as further detailed in the Metrics and Targets section of this report on p. 43). Data was sourced from the central engineering platform, and the ESG Beacon team provided guidance on data-related queries.
- **Emissions data diligence:** The ESG Beacon team has developed tools that allow users to compare emissions metrics between different data sources for individual companies as well as at a portfolio level. This tool allows rapid identification of large variances in emissions data to prioritize areas of further investigation and identify where company emissions data may be less reliable.
- **Centralization of external nonprofit organization data:** ESG Beacon centralizes data from a variety of nonprofit organizations and partners by providing streamlined data ingestion services, data dictionaries, and dashboards. ESG Beacon enables firmwide access to nonprofit data to inform internal analysis and external advisory (subject to controls).
- **Accelerate client tools:** ESG Beacon supports internal teams across the firm, to help them support a broad range of clients: from corporate advisory (e.g., SBG's analytics suite), to client investments (e.g., nonprofit data in asset management portfolio analytics), to institutional client trade post-trade analytics (e.g., Marquee Carbon portfolio footprint tools).

These tools and the ESG Beacon platform help to support the development of capabilities related to increasing regulatory requirements related to data and measurement.



We aim to continue to develop the ESG Beacon hub and have identified a number of near-term priority initiatives to further centralize sustainability data and develop shared analytics within ESG Beacon.

CASE STUDY

GS Climate Transition Tool

The Climate Transition Tool – developed in 2022 by the GS SUSTAIN team, which is part of GIR – combines existing climate-related disclosures with GS SUSTAIN proprietary Climate Transition Metrics where applicable to help provide a more forward-looking lens into a company’s climate transition plan and decarbonization performance. The Climate Transition Tool utilizes 20+ metrics and covers more than 7,000 public companies across 50+ sectors including 3,200+ in the Americas, 2,600+ in APAC, and 1,200+ in EMEA.

The Climate Transition Tool provides a view on companies’ climate transition efforts through the lens of two distinct frameworks with associated scores:

- The **Transition Plan Transparency** framework is an absolute assessment of companies’ disclosures across metrics that demonstrate whether a company has a transition strategy in place (e.g., targets), how integrated the strategy is with the broader business strategy, and the quality of emissions reporting (e.g., Task Force on Climate-related Financial Disclosures support, assurance of disclosures).

- The **Transition Performance** framework is a sector-relative assessment, factoring in changes in the carbon emissions profile of a company and green business mix exposures (e.g., green revenue and green capex), incorporating GIR research analysts’ forward-looking estimates where applicable.

The Climate Transition Tool can be used in the investment process, for example:

- **Engagement:** Provides clients with an engagement tool to compare company performance with industry and regional peers.
- **Complement Reported Metrics with Proprietary Metrics:** GS SUSTAIN green revenue and green capex estimates help to fill gaps in critical data not widely available from existing company disclosures.
- **Portfolio Analysis:** Clients can assess how portfolios perform and find areas of opportunities for improvement.
- **Company Comparisons:** Allows clients to identify and understand how companies in their investment universe compare in terms of transition plan transparency and transition performance.

In Q4 2023, The Climate Transition Tool was added to the portfolio analytics offering via our Marquee Platform and complements the existing Carbon Analytics – further empowering investors to analyze their portfolios’ climate performance.

GS Climate Transition Tool

Examples of key metrics reported.



CASE STUDY

Paris Alignment Tool

The Public Markets Investing team within AWM leverages a Paris Alignment tool for certain tailored client solutions. This tool was originally developed by NN Investment Partners. This tool combines quantitative and qualitative information from internal and external data sources on a company's ambitions and target-setting, emissions performance, climate disclosures, decarbonization strategies, and capital allocation alignment to provide a forward-looking categorization of a company's alignment with the aims of the 2015 Paris Agreement. Companies are categorized as either "Achieving Net Zero," "Aligned," "Aligning," "Committed to Aligning," or "Not Aligned." As part of the ongoing refinement process, we continue to scale the tool's functionality, product applications and aim to expand the roll-out to our client base.

Example Use Cases

- **Portfolio Management:** For clients who have expressed interest in tracking the climate characteristics of companies within their portfolio, the Paris Alignment tool can be used to design tailored portfolios and track ongoing portfolio performance in accordance with each client's unique objectives.
- **Engagement:** Provides clients with an engagement tool to inform engagement by company performance with industry and regional peers.

Addressing Market Gaps

We seek to identify climate-related gaps in the marketplace and address them by leveraging our existing capabilities and developing innovative solutions, working with clients and strategic partners, and providing grant and concessional capital. Our industry partnerships ultimately create synergies for our commercial offering — the lessons we learn further inform the development and execution of our sustainable finance capabilities and the solutions we bring to our clients and to markets. We also conduct proactive engagement and advocacy with key industry groups and regulators to better serve our clients as they navigate the transition to a low-carbon economy.

Driving Capital into Under-Invested Climate-Related Markets and Opportunities

CASE STUDY

Climate Innovation and Development Fund

Despite growth in recent years, global climate finance flows continue to fall short of demand. In 2021-2022, average climate finance flows reached nearly \$1.3 trillion — nearly double 2019-2020 levels, but well below the roughly \$4.5-\$5 trillion estimated need.²⁴ The gap is particularly acute in Asia, where local economies remain heavily dependent on public-sector financing — and where clean energy investment is not yet at scale. In India, for example, the power sector may need about \$650 billion in additional financing to reach its 450GW renewable energy target.²⁵ Similarly, Vietnam's energy sector may need \$8-10 billion annually through 2030 to account for higher energy demand and looming energy shortages.²⁶

In 2021, to help address this gap, Goldman Sachs and Bloomberg Philanthropies seeded and launched the Climate Innovation and Development Fund (CIDF) with \$25 million of concessional capital. Structured as a blended finance²⁷ facility and managed by the Asian Development Bank (ADB), the CIDF was designed to help increase the pace, scale, and ambition of climate solutions and contribute to the clean energy transition

in India and Vietnam. With its seven distinct investments, the CIDF²⁸ has helped unlock ~\$500 million in private sector and government investments to support first-of-their-kind projects and solutions in these two emerging markets.²⁹ The CIDF's seven investments include:

Vietnam: VinFast – The First Electric Bus Fleet

CIDF provided a milestone-based grant that mobilized ~44x of investment capital to support the country's first fully-electric public transport bus fleet and first national electric vehicle charging network. The grant partially offset the project's high upfront capital expenditure cost of establishing electric vehicle manufacturing lines for electric buses ("e-buses") and the associated charging network. The project is now on track to build up to ~200 e-buses and add to the 150,000 charging ports VinFast has in place across 63 provinces and cities throughout the country.

India: Green Cell – Electrification of Intercity Bus Routes

This project mobilized ~14x of CIDF capital committed to support the purchase of 255 e-buses to replace diesel buses that run across 56 high-traffic intercity routes. To help reduce reliance on India's fossil fuel-based electricity grids, the CIDF grant component will partially fund (via a capital expenditure buy-down grant) a solar power-plus-battery storage system to charge the e-buses, supported by an offsite solar farm dedicated to the project. This combination allows a portion of the bus fleet to be 100% powered by renewable energy, which

²⁴ Climate Policy Initiative, Global Landscape of Climate Finance – 2023 & 2021.

²⁵ [Governments of India and the United Kingdom Join Forces with UN Special Envoy on Climate Ambition and Solutions Michael Bloomberg to Mobilize Private Capital in Support of India's Low-Carbon Transition.](#)

²⁶ [USAID, Clean Energy Report.](#)

²⁷ Blended finance is defined as the strategic use of development finance (from public or philanthropic sources) to mobilize additional private sector finance in sustainable development.

²⁸ [Progress and Lessons from the Climate Innovation and Development Fund.](#)

²⁹ All grant mobilization figures and projected CO2 or GHG emissions data for each CIDF project has been provided by ADB. Grant mobilization figures are rounded estimates as of the investments' financial close date.

may not have been economically viable otherwise. The buses are expected to serve five million people per year and include enhanced safety features for female passengers. The project aims to eliminate ~15,000 tons of CO₂e emissions per year, reflecting an important decarbonization effort given that the road transportation sector in India is largely fossil fuel based and contributes nearly 12% to the country's total emissions.³⁰

Vietnam: AC Energy – 88-Megawatt Wind Farm

CIDF's grant has mobilized ~31x of investment capital to support an 88-megawatt wind farm in South Central Vietnam. While the project featured bankable qualities, environmental and safeguard measures were a key consideration for stakeholders. The grant is designed to de-risk the wind farm's project finance through the provision of a revenue reserve facility, which disburses funds when operations are curtailed due to environmental and social safeguards — e.g. where operations are reduced to (1) lower the shadow flicker impact on residents in the project locality or (2) reduce mortality of birds migrating close to the turbines. The project aims to offset ~215,000 tons of carbon dioxide per year³¹ while meeting Vietnam's growing electricity demand.

Vietnam: Australis Greener Grazing – Climate-Resilient Aquaculture Production

CIDF's matched, milestone and activity-based grant mobilized ~14x of investment capital to support an initiative to research and develop the cultivation of *asparagopsis taxiformis* seaweed within commercial ocean farming. A small proportion of this particular type of seaweed in livestock's daily feed can reduce methane emissions associated with the digestive process by up to 98%,³² targeting a major driver of global emissions. For context, the agriculture sector is one of the largest contributors of global greenhouse gas emissions.³³ The grant will promote climate resiliency and foster ecosystem biodiversity.

India: Tata Power Delhi Distribution – Grid-Scale Energy Storage Capabilities

In addition to a loan facility with ADB, CIDF's grant, through a capital expenditure buy-down, mobilized ~22x of investment capital to partially fund the purchase and integration of a pilot 10-megawatt-hour (MWh) battery energy storage system ("BESS"), which is the first 10 MWh grid-scaled energy storage project at the distribution transformer level in South Asia. The project will help Delhi's grid to integrate clean energy sources such as solar and wind, and is expected to help reduce grid instability, black/brownouts, and damage to customer equipment through power surges.

Vietnam: GreenYellow – Solar Photovoltaic (PV) Rooftops

The CIDF mobilized ~8x of investment capital and is providing a grant to assist the financing role of GreenYellow, a project aimed at developing commercial and industrial rooftop PV solar systems in Vietnam. This funding, in the form of a conditional guarantee / first loss capital, will support a commercial bank's participation and aims to overcome the challenges of high upfront costs and limited financing options in Vietnam's emerging rooftop solar sector. With a planned peak capacity of up to 32.3 megawatts, this project aims to lead to an annual reduction of ~15,000 tons of carbon dioxide emissions by 2025.³⁴

India: Greenway – Improved Cookstove Use

The CIDF grant allocated to Greenway Grameen Infra Private Limited ("Greenway") is intended to enable the production and distribution of up to 1 million improved cookstoves in rural households of India's Madhya Pradesh and Odisha states. This investment, in the form of a liquidity reserve, mobilized ~12x of investment capital. In 2020, it was estimated that about 3.2 million people globally lose their lives due to household air pollution from inefficient cooking practices each year.³⁵ This initiative addresses health hazards caused by inefficient cooking practices, aiming to save lives and empower primarily women by reducing their domestic workload.

CASE STUDY

Open-Source Data and Analytics to Advance Climate Solutions

Goldman Sachs supports open-source tools and analytics to advance solutions to data challenges through our participation in various industry groups.

For example, [Open-Source Climate \(OS-Climate\)](#) — an umbrella project of the Linux Foundation using Open-Source best practices — was launched in 2022 with the aim of building a nonprofit, transparently governed public utility of climate-related data and analytics to rapidly scale investment in the climate transition.

As OS-Climate's founding US bank member, we have supported the organization's work to develop an open-source data platform and net-zero alignment tools that can be used across industries. Initial tools released by OS-Climate include Implied Temperature Rise (ITR) models for portfolio alignment,

³⁰ [IEA, Transitioning India's Road Transport Sector.](#)

³¹ [ADB, BIM Wind Sign \\$107 Million Financing Package to Support Wind Energy in Viet Nam.](#)

³² [Washington Post, An unusual snack for cows, a powerful fix for climate.](#)

³³ [IPCC, Climate Change 2022: Mitigation of Climate Change.](#)

³⁴ [ADB, GreenYellow Sign Deal for Commercial and Industrial Rooftop Solar in Viet Nam.](#)

³⁵ [World Health Organization, Household air pollution.](#)

and assessments of physical risk and transition analysis. This suite of tools and resources enhance the market's ability to make informed, risk-managed choices, ultimately contributing to climate resilience and adaptation efforts while aligning investments with climate objectives.

Through our membership of [The Fintech Open Source Foundation \(FINOS\)](#) – a fellow project of the Linux Foundation, Goldman Sachs has joined the open-source community in designing sustainability reporting tools to help increase data transparency, accuracy and efficiency, and support higher levels of audit assurance. In November 2023, Goldman Sachs hosted a day-long Hackathon, where more than 60 professionals from more than 15 firms, including non-profits, data-vendors, financial services, lineage-platforms, consultants and auditors, joined in testing climate data's journey from collection to aggregation to digital reporting. We plan to continue contributing to open-source solutions that help address some of today's common data challenges.

Engagement and Advocacy

As a global financial institution, we recognize the importance of multi-stakeholder engagement with trade associations, industry groups, and policymakers to advance our commercial priorities and our clients' objectives.

Our participation in various trade associations, industry groups, and initiatives supports our ultimate goal of managing risk and creating value for our clients and our firm. Our participation does not indicate that we are in complete agreement with the entirety of each group's stated policies. Rather, we participate in such groups and initiatives to the extent that their objectives align with our own commercial priorities and the needs of our clients. We aim to contribute our expertise to these organizations and leverage their input where doing so is consistent with our policies and appropriate for our firm.

Memberships and Engagement

Consistent with the principles and limitations described immediately above, we participate in a number of climate- and/or sustainability-focused initiatives and organizations, including the UN Principles for Responsible Banking, UN Principles for Responsible Investing, RMI's Center for Climate-Aligned Finance, and Net Zero Banking Alliance.

Public Policy Advocacy

Goldman Sachs participates in direct advocacy on certain public policy issues we believe foster global economic growth, promote financial stability, and improve communities and society, all of which impact our firm, our clients, capital markets, and the general economy. As part of our engagement in the public policy process, we participate in several trade organizations and industry groups, such as the Financial Services Forum, Bank Policy Institute, Securities Industry Financial Markets Association, Asia Securities Industry & Financial Markets Association, Association for Financial Markets in Europe, Council of Institutional Investors, American Bankers Association, Institute of International Finance, and International Swaps and Derivatives Association, among others.

Managing Our Firm

We provide our people with the tools, resources, and support they need to help our clients and enhance the value of our firm. We are committed to responsibly managing our operational and supply chain footprint while monitoring and managing climate risk within our work space and business processes and our portfolio through scenario analysis, integration of climate into our Risk Appetite Statement, and integration of climate risk into our business processes.

Operations and Supply Chain

Managing our operations and supply chain is integral to operating the firm sustainably, and our experience in managing our business also enables us to advise and support clients on their operational sustainability objectives.

We have continued to build on our existing state of carbon neutrality across our operations and business travel since 2015, with an expanded commitment to achieve net zero by 2030 in our operations and supply chain. Since making this commitment, we have made progress, with a focus on key initiatives.

Our Operations

We have enacted a number of initiatives to reduce our operational footprint, including improving energy efficiency and increasing our sourcing of renewable energy.

For example, in 2022, we maintained Leadership in Energy and Environmental Design (LEED) Gold certification or its equivalent for all new builds and fit-outs. As we plan, design, and construct new workplaces, we seek low-carbon strategies and sustainable designs that reduce energy use, carbon emissions and potable water consumption to the greatest extent feasible, and continue to evaluate opportunities for ongoing operational efficiencies. As of 2022, 71% of our global square footage has been LEED (or equivalent) certified. We also source renewable electricity equivalent to 100% of our global consumption and we play a role in enabling new renewable electricity to be brought to the grid in key locations where we operate.

In addition, climate-related risks may be considered as part of our corporate real estate strategy. Climate risk assessment and mitigation is integrated into our associated business resiliency processes, which includes collaboration across multiple teams (e.g., Facilities Management, Office of Global Security). Simulation exercises are also used to assess the risks that have the potential to disrupt normal business operations.

Our Supply Chain

In order to make progress on our supply chain net zero commitment, we have taken steps to improve our understanding of the emissions of our supply chain.

For example, in 2022 we asked our top vendors to provide their environmental data and climate strategies. We utilized key findings from their responses to offer resources and training on greenhouse gas inventory management and provided direct and tailored feedback to over 30 vendors across a range of industries. Accurately understanding vendor-specific emissions and strategies helps improve our ability to support our vendors' decarbonization goals. We are also beginning to leverage the expertise of commercial decarbonization teams within our business, including SBG, to support our vendors, and other companies, on their journeys to net zero. We recognize that a portion of Scope 1, 2, and 3 operational and supply chain emissions will not be eliminated through these reduction strategies and will require investments in carbon avoidance and removal credits. Working with internal stakeholders, we have established a governance framework around potential carbon credit purchases in the context of sourcing for our own operational commitments, to ensure they meet our criteria around quality, organizational priorities, and emerging best practices.

Progress Toward Our Operational Goals

Our efforts to drive sustainability in our own operations and supply chain include broader sustainability milestones, including, but not limited to, energy and emissions impact, where we have several near-term operational goals for 2025 to measure progress. For more information on the key actions taken this year within these areas and quantified progress toward operational goals, refer to the Goldman Sachs 2022 Sustainability Report.



Managing Risk in Our Portfolios

In addition to our work with clients and partner organizations to help drive impact on climate transition in the real economy, we have also developed a strategic framework for addressing the risks posed by climate change on our businesses and operations.

Climate Risk Identification

Climate risk identification is a critical first step in managing climate risk in our portfolios. We categorize climate risk into **physical risk** and **transition risk**. Physical risk is the risk that asset values may change as a result of changes in the climate while transition risk is the risk that asset values may change

because of changes in climate policies or changes in the underlying economy as it decarbonizes.

Physical risk is further broken down into acute and chronic risks, while transition risk is broken down into policy risks, technology risks, and liability risks, in line with common industry categories. Physical and transition risks may have meaningful impacts in the short, medium, and long term. These risks are incorporated into the Firmwide Risk Taxonomy, which includes both financial and non-financial risks. The Firmwide Risk Taxonomy also recognizes that climate-related risks may materialize through other risk categories (e.g., Credit and Market Risk, Liquidity and Funding Risk, and Operational Risk). We have integrated climate risk management into each of these risk categories as described in further detail in the Risk Management section.

Categorization of Climate Risk

PHYSICAL RISK

Physical risk is the risk that asset values may change as a result of changes in the climate. Risks related to the physical impacts of climate change include acute risks and chronic risks.

Acute Risks

Event-driven (e.g., damage to assets from extreme weather events, disruption to operations/supply chains).

Chronic Risks

Longer-term shifts impacting resource availability (e.g., sea level risk, chronic heat waves).

TRANSITION RISK

Transition risk is the risk that asset values may change because of changes in climate policies or changes in the underlying economy due to decarbonization. Transition risks include policy, technology, and liability risks.

Policy Risks

Supply-side policies encourage substitution away from carbon-intensive technologies and products. Demand-side policies discourage consumption of carbon-intensive goods/services.

Technology Risks

Technology development and deployment can affect competitiveness/demand of certain sectors/goods.

Liability Risks

Exposure to high-emission sectors can affect current and projected resiliency of operations to legal liability and reputational damage. There is potential for this to increase as loss and damage from climate change grows.

Time Horizons

The firm defines the following short-, medium-, and long-term horizons, which are relevant for the evaluation of climate-related risks and opportunities. These time horizons were selected to reflect a combination of tenures over which transition and physical risks are generally relevant for scenario analysis, risk management, investment processes, and the positioning of relevant portfolios.

The firm's scenario analysis capabilities analyze the impact of climate risks across a range of time horizons. Our methodology provides flexibility to assess short-, medium-, and long-term tenures as well as different shock applications along the climate scenario pathway.

For example, the firm considers shorter-term acute risks such as climate-related event-driven damages to assets from increasing frequency and severity of extreme weather events. In addition, the firm also has the capabilities to analyze chronic climate-related risks such as longer-term shifts impacting the environment (e.g., sea level rise or chronic heat waves). When first line of defense investment teams complete a physical climate risk assessment as part of the transaction review process for select in-scope transactions, depending on the term of the loan or investment, they evaluate the severity of physical climate risk factors either for today or a future time period.

Short-Term (0-5 years)

Aligns with the time horizon of how we manage potential market risks, instantaneous impacts from policy changes, investment due diligence, and asset selection processes.

Medium-Term (5-10 years)

Aligns with the time horizon for managing risks related to our 2030 sectoral targets, internal scenario analysis, policy and regulatory-related risks, risks assessed through our product development process, and the exit and liquidation of our investments.

Long-Term (10+ years)

Aligns with the time horizon for managing risks related to the firm's net zero targets for its lending and investments, strategic risk assessment horizon and quantification processes, and risks assessed as part of long-term product development.

Monitoring Climate Risk Within Our Portfolio Through Scenario Analysis

Based on the outcomes of our risk identification process, we have developed methodologies for assessing both physical and transition risks. These methodologies serve as fundamental elements for quantifying and integrating climate risk into relevant risk management processes across the firm. We use a variety of measurement methodologies to assess the potential impact of climate related risks and perform scenario analysis to identify vulnerabilities and risks on an ongoing basis. Based on our findings and also as industry-wide capabilities advance, including data availability, we are continuously evaluating relevant enhancements to our approach.

In both our physical and transition risk scenario analysis, we leverage open-source data and models used by the scientific and climate policy communities. For physical risk scenario analysis, we employ a combination of open-source data, General Circulation Models (GCM), and our internal methodologies to project how climate variables such as temperature may evolve over time at different geographical locations. In our transition risk scenario analysis, we use Integrated Assessment Models (IAM)³⁶ as a foundation to which we add our internally developed methodologies.

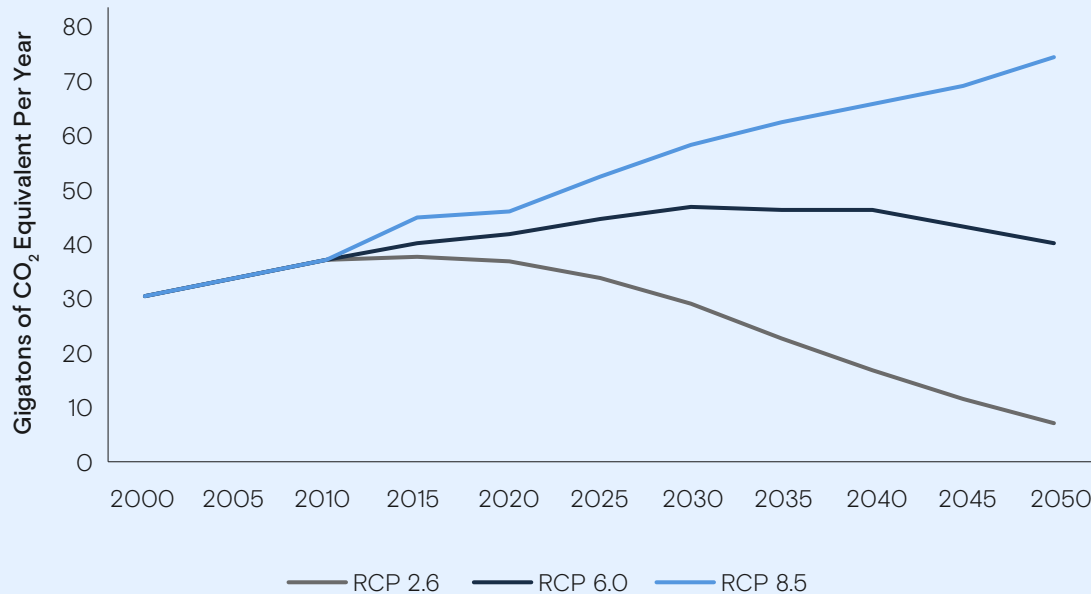
We have developed a robust climate scenario analysis framework that is able to leverage a number of climate risk scenarios. For example, we model both Representative Concentration Pathway (RCP) scenarios that project how emissions will evolve over time as well as Network for Greening the Financial System (NGFS) scenarios. The scenarios incorporate assumptions about climate policy changes as well as economic and demographic developments.

In our climate scenario analysis, understanding the range of impacts under various scenarios is fundamental to our risk management processes.

³⁶ IAMs, which are open-source models used by the climate policy community, combine a physical climate model with an underlying economic model.

The figure below illustrates the types of climate scenarios leveraged in the context of RCP scenarios, though our framework extends beyond these pathways and also possesses the capability to analyze NGFS scenario pathways.

Comparison of RCP Scenarios



Source: GS Risk

Physical Risk Scenario Analysis

Open-source GCM climate projections form the basis of our physical risk scenario analysis. We have developed relevant physical climate risk factor calculation methodologies and calculate overall severity of these risk factors for relevant future horizons under RCP 4.5 – the chosen baseline scenario – and RCP 8.5 – the stressed scenario. The global physical climate risk calculation allows for retrieval of the outcomes based on geo-coordinates as inputs, and position-level risk classification based on those outcomes. With global physical climate risk stress maps, we are able to identify physical risks over future periods at different geographical locations.

Physical Risk Factors and Scoring

Leveraging open source GCM models and our internal methodologies, we have developed a climate-related and environmental scoring approach for seven physical risks and one environmental risk. In the following, we describe our treatment of these risk metrics in more detail:



1. Frequency of Extreme Temperature

Climate change is expected to increase daily temperatures, including heat waves and high humidity, globally. We use climate models to define extreme temperature metrics (Consecutive Hot Days, Hot and Wet Days, etc.) and establish a risk index based on the number of days meeting these criteria.



2. Heat Stress Index

For heat stress in direct sunlight, we adopted the Wet Bulb Globe Temperature (WBGT) measurement, which combines relative humidity with standard temperature measurement to produce a single comprehensive and highly relevant heat stress index. Based on the GCM model output, we developed an algorithm to estimate WBGT for any given geo-coordinate.



3. Water Stress and Dryness Index

Severe drought conditions may be caused by global warming, even in regions where such events have been historically rare. We use GCM outputs to calculate the local dryness index, which we employ to project the total renewable freshwater resources.



4. Increase in Energy Demand for Cooling Purposes

As temperature rises, demand for additional energy for cooling purposes will increase. In our physical risk model, we evaluate an increase in energy consumption for cooling purposes versus a baseline, which considers historical electricity usage patterns and projections of daily high temperatures from GCM data.

5. Hurricanes and Typhoons

Some major metropolitan areas are located in coastal areas where cyclones (hurricanes and typhoons) are frequent. Since hurricane activity is not a direct output of GCMs, we analyze historical hurricane data for global locations and summarize it via a hurricane/typhoon index that encodes the number of historical events and the corresponding maximum sustained wind speed for the given location. The extreme precipitation that sometimes occurs during these events is captured in the GCM projections, and its physical risk impact is captured in our flood risk index.

6. Sea Level Rise, Coastal Floods, and Non-Coastal Flooding

Coastal properties face high risk from Sea Level Rise (SLR), which will continue even if global temperatures stabilize, due to the irreversible loss of continental ice caps. We developed an SLR index to estimate future coastal flood frequency based on historical frequency. Non-coastal flooding (NCF) refers to inland flooding events unrelated to SLR and may occur in landlocked areas far from seas and oceans.

7. Wildfires

We measure wildfire risk by factoring in both number of annual wildfires and size. The projected wildfire index increases with temperature, based upon the underlying assumption that high temperature corresponds to higher wildfire impacts. We use the temperature projections from the GCM output which is then paired with historical wildfire data.

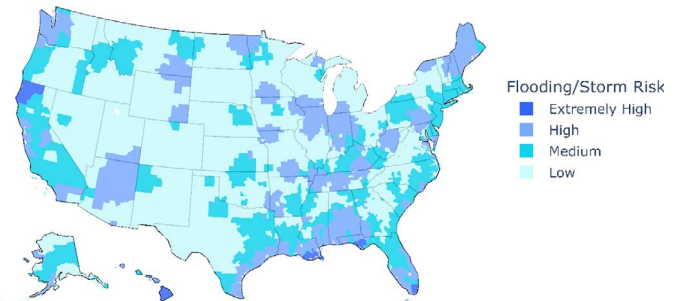
8. Seismic Activity and Earthquake Risk

Although not directly related to human-caused climate change, we have also included a scoring methodology for earthquake risk, which we consider to be a significant environmental risk factor. We rely on historical data to derive the intensity (as measured by the Mercalli scale) for a global location, given the earthquake epicenter and its magnitude. The derived index summarizes the damage potential for buildings resulting from an earthquake.

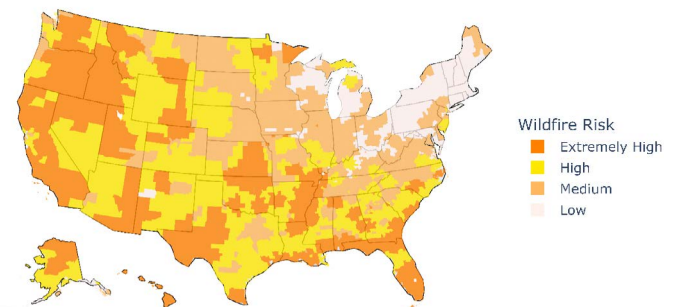
For each of these physical climate risk hazards, we categorize the physical risk severity (extremely high, high, medium, low) and translate these severity ratings into stressed losses. For physical risk, global impact from both acute and chronic hazards are relevant. We continue to explore portfolios broader than real estate property collateral. Based on the analysis conducted so far, the impact of physical risk on our real estate lending portfolio is low due to limited scope of portfolios directly examined and other credit considerations mitigating the impact, though we continue to monitor the severity of impacts.

The GCM outputs include daily high and low temperatures, as well as daily precipitation globally until the year 2100 with quarter-degree by quarter-degree global spatial resolution under RCP 4.5 and RCP 8.5. The data illustrated in the figures below represents two physical risk hazards across the US demonstrating the range of severities from low to extremely high, which shows areas most exposed to sea level rise, coastal floods, and non-coastal flooding, and wildfire risk in a 2050 climate environment.

US Flooding/Storm Risk Severity in a 2050 Climate Environment under RCP 8.5



US Wildfire Risk Severity in a 2050 Climate Environment under RCP 8.5



Transition Risk Scenario Analysis

Due to varying decarbonization policies among countries and industry differences, we assess transition risk by generating financial shocks (rapid changes in indicators like stock prices, credit conditions, and credit ratings) under different climate policy scenarios by country and industry. These shocks are then integrated into our scenario analysis to evaluate their potential impact on our portfolios. To assess impact, three key scenario design decisions are involved.

1. Model Selection

Our transition risk scenario analysis uses the outputs of an open-source IAM to assess climate change policies and technology strategies globally. The IAM integrates the world's energy, agriculture, and land use systems with a physical climate change model and has been widely used by the climate research community to study the effects of climate policies.

2. Scenario Selection

Within our climate risk assessment, we leverage scenario pathways, including both NGFS and RCP. These pathways are considered independently, according to specific use cases. NGFS has greater flexibility as related to financial and macroeconomic aspects guiding our evaluation of climate-related risks in the financial sector. RCPs are climate modeling pathways that represent future greenhouse gas concentrations. Both frameworks provide scenarios that may serve as baseline transition risk scenarios, for example, RCP 6.0 or NGFS Current Policies.

The following scenarios are considered as stressed transition risk scenarios:

- Scenarios in which the Paris Agreement is implemented by all countries, like RCP 2.6 and RCP 1.9; such that global warming is restricted to 1.5°C through stringent policies and innovation, similar to NGFS Net Zero 2050.
- Scenarios in which the Paris Agreement is partially implemented, like RCP 3.7 and RCP 4.5. Intermediate scenarios, considering the exhaustible nature of non-renewable fuels.

3. Transition Risk Methodology

Our transition risk model takes the emission pathways, sector-level and (where applicable) company-level carbon intensity data, and historical risk factor data as inputs. These inputs generate estimated risk factor shocks (e.g., equity shocks) when moving from the base scenario to a stress scenario. Losses, under various climate transition scenarios, are then projected using these shocks.

When implementing each scenario, we assume a credible policy change is announced and the market consequently adjusts credit ratings and prices of affected companies and trades. In each scenario, we estimate the change in credit ratings that would result from each policy change as well as the changes in equity and credit prices that are consistent with those credit rating changes. We then reprice all affected assets on our balance sheet to measure the total change in value that would result under each scenario. Given the current business mix and structure, and based on our initial climate scenario analysis, we have estimated the magnitude of potential losses for various scenarios. These estimates assume an immediate and credible change in climate policies that are factored into current market price. We continue to refine these estimates, such as measuring impacts along the path. Under this approach, we are actively monitoring the estimated loss impact from transition risk to the firm but deem the impact to be low in comparison to other downside stress scenarios the firm assesses. We will continue to refine our estimates and methodologies.

Climate Risk Integration

As a firm, we are integrating climate scenario analysis and the associated proprietary physical and transition risk capabilities into our risk management framework, including evaluations of new loans. Further integration efforts are captured in the Risk Management section.

We have developed a framework for measuring and monitoring our climate risk appetite within our RAS including setting climate thresholds for select legal entities. The global, firmwide RAS framework includes methodologies for assessing transition and physical risks, including through climate scenario analysis, to help us identify vulnerabilities and further inform business selection.

We have incorporated enhanced considerations for assessing climate-related and environmental risk during underwriting, including a dedicated section to document physical and transition risk exposure and potential mitigation within select capital and investment committee processes.

Section IV

Risk Management

As a global financial institution, Goldman Sachs is exposed to climate-related risks that manifest in different ways across our businesses.

While we see significant climate-related opportunities across our financing, investing, asset management, and advisory activities, we also understand that extreme weather events or chronic changes in temperatures resulting from climate change may disrupt operations or affect the value of our clients' and the firm's investments.

Negative financial impacts on clients and markets from climate change may result in higher credit risk or disrupt

markets. Involvement in certain industries associated with climate change may also pose reputational risk. To identify, mitigate, and adapt to these climate-related risks, we are committed to advancing our climate risk management capabilities, building on the firm's deep risk management culture.

In this section:

- 36 Our Three Lines of Defense
- 37 Climate Risk Identification and Assessment
- 39 Integration of Climate Risk into Risk Management Processes
- 42 Consideration of Other Environmental and Social Risks Alongside Climate

Our Three Lines of Defense

Goldman Sachs' Enterprise Risk Management Framework consists of several key processes including risk identification and assessment, risk appetite, limits and threshold setting, risk reporting and monitoring, and risk decision-making. Our risk management framework is based on a "three lines of defense" structure, which covers financial and non-financial risks, including climate-related risks.

First Line

Our Businesses

Our businesses are considered the first line of defense and are accountable for outcomes of risk-generating activities, as well as for assessing and managing those risks, including climate-related risks, within clients' risk appetite and the firm's risk appetite.

Second Line

Independent Oversight and Control Functions

Independent risk oversight and control functions are considered the second line of defense. There are both business segment-specific and firmwide risk and control functions that perform second line risk management activities, including independent assessment, oversight, and challenge of the risks taken by the first line of defense.

Third Line

Audit

Internal Audit is the third line of defense and provides independent assessments and opinions of the firm's overall control environment, risk management controls, and governance processes. Internal Audit reports to the Board Audit Committee.

Our approach to climate risk management starts with climate risk identification and assessment, which provides the foundational information that supports our efforts to integrate climate risk into risk management processes. This includes understanding the potential materiality of climate-related risks and determining how they manifest across the firm's businesses, as well as monitoring and managing climate-related risks within our broader enterprise risk management framework.

In the Goldman Sachs TCFD Report 2021, we outlined our firm's approach to managing climate-related risks across our businesses and how we have begun to integrate climate risk considerations in our decision-making. Over the past two years, we have continued to make enhancements to our climate risk management framework, including steps to further integrate climate into the firm's broader risk management processes.

Key enhancements to our climate risk management processes detailed in this report include Climate Risk Identification and Integration.

Climate Risk Identification and Assessment

- Further refining the Firmwide Risk Identification framework for climate-related risks, including physical and transition risk drivers and resulting impacts across risk categories

Integration of Climate Risk into Risk Management Processes

- Further integrating climate risk into existing risk management processes
- Enhancing modeling capabilities and assessing climate across risk categories
- Developing climate risk concentration reporting to give insight into the sensitivities of lending exposures to climate-related risks by sector and geography

Climate Risk Identification and Assessment

Risk identification serves as the foundation for our firm's risk processes, informing risk strategy, mitigants, and controls. Our bank's risk identification process is supported by quantification methods, data infrastructure, and analytics, culminating in our comprehensive Risk Factor Inventory encompassing financial and non-financial risks, including climate-related risks.

This inventory contributes to our quantitative modeling, including climate scenario analysis, capturing both granular and broader, challenging-to-quantify risks. Quarterly Risk Identification workshops with first and second-line teams assess material risks in collaboration with teams like Credit and Market Risk to understand their impact on the overall risk profile.

This identification of climate-related risks precedes a materiality assessment of risk factors that may manifest across the firm's businesses. Since the Goldman Sachs TCFD Report 2021, the firm has also updated the Firmwide Risk Taxonomy to capture climate-related risks more comprehensively. The risk taxonomy is the classification structure by which the firm organizes potential risks and risk events, providing common terms for risk

identification, assessment, monitoring, and reporting processes. Within this taxonomy, climate-related risks are categorized within the broader Strategic and Business Environment Risk category as distinct, stand-alone risks. Additionally, we also consider climate-related risks to be potential drivers across all risk categories.

In describing physical and transition risks as risk drivers, we emphasize how they may impact other risk categories (Credit and Market Risk, Liquidity and Funding Risk, and Operational Risk) over a range of time horizons.

The following table details key climate risk drivers and examples that may arise across our risk categories.

Physical Risk Drivers

Drivers	Driver Examples	Example Impacts Across Risk Categories
Acute Physical Risk	Floods (Coastal and Non-Coastal)	Operational Risk: The loss incurred by damage to physical assets from extreme weather events has the potential to disrupt the firm's operations.
	Hurricanes/Typhoons	Credit and Market Risk: Acute physical risk events such as floods can disrupt our clients' operations and lead to weaker financial performance and greater risk or losses on our exposures.
	Wildfires	Credit and Market Risk: Damage to physical assets due to wildfires could reduce corporate profitability, thereby leading to higher probabilities of default and/or diminishing collateral value.
Chronic Physical Risk	Frequency of Extreme Temperatures	Operational Risk: The longer-term changes in climate patterns may impact resource availability, disrupt operations, and impact profitability.
	Heat Stress	Credit and Market Risk: Chronic physical risks could also decrease the value of holdings, particularly for real estate exposures.
	Long-Term Sea Level Rise	
	Increase in Energy Demand for Cooling Purposes	
Environmental Risk (Including Biodiversity)	Seismic Activity and Earthquake Risk	Operational Risk; Credit and Market Risk: The risk from earthquakes may impact insurance considerations or increase likelihood of physical asset disinvestment in zones of high seismic activity.
	Water Stress and Drought	Operational Risk; Credit and Market Risk: The risk of insufficient access to water could negatively impact client finances, thus increasing the probability of default and raising lender risk exposure. This may also impact employees' health and safety as assessed for the firm's investments.

Transition Risk Drivers

Drivers	Driver Examples	Example Impacts Across Risk Categories
Technological Change	Technology Improvements or Innovations	<p>Credit and Market Risk: Increased competition from low-carbon and/or energy-efficient technologies may impact demand for certain sectors or goods. This may impact our clients' financial performance.</p> <p>Liquidity and Funding Risk: Liquidity outflows may occur through deposit withdrawals or drawdowns on revolvers if clients' business structures are inflexible as new technology innovations revolutionize operating models.</p>
Policy & Regulation	Carbon Prices and Other Emissions Regulations Global Trade Policies Regulations on Use of Products and Services Enhanced Reporting Requirements	<p>Credit and Market Risk: Changes in policies and regulations could lead to increased operating costs (through higher compliance costs or insurance premiums), negative impacts on asset valuations, and reduced demand for certain products and services provided by our clients.</p> <p>Liquidity and Funding Risk: For higher transition risk sectors, liquidity outflows could occur through deposit withdrawals or drawdowns on revolvers if clients are negatively impacted by new climate regulations.</p>
Liability & Legal	Climate-related Litigation Investor Pressures Reputational Risk	<p>Operational Risk: Exposure to high-emission sectors could affect current and projected liability and reputational damage.</p>
Market Sentiment	Changing Consumer Sentiment Market Value Volatility Materials Scarcity	<p>Credit and Market Risk: Shifts in consumer preferences, market signals, and rising input costs may lead to reduced demand for certain products and services, increased production costs, shifts in energy costs, changes in revenue mix, and re-pricing of assets.</p> <p>Liquidity and Funding Risk: Changing consumer preferences may affect market prices for certain products and services, leading to potential liquidity outflows.</p>

Integration of Climate Risk into Risk Management Processes

In order to effectively manage climate-related risks, we continue to integrate these risks into our management and decision-making processes. This includes embedding climate risk across our three lines of defense model, incorporating climate risk into the way we manage our operations, and integrating climate risk into portfolio management and investment decision making.

Embedding Climate Risk Across the Three Lines of Defense

First Line of Defense

A significant focus of our climate risk management program is appropriate integration in our first-line businesses. The firm incorporates climate-related and environmental risk assessments in select transaction underwriting decisions and continues to further strengthen business adoption of climate-related and environmental risk management. Our upfront business selection and due diligence processes include sector and geographic guidelines and are overseen through designated committee review processes. Enhanced considerations for assessing climate-related and environmental risk during underwriting are in place, including a dedicated section to document physical and transition risk exposure and potential mitigation within select capital and investment committee processes. Targeted trainings have been conducted with global teams most frequently impacted by these changes.

Second Line of Defense

Management Within Risk Categories

Climate risk is identified as a risk driver that could materialize across various risk categories. As such, we assess and manage climate risk in each risk category.

Credit and Market Risk

To monitor the impact of climate risk on the credit risk of companies with material wholesale lending exposure, transition risk analysis is performed for high transition risk companies (determined by the relative emissions intensity of the company's sector). This analysis includes an assessment of companies'

disclosures related to the low-carbon transition and evaluation of ongoing and future initiatives to mitigate their transition risk. The outcome of this analysis is a transition risk mitigation score which factors into the counterparty's overall credit rating.

For select transactions across our businesses, physical risk impact of climate risk on the firm's portfolios and value of our positions are also assessed. Second line of defense quantification teams are exploring how market risk factors can be further incorporated into existing transition risk climate scenario analysis capabilities. At present, climate scenario analysis focuses on credit and equity spread shocks, and we continue to assess how market risk sensitivity interacts with transition risks in our scenario-specific projections.

Liquidity and Funding Risk

Liquidity Risk uses climate scenario analysis to quantitatively assess the impact of transition risk on the firm's liquidity (e.g., policies and market dynamics that influence the demand for certain goods and services). This climate scenario analysis assessment specifically measures the liquidity impacts in a scenario where government policy changes result in more expensive access to capital markets for high emission intensity companies. In this high transition risk scenario, the reduced access to capital markets leads to increased reliance on funding from our firm, including revolver draws and withdrawal of deposits, resulting in liquidity outflows.³⁷

Operational Risk

The firm's Operational Resilience Framework is designed to ensure the firm's ability to prevent, respond to, recover from, and adapt to operational disruptions, such as those caused by physical risk impacts. The firm maintains a resilience testing program and has developed a 'severe but plausible' business disruption scenario library, utilized in integrated resilience testing of our important business services. The scenario library incorporates climate-related scenarios such as severe weather impacts, flooding,

³⁷ Due to a lack of historical climate-specific liquidity stress periods, the stress outflow calibration incorporates management judgment and is informed by the relative severity of non-climate specific liquidity stress periods.

Risk Management

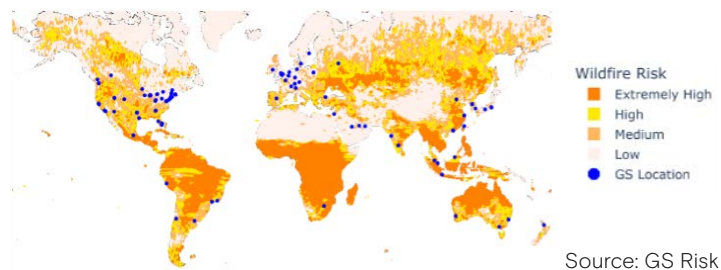
and extreme heat. Through our internally developed scenario analysis, we demonstrate severity of two physical risk hazards with Goldman Sachs' own operations overlaid.

The below heatmaps allow the firm to understand where mitigation strategies are most needed, for example, in regions whose exposure to the selected risk factor is expected to significantly increase through 2050.

Global Flooding/Storm Risk Severity in a 2050 Climate Environment under RCP 8.5, GS Operations Overlaid



Global Wildfire Risk Severity in a 2050 Climate Environment under RCP 8.5, GS Operations Overlaid



At the transactional level, our Operational Risk Environmental team conducts environmental, health, and safety (EHS) due diligence for in-scope real-estate equity transactions. They assess the financial impact of EHS risk and assist business teams in identifying and mitigating environmental risks, including those related to climate change. As an example, climate risk indicator tools are used to assess the severity of physical climate risks based on various risk factors and geographic coordinates. These tools are employed by business teams to evaluate and quantify physical climate risk data, with the extent of usage depending on the capital source and transaction value.

Strategic & Business Environment Risk

Our second line of defense has developed a framework for measuring and monitoring our climate risk appetite within our Strategic & Business Environment Firmwide Risk Appetite Statement, including for specific legal entities. The RAS framework includes methodologies for assessing transition and physical risks, including through climate scenario analysis, to help us identify vulnerabilities. As described previously, these assessments can be used across first and second line of defense risk management, for example in transaction level due diligence and in our credit underwriting process.

With respect to limits and thresholds, the level of integration of climate risk differs across legal entities, with quantifiable thresholds on exposure concentrations and stress loss set in our European and UK legal entities. These thresholds are used to monitor concentrations of potentially material climate-related risks for select GS legal entities and are reviewed and approved by relevant Board and senior management governance committees as specified in respective entity RAS.

Third Line of Defense

As the firm's third line of defense, Internal Audit (IA) independently assesses the firm's internal control structure applicable to climate risk management, raises awareness of control risk, and reviews the implementation of management's control measures in line with regulatory requirements and expectations. IA maintains a working group tasked with monitoring emerging developments and coordinating IA audit coverage of climate risk management. The climate risk management audit plan is developed using a risk-based methodology in order to focus on the most significant risks as informed through risk assessment.

Integrating Climate Risk into Financial and Portfolio Management

As climate risk evolves, it is important to understand which portfolios are most vulnerable to transition and physical risk, and, through active risk management, focus on those portfolios with highest severity of exposure. To identify and measure the areas of greatest potential vulnerability, our second line of defense has developed the following concentration monitoring.

Transition Risk

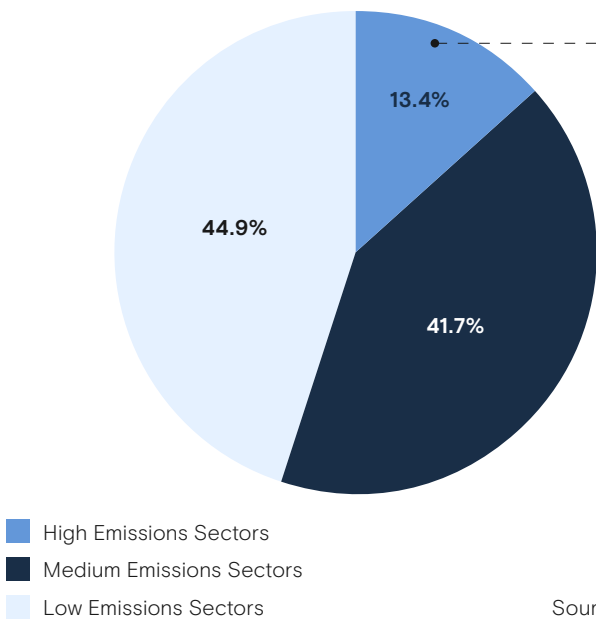
We evaluate the impact of transition risk on the firm’s banking book portfolio, including held-for investment loans, fair value debt, and equities. The Greenhouse Gas Protocol divides emissions into 3 scopes: 1) direct emissions, 2) indirect emissions (such as purchased electricity), and 3) value chain emissions. Based on sectors’ GHG emission intensity profiles, we categorize sectors into high, medium, or low.

The following concentration monitoring for transition risk demonstrates the stressed loss distribution for highest transition risk sectors and geographies for the firm’s investing and lending positions. We assess high, medium, or low emission levels at the

position level and track concentrations at sub-sector and sector levels. As shown to the right, the high emission level category is comprised of two sectors: Natural Resources & Utilities and Diversified Industrials. Diversified Industrial comprises several industry sub-sectors including Air Transportation, Nonmetallic Mineral Product Manufacturing, and Transportation Equipment Manufacturing. Natural Resources & Utilities comprises several industry sub-sectors including Mining Oil and Gas, Mining Others, and Primary Metal Manufacturing.

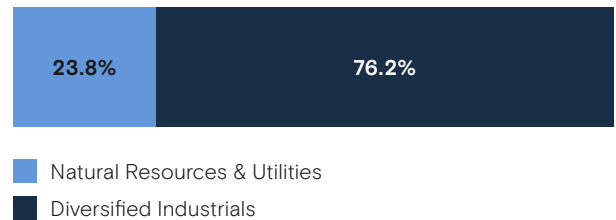
The largest contributors to the firm’s potential transition risk losses stem from higher emitting corporates in developed nations (specifically across the US and Europe) due to location of corporate headquarters and operating activities.

% Contribution of Stress Loss Across Emission Levels

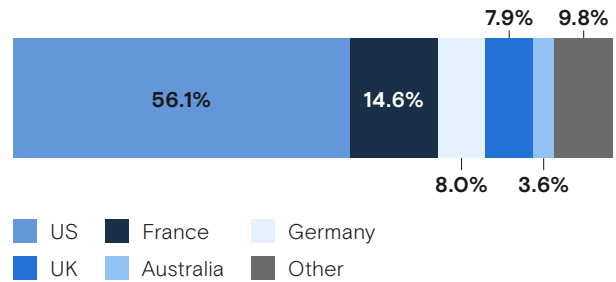


Source: GS Risk

% Contribution of Stress Loss Across High Emissions Sectors



% Contribution of Stress Loss for High Emissions Sectors Across Geographies



Source: GS Risk

Consideration of Other Environmental and Social Risks Alongside Climate

As our risk management practices evolve, we are increasingly considering climate-related risks alongside other environmental and biodiversity risks such as seismic and water stress risk. We also integrate and manage environmental and social risks through risk assessment and reporting. These environmental risks may not be exclusively linked to long-term changes in the climate, but nonetheless, we find they are best assessed together with climate-related risks. Given the significance of these environmental risks, in-house specialist teams consider climate-related and environmental (C&E) risk in an integrated manner.

We proactively manage and publicly report the material impacts of sustainability-related risks to our firm, including C&E and social risks across our first and second line teams. Dedicated teams within our Compliance and Executive Office divisions examine legal, regulatory, reputational, environmental, social, and governance risks, and review potential transactions through a risk management lens.

Our Environmental Policy Framework (EPF) outlines the firm's specific policies and approach to C&E and social risk. Transactions that may have significant environmental or social risks, including reputational risks, are escalated for enhanced review and business selection discussion. Several teams are involved in helping businesses identify and mitigate potential environmental and social risks, including our Business Intelligence Group (BIG), Sustainable Finance Group, and Operational Risk. For several carbon-intensive sectors with particular environmental sensitivity (e.g., Oil & Gas, Chemicals, Metals & Mining, Forestry, etc.), business teams are equipped with enhanced due diligence guidelines and training to evaluate and engage with new business opportunities more effectively.³⁸

When reviewing counterparties in high risk sectors, there are a number of sector specific factors reviewed to confirm alignment with our policies to help us assess related risks. For example, our EPF includes an expectation for companies with significant thermal coal revenue to have clear diversification plans, given our view that companies in the thermal coal mining sector with diversification strategies are more successful in obtaining financing. Because each financing opportunity presents a unique situation, we consider deal dynamics and a client's transition plan as part of our overall risk management approach. Specifically, we look at a broad range of factors including, but not limited to, medium-term emissions goals, relative level of short-term diversification targets, high emission product volume plans, any current or planned investments in low carbon products, and expectations on related public disclosures.

For our firm, putting people and practices in places that allow us to take a deliberate approach to responsible risk management is a critical driver of success. We will continue to evolve our program and climate risk management approach to help us navigate and meet increasingly complex requirements.

³⁸ The guidelines are reviewed periodically and updated based on emerging best practices, regulatory changes, and engagement with stakeholders. We focus primarily on climate-specific risks in this disclosure; however, many of the program enhancements described apply to both climate risk as well as environmental risk.

Section V

Metrics and Targets

Our overall climate strategy is supported by specific metrics and targets that help us track progress, report to our stakeholders, and drive our business decision-making.

These metrics and targets support our strategic objective of working with our clients to help them achieve their sustainability goals, addressing sustainability-related market gaps, and managing our firm in light of sustainability-related

risks and opportunities. This metrics and targets section covers three main targets: our firmwide \$750 billion sustainable finance commitment, our 2030 sectoral targets, and our 2030 operational and supply chain commitment.

In this section:

- 44 Our Firmwide \$750 Billion Sustainable Finance Commitment
- 45 2030 Sectoral Targets
- 51 Progress Toward Our 2030 Operational and Supply Chain Commitment

Our Firmwide \$750 Billion Sustainable Finance Commitment

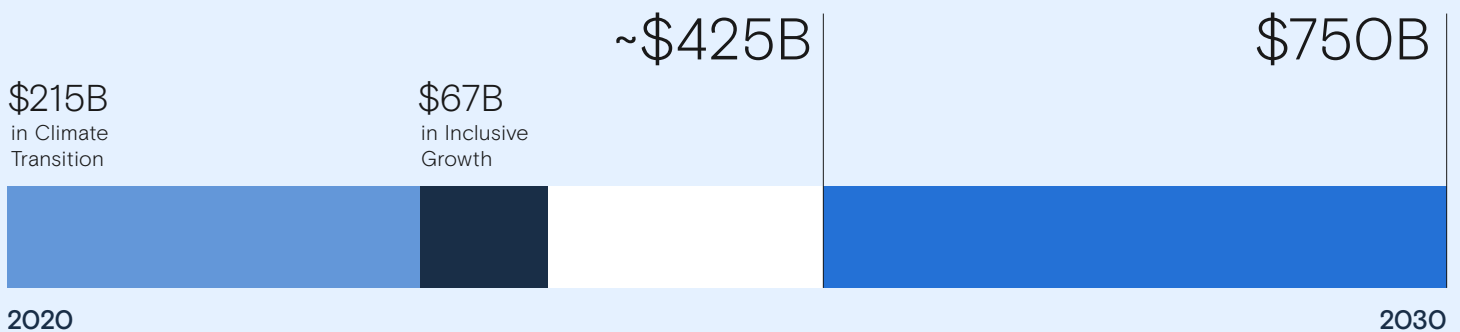
In 2019, we developed our Sustainable Finance Framework and announced our firmwide 10-year, \$750 billion sustainable finance commitment to support the increasing demand for sustainable finance solutions across our financing, investing, and advisory work with clients.

We have made significant progress over the first three years. Since setting this 10-year commitment, we have achieved approximately \$425 billion³⁹ in commercial activity, including \$215 billion in Climate Transition, \$67 billion in Inclusive Growth, and the remainder in multi-theme.⁴⁰ Of the \$215 billion in Climate Transition, the most significant sub-theme contributor is from Clean Energy followed by Sustainable Transport, which together drive the majority of the contribution.

This progress demonstrates the strength of our sustainable finance strategy and our ability to direct capital toward solutions necessary to help our clients achieve their sustainability objectives. We plan to update the market on our progress toward this goal next year in our 2023 Sustainability Report.

~55%

of 10-year commitment
achieved in first three years



³⁹ As of 12/31/22.

⁴⁰ Multi-theme includes activity relating to both Climate Transition and Inclusive Growth.

2030 Sectoral Targets

In the [Goldman Sachs TCFD Report 2021](#), we published three 2030 sectoral targets: Energy,⁴¹ Power, and Auto Manufacturing.⁴² These sectors reflected where we saw the greatest opportunity to proactively engage with our clients, deploy capital required for the transition, and invest in new commercial solutions to support transition to the low-carbon economy.

In an environment where our industry is facing constantly evolving regulatory guidance across jurisdictions and a proliferation of new methodologies and frameworks, we remain focused building our analytical capabilities and addressing identified gaps. In addition to helping position the firm to meet any potential regulatory climate-related integration or disclosure requirements, these capabilities also provide decision-useful climate-related metrics to identify drivers of change within our financing portfolios and potential decarbonization opportunities.

We acknowledge that the geopolitical and policy environment has evolved materially since we established our sectoral targets in 2021. Unforeseen events including escalating geopolitical tensions and rising interest rates have had implications on decarbonization in the Energy sector and more broadly. Looking ahead, certain policies and proposed regulations including Basel 3 reforms, could introduce higher capital requirements for Goldman Sachs, which could lead to a reduction in our ability to help finance opportunities including those that support climate transition. At the same time, the US Inflation Reduction Act and similar global policies have provided tailwinds for investments in clean energy technologies. We remain committed to achieving our portfolio targets, however, for the world to meet collective climate-related goals, it will require even more policy levers globally given current conditions and the collective impact of corporate actions, technological advancements, and changes to consumer behavior.

Our Framework

Our physical emissions intensity-based 2030 sectoral targets provide insight into how our financing activities are supporting

decarbonization in the real economy by working with our clients on their respective transitions.

Our clients require a diverse set of financing solutions to manage and execute their decarbonization strategies. Accordingly, we have structured our targets to encompass a broad range of financing options, including both direct financing and facilitated capital market solutions. The following financing activities — leveraging capabilities across our businesses — are in-scope for our 2030 sectoral targets:

- Corporate lending commitments
- Capital markets financing
- On-balance sheet investments (including tax-equity investments)

We measure these portfolios based on physical emissions intensity metrics, i.e., the quantity of emissions per unit of production.⁴³ The portfolio metrics in this report for Energy, Power, and Auto Manufacturing reflect the exposure-weighted average of our individual clients' emissions intensities for 2021, as shown below.

We continue to believe physical emissions intensity is an appropriate lens to measure and manage financed emissions as it:

- Normalizes for company size and scale of production
- Allows for growth in businesses that are more emissions efficient and incentivizes financing toward companies with transition plans to become more emissions efficient
- Reduces volatility resulting from short-term changes in production levels, or from non-emissions related factors like enterprise value

$$\text{SECTOR PORTFOLIO EMISSIONS INTENSITY} = \sum \left(\frac{\text{CLIENT EMISSIONS}}{\text{CLIENT PRODUCTION}} \right) \times \left(\frac{\text{CLIENT FINANCING}}{\text{SECTOR PORTFOLIO FINANCING}} \right)$$

⁴¹ Energy has been renamed from Oil & Gas in the Goldman Sachs TCFD Report 2021 and includes all liquid and gaseous fuels, such as oil, natural gas, hydrogen, biofuels, sustainable aviation fuel production.

⁴² Our target is specifically focused on light duty vehicle auto manufacturing, including both cars and light trucks for passenger and commercial uses.

⁴³ Unit of production is specific to each sector.

Metrics and Targets

When we set these goals, we acknowledged that progress against these targets was not likely to follow a linear trajectory. As we work toward achieving our 2030 sectoral targets, we understand both the time required to embed change across these sectors and the volatility in financing volumes — especially with our inclusion of capital markets — will likely lead to fluctuations in our decarbonization journey. However, we remain steadfast and committed to our decarbonization goals.

Our 2021 sectoral portfolio emissions intensities and progress against our 2030 sectoral targets are provided below. Client-level and aggregated portfolio metrics were subject to a review process prior to disclosure that involved senior stakeholders across our business segments, the Sustainable Finance Group, and key support functions including Controllers and Risk. The final sectoral portfolio metrics were reviewed and validated by our Firmwide Climate Steering Group referenced in the Governance section of this report. Further details on our target-setting framework and additional sector-specific considerations can be found in our the [Goldman Sachs TCFD Report 2021](#).

Update on Our 2030 Sectoral Targets

As highlighted previously, we are committed to working with our clients, investors, and the public sector to support the goal of limiting global warming to 1.5°C above preindustrial levels. At the same time, we recognize that there are substantial gaps between the benchmark 1.5°C aligned scenarios and the current state of policies, commitments, and technologies. In our ongoing pursuit of these targets, we will continue to evaluate data quality, and, if necessary, adjust our reporting and methodology to ensure the accuracy and relevance of our metrics. The 2030

sectoral targets in the Goldman Sachs TCFD Report 2021 align with ambitious climate goals. The upper bound of each target does not exceed the expectations set by the below 2°C scenario, whereas the lower limit aligns with the 1.5°C pathways.⁴⁴

This section of the report provides an update on the progress toward those targets between 2019 and 2021, taking into account the most recent data available for our physical emissions intensity calculation. Due to the time lag that exists for company reported intensities and vendor ingestion of company emissions and production data, 2021 is the most current year where data exists across all three of these inputs for our physical emissions intensity calculation.

As of 2021, we have begun to see progress toward these portfolio targets, but reiterate that year-to-year progress may not always be linear. More details on progress by sector against these targets is provided in the following sub-sections and is summarized in the table below.

Energy

Oil and gas demand has risen since 2021 and is expected to continue on this trajectory until 2030.⁴⁵ For the period that this section of the report covers, calendar years 2019 and 2021, the yearly aggregate of global oil and gas demand remained relatively consistent as indicated by our *Carbonomics* research.⁴⁶ The change in physical emissions intensity for our Energy sector portfolio⁴⁷ was reflective of this broader market dynamic and was largely unchanged in 2021 compared to our 2019 baseline. Although we anticipate a shift toward low-emission fuel sources and reduced Scope 3 end-use emissions over time, near-term shifts for many of our corporate clients have proved challenging given fossil fuel demand has not materially decreased. Despite these challenges, we remain committed to supporting our clients

2030 Sectoral Targets and Intensities of Our 2021 Financing Portfolios

Sector	Metric	2019 Baseline	2021 Intensity ^a	2021 vs. 2019	2030 Sectoral Targets
Energy	gCO ₂ e / MJ	72	72	0%	56 – 60 (17 – 22%) ^b
Power	kgCO ₂ e / MWH	417	296	-29%	147 – 219 (48 – 65%) ^b
Auto Manufacturing	gCO ₂ e / km	152	119	-22%	70 – 77 (49 – 54%) ^b

^a Majority of vendor data was pulled during the month July 2023.

^b Reduction percentage from 2019 baseline to 2030 sectoral target.

⁴⁴ The referenced 2 and 1.5 degree pathways are based on Goldman Sachs' *Carbonomics* research, which starts with the same science-based carbon budgets from IPCC as other research scenarios and builds out pathways based on the costs of different technologies and approaches to decarbonization. For additional details on the GS *Carbonomics* research, please refer to the Goldman Sachs TCFD Report 2021.

⁴⁵ [IEA, World Energy Outlook 2023](#).

⁴⁶ [Carbonomics: Introducing the GS net zero carbon models and sector frameworks](#).

⁴⁷ Includes all liquid and gaseous fuels, such as oil, natural gas, hydrogen, biofuels, sustainable aviation fuel production.

Metrics and Targets

through their decarbonization journeys, for example, by offering insights on operational efficiencies, low-emission fuels, and carbon capture utilization and storage (CCUS). Through this engagement, we continue to help facilitate our clients' transition to more sustainable practices and a greener future.

The companies in our 2019 and 2021 Energy portfolio that reported physical emissions intensity of Scope 1 & 2 decreased their intensities by approximately 8% from 2019 to 2021.

There was also an increase in the number of companies in the portfolio that report Scope 1 & 2 emissions between 2019 and 2021. Companies in the Energy sector portfolio are taking steps to manage methane performance and making significant commitments in line with industry best practices, such as joining the Oil & Gas Methane Partnership, with over 50% of the weighted 2021 portfolio currently participating⁴⁸ in the [OGMP 2.0 initiative](#).

We are also assisting companies involved in the development of tools and resources to understand and mitigate methane emissions through our core business segments. For example, we advise and finance companies that specialize in technologies such as leak detection and capture, methane measurement and monitoring, and flare capture and use.

In addition, we have developed dedicated low carbon biomethane investment platforms, such as Verdalia Bioenergy mentioned earlier in this report, expanding our methane mitigation contributions outside of the oil and gas sector.

Power

Global net renewable electricity capacity additions increased over 50% from 2019 to 2021.⁴⁹ Our own portfolio physical emissions intensity reduced by 29% between 2019 and 2021, which reflects both company shifts in power generation mix toward low-carbon alternatives, as well as our increased financing to companies specializing in renewable power generation. We helped our clients in this transition through a range of financing products, including green bonds. In 2021, the year of focus of this metrics sub-section, we supported the issuance of approximately \$2 billion in green bonds dedicated to the buildout of renewable power generation capacity.

Auto Manufacturing

Global electric vehicle sales more than tripled their market share between 2019 to 2021 (from 2.5% to 8.6%) supported by government policies and ambitious auto manufacturer electric and hybrid vehicle sales targets.⁵⁰ Our Auto Manufacturing sector portfolio emissions intensity aligned with this market trend and reduced by 22% in 2021 compared to our 2019 baseline.

⁴⁸ As of November 20, 2023.

⁴⁹ [IEA, Renewables](#).

⁵⁰ [Electric cars fend off supply challenges to more than double global sales – Analysis – IEA](#).

⁵¹ [Dominion Energy, 2021 Green Bonds](#).

⁵² [Pattern Energy, Western Spirit Wind](#).

⁵³ [AES, 2021 ESG Indicators: Accelerating the future of energy, together](#).

Since 2019, we have continued to expand our relationships with EV-focused manufacturers through both lending and capital markets products. We also saw our traditional manufacturing clients make progress to reduce their operational emissions.

Examples of 2021 Portfolio Transactions

Below are a few examples of transactions included in our 2021 sectoral portfolios.

Dominion Energy Green Bond Issuance

Dominion Energy is implementing solutions that can help accelerate decarbonization, reduce risk, and support a sustainable future. In 2021, GS served as a joint book-running manager on Dominion Energy's issuance of a \$1 billion green bond with proceeds to be used to finance and/or refinance existing and future eligible green expenditures associated with certain solar energy investments.⁵¹

Tax Equity Investment in Western Spirit Wind Project

Pattern Energy Group LP (Pattern Energy) is one of the world's leading private renewable energy and transmission companies. In 2021, GS invested \$225 million in Pattern Energy's Western Spirit Wind Project, a series of four wind projects located in New Mexico. When combined with the Western Spirit transmission line project, the project leverages the powerful wind generation profile of New Mexico and delivers power to the robust California market and the broader western region of the US. The project can cover the electricity generation of more than 900,000 people, diverting production of energy away from higher emitting sources of energy.⁵²

AES General Purpose Financing

AES is a global energy company developing and operating solutions that will enable the transition to zero and low-carbon sources of energy. GS has a long-standing lending relationship with AES which has supported their business strategy to execute, amongst other things, their climate transition plan which saw AES's reported emissions intensity fall between 2019 and 2021. AES has grown its renewables business, including signing 13.6 gigawatts of new contracts of wind, solar, and energy storage between 2016–2021.⁵³

Rivian General Purpose Financing and Initial Public Offering (IPO)

Rivian designs, develops, and manufactures category-defining electric vehicles and accessories and sells them directly to customers in the consumer and commercial markets. In 2021, GS entered into a credit agreement with Rivian, to support its general operations. GS also acted as co-lead underwriter in Rivian’s IPO allowing it to raise ~\$13.7 billion to fund growth in areas such as boosting production of its all-electric vehicles.

NIO Equity Issuance

NIO designs, develops, jointly manufactures and sells premium smart electric vehicles, driving innovations in next-generation technologies in autonomous driving, digital technologies, electric powertrains and batteries. GS supported NIO in its issuance of \$1.5 billion of convertible notes in January 2021 and \$2.0 billion of primary American Depository Shares (ADS) in November 2021 for general corporate purposes and to further strengthen its cash and balance sheet positions.

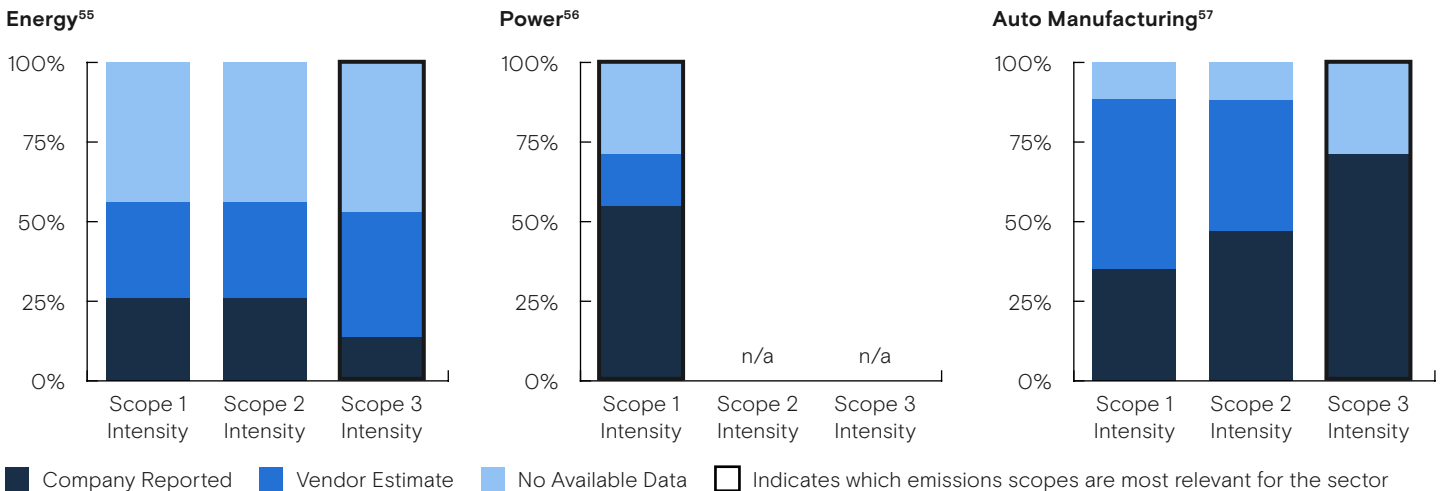
Data Challenges

Reliable and up-to-date emissions and production data is a key enabler for accurately reflecting our financing portfolios’ physical emissions intensity. As discussed earlier in this report’s Strategy section, the data landscape continues to evolve, and we recognize that our clients have made reporting improvements since our sectoral targets were initially developed in 2021. However, challenges remain in sourcing standardized, timely, and accurate data.⁵⁴

We have observed four broad data challenges that affect our physical emissions intensity baseline calculations, and detail these below to illustrate the complexity of the data environment at this current time. Given these complexities, we are focused on improving the accuracy of our portfolio measurement over time and may periodically reevaluate and, if necessary, restate our baseline to ensure the accuracy, relevance, and decision usefulness of our portfolio metrics.

1. Significant gaps exist in the availability of company reported data, especially in the Energy sector.

We continue to observe significant data gaps in company-reported information, particularly in the Energy sector. The chart below shows these gaps are most pronounced when considering company Scope 3 emissions, which represent the largest contribution to overall emissions in Energy. These data gaps necessitate the use of estimates and fallback methodologies to calculate our portfolio intensity. To address this issue, we will continue working with vendors and data utilities to enhance company-reported data availability across all sectors, enabling us to represent our portfolio companies’ emissions more accurately. We note that calculating Scope 3 emissions in the Energy sector is not straightforward and can present an outsized operational burden, especially for smaller companies.



⁵⁴ Our reliance on climate-related emissions and production data from other companies and third-party data providers impacts our ability to report portfolio performance effectively and efficiently to stakeholders. It can be challenging to capture quality data for a variety of reasons, including new methodologies or restated data, inconsistency in approaches across companies and data providers and in the calculation of data over time, and we do not provide assurance on the accuracy of such third party information. Furthermore, time lags in the availability of these data can be significant. These are among the factors that impact our ability to report portfolio performance to stakeholders in an accurate, precise, and timely manner.

⁵⁵ For Energy, “company reported” category includes emissions sourced from company reports (e.g., sustainability, corporate social responsibility, and annual reports) and are checked for reasonableness. Vendor estimates indicate where a vendor has indicated data is based on an approximation.

⁵⁶ In Power, “company reported” includes emissions sourced from company reports, from vendors specifying company sources, or when the business confirmed client financing was exclusively to renewable power generation.

⁵⁷ In Auto Manufacturing, “company reported” includes emissions sourced from company reports, from vendors specifying company sources. For Scope 3 intensity, company reported also includes all companies with electric vehicle only production.

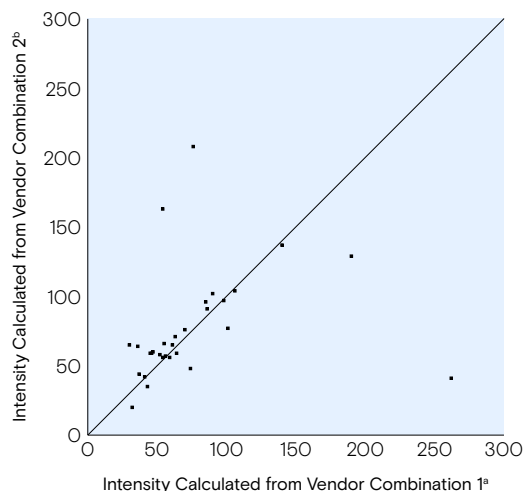
2. Wide variance of intensities calculated from vendor data often differ from company reporting. Production-based intensity estimates are typically more reliable.

We source emissions and production data from multiple vendors. However, as many of our vendors do not provide both emissions and production data, we often rely on vendor combinations to calculate a company emissions intensity.

The scatterplot to the right shows intensities calculated from two combinations of vendors for several companies in our financing portfolio. It illustrates the variance in emissions intensities that we observed across vendor combinations making it difficult to choose which intensity (and vendor combination) to use.

The variance across vendor combinations is primarily driven by differences in methodology used in calculating emissions data. To estimate emissions, many vendors rely on revenue-based fallback methodologies that correlate emissions with company revenues. This can lead to inaccurate estimates, e.g., overestimating intensities for larger companies with more revenues or inaccurately reflecting year-over-year intensity change in line with revenue shifts.

Comparison of 2021 Intensities from Two Vendor Combinations



We further illustrate this challenge with two anonymized Energy examples (Clients X and Y) in the table below. Client X represents a company that reports its emissions intensity, and by comparison we are able to see that vendor-based intensities vary significantly and none match the company reporting. Client Y does not report intensity, but similarly we observe a variation across vendor-based intensities, making it difficult to select which intensity to use in our calculations. The final column in this table shows our estimates of Client X and Y’s intensities using a production-based estimate; we have observed that this methodology is often closely aligned to company reported numbers and allows comparability across companies as it is anchored in production mix.

Comparison of Scope 1-3 Intensities (gCO₂e / MJ) Across Financing Portfolio Companies: Company-Reported, Vendor-Based, Production-Based Estimates

Energy Clients	Company-Reported Intensity	Vendor-Based Intensity			Production-Based Intensity Estimate
		Vendor Combination 1 ^a	Vendor Combination 2 ^b	Vendor Combination 3 ^c	
Client X	67	54	163	76	71
Client Y	None	98	97	86	92

^a Vendor Combination 1: Vendor C Emissions/Vendor B Production.
^b Vendor Combination 2: Vendor A Emissions/Vendor D Production.
^c Vendor Combination 3: Vendor C Emissions/Vendor C Production.

3. Year-on-year intensity changes based on vendor data may not reflect shifts in actual company performance.

When calculating our updated 2021 portfolios' intensity across sectors, we observed that, especially in the Energy sector, even when holding the vendor combination constant between years (2019 and 2021), intensity changes did not always reflect actual company production and company emissions reduction initiatives. As an example, for one client, vendor data indicated a 6% increase in physical emissions intensity from 2019 to 2021. However, the company reported a 2% increase in natural gas production (increasing the mix of gas relative to oil in 2021) and a 20% reduction in Scope 1-2 intensity, suggesting that total intensity should have decreased slightly. However, the vendor's Scope 3 emissions data was a revenue-based estimation, which increased in line with the company's revenues between 2019 and 2021, resulting in an increased emissions intensity. Given this dynamic, using vendor data when Scope 3 is estimated raised concerns about accurately tracking true changes in an individual company's emissions intensity performance and remaining internally consistent across companies.

4. Fallback methodologies used in the absence of data have substantial limitations.

Across all three sectors, where no data is available, we resort to fallback methodologies. In Power and Auto Manufacturing, we assign an average intensity based on subsector⁵⁸ and in Energy, we assign an intensity based on the client archetype (estimated fuel mix). However, it is important to note several limitations with this approach, including the calculation of a subsector average that includes only GS financing portfolio companies, thereby not reflecting the broader industry dynamics, and not factoring actual company-level activities and company-specific operational reduction initiatives.

Impact of Data Challenges on Our Methodology

The Energy sector presents the most notable data limitations due to limited company reporting and variable vendor estimates, especially for Scope 3 emissions, which account for the majority of sector emissions. In our update, we used a production-based approach specifically for the Energy sector in 2021, when company reported data was not available.

Anchoring our company-level intensities in production numbers enables us to better understand the drivers of change, create internal consistency across companies, and better track true portfolio progress on emissions intensity. Our emissions intensity would have been lower for 2021, had we maintained the prior, less accurate general sub-sector average estimate approach.

We will continue to enhance our methodology to improve accuracy across sectors moving forward. As companies report more information and vendors work toward enhancing the accuracy of the data they provide to the market, through engagement on identified errors, methodology refinement, and increased asset-level emissions data capabilities, we expect the data available for our measurements will continue to improve, reducing the need for estimations.⁵⁹

Next Steps

Through 2024, we will set 2030 sectoral targets for additional carbon-intensive sectors and maintain support for our clients' low-carbon transitions across all sectors.

When we identify significant gaps or disparities in vendor data, we plan to continue engaging directly with vendors to address gaps and understand the factors that contribute to these differences. In cases where data gaps persist, we will continue to implement methodologies that prioritize understanding the composition of company assets, a process we will continually refine as information availability improves.

Our internal engineering efforts, exemplified by initiatives like ESG Beacon, are integral to our approach. These efforts involve developing automated tools that make it easier to compare and investigate vendor data, enabling us to better understand how financing positions impact portfolio intensity as we handle larger volumes of data. Additionally, we support open-source initiatives that are working to better organize climate-related data from company reporting and public regulatory databases. We expect these combined efforts will play a pivotal role in improving the accessibility and transparency of data over time.

As the data and methodology landscape evolves, we will continue to evaluate data quality, improve our methodology, and, if necessary, make adjustments to our reporting and approach to ensure the accuracy and relevance of our metrics.

⁵⁸ In the Power sector, in-scope subsectors include conventional power generation, renewable power generation, and integrated companies with generation and transmission and distribution activity. In the Auto Manufacturing sector, in-scope subsectors include EV and internal combustion vehicles.

⁵⁹ [S&P Global, Checking and cleaning environmental data to correct disclosure errors.](#)

Progress Toward Our 2030 Operational and Supply Chain Commitment

In March 2021, we made a commitment to achieve net zero in our own operations and supply chain by 2030, representing a significant milestone in our climate journey.

To monitor our progress effectively, we measure and report Scope 1, 2, and 3⁶⁰ emissions. Since 2015, we have been carbon neutral across our operations and business travel, and we expect our continued focus on energy management and renewable energy sourcing to help position us to deliver on our 2030 operational and supply chain goals.

GHG Emissions

Our operational greenhouse gas (GHG) emissions come from a range of sources, including fuel combustion (Scope 1) and purchased electricity (Scope 2). Business travel-related emissions are primarily Scope 3 emissions from commercially

operated air, rail, bus, ferry, car, and hotel stays. The table below shows our progress against these emission scopes.

As we seek to reduce our emissions, we also recognize that some Scope 1, 2, and 3 operational and supply chain emissions will not be entirely eliminated through reduction strategies and will require carbon avoidance and removal credits. Our governance framework is designed to ensure that any carbon credit purchases align with our strict criteria of quality, organizational priorities, and emerging best practices, all within the context of fulfilling our operational commitments.

For more details on key environmental metrics pertaining to our business operations, please refer to our [2022 Sustainability Report](#).

Greenhouse Gas Emission Indicators for Our Operations

	Trend ^a 2021–2022	2022	2021	2020	2017 (Baseline)
Greenhouse Gas (GHG) Emissions					
Scope 1 – Direct (Metric Tons CO ₂ Equivalent [tCO ₂ e]) ^{b,d}	↑	11,980	11,847	9,330	10,750
Scope 2 – (Location)—Indirect (tCO ₂ e) ^{b,d}	↑	158,151	145,264	142,990	192,296
Scope 2 – (Market)—Indirect (tCO ₂ e) ^{b,d}	↓	9,840	12,635	6,776	21,107
Scope 3 – Category 6 – Business Travel (tCO ₂ e)	↑	57,233	23,802	29,295	120,001
Total Emissions: Scope 1 & 2 (Location) (tCO ₂ e) ^{b,d}	↑	170,131	157,111	152,320	203,046
Total Emissions: Scope 1 & 2 (Market) (tCO ₂ e) ^{b,d}	↓	21,820	24,482	16,105	31,857
Total Emissions: Scope 1, 2 (Market) and 3 Category 6 (tCO ₂ e) ^{b,d}	↑	79,053	48,284	45,400	151,858
◊ Net Emissions: Scope 1, 2 (Market) and 3 Category 6 (tCO ₂ e) ^{b,c}		0	0	0	0
Verified Carbon Avoidance Credits (tCO ₂ e)		57,233	26,116	43,225	146,950
Verified Carbon Removals (tCO ₂ e)		21,820	20,000	0	0

^a Many metrics trending upward from 2021 to 2022 are primarily due to lifting COVID restrictions and employees returning to the office.

^b Historical energy, water, and greenhouse gas metrics were updated to reflect activities at sites related to acquisitions that closed in 2022. For originally reported values, please refer to our 2021 and 2020 Sustainability Reports. Global renewable energy consumption and verified carbon credits reflect the totals at the time of original reporting (excluding the acquisition activities).

^c This symbol ◊ before an indicator denotes a commitment through Goldman Sachs' 2025 ESG and Net Zero Commitments and ongoing 2020 Operational Commitments. Net Emissions represent achievement of ongoing Carbon Neutral commitment. Reductions are from a 2017 baseline.

^d Historical data points may be adjusted to reflect new information and/or changes to accounting methodologies.

⁶⁰ We report Category 6–Scope 3 (Business Travel) emissions from our operations at this time.

Section VI

Looking Forward

In 2024 and beyond, we will continue to support our clients in critical sectors as they deliver on their climate transition strategies. This includes providing financing and investing in climate transition-enabling technology and infrastructure. In next year's TCFD disclosure, we plan to provide another update on progress toward our 2030 sectoral targets as well as assess and set targets for additional carbon-intensive sectors. We also plan to provide other climate-related disclosures, as relevant regulations are finalized.



Section VII

Appendices

List of Acronyms

- ADB: Asian Development Bank
- AWM: Asset & Wealth Management
- CIDF: Climate Innovation and Development Fund
- C&E: Climate-related and environmental
- EHS: Environment Health & Safety
- EO: Executive Office
- EPF: Environmental Policy Framework
- ERC: Enterprise Risk Committee
- ESG: Environmental, social, and governance
- GBM: Global Banking & Markets
- GIR: Global Investment Research
- GSAM BV: Goldman Sachs Asset Management B.V.
- IPO: Initial public offering
- IRA: US Inflation Reduction Act
- KPI: Key performance indicator
- LEED: Leadership in Energy and Environmental Design
- NN IP: NN Investment Partners
- OEM: Original equipment manufacturers
- RAS: Risk Appetite Statement
- REG: Renewable Energy Group
- RMI: RMI, formerly Rocky Mountain Institute
- SAWG: Sustainable Asset Working Group
- SBG: Sustainable Banking Group
- SEC: Securities and Exchange Commission
- SFG: Sustainable Finance Group
- XIG: External Investing Group

Links to Other Resources

- [Goldman Sachs 2022 Sustainability Report](#)
- [Asset & Wealth Management TCFD Report 2022](#)
- [Goldman Sachs TCFD Report 2021](#)
- [Goldman Sachs Environmental Policy Framework](#)

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We have included in this report statements that may constitute “forward-looking statements.” Forward-looking statements are not historical facts or statements of current conditions, but instead represent only our beliefs regarding future events, many of which, by their nature, are inherently uncertain and outside our control. These statements are not guarantees of future results or performance and involve certain known and unknown risks, uncertainties and assumptions that are difficult to predict and are often beyond our control. These statements relate to, among other things, our goals, targets, aspirations and objectives, and include the use of projections in connection with aggregated key performance indicator (KPI) metrics provided by third parties, and actual outcomes and results may differ materially from those expressed in, or implied by, any of these forward-looking statements, including KPI projections. Factors that could cause our results to differ from the forward-looking statements include global socio-demographic and economic trends, energy prices, technological innovations, scientific developments, increased availability of relevant data, climate-related conditions and weather events, legislative and regulatory changes, and other unforeseen events or conditions. For more information, see “Forward-Looking Statements” in Part 1, Item 1 of our Annual Report on Form 10-K for the year ended December 31, 2022 (2022 10-K) and in our subsequent reports filed with the Securities and Exchange Commission (SEC). In addition, important factors that generally affect our business and operations can be found under “Risk Factors” in Part I, Item 1A of our 2022 10-K, and in subsequent reports filed with the SEC. This report contains statements based on hypothetical or severely adverse scenarios and assumptions. These hypothetical scenarios may not occur, and actual events may be significantly different from these hypothetical scenarios. These statements should not necessarily be viewed as being representative of current or actual risk or forecasts of expected risk.

The disclosures included in this report are being provided in connection with our application of the Task Force on Climate-related Financial Disclosures (TCFD) recommendations. Our approach to the disclosures included in this report differs from our approach to the disclosures we include in our mandatory regulatory reports, including our filings with the SEC. This report is intended to provide information from a different perspective and in more detail than that required to be included in other regulatory reports, including our filings with the SEC.