Attachment 1: Portfolio Emissions Measurement

On an annual basis, staff measures the emissions financed by the CalSTRS investment portfolio as a means of understanding overall emissions and what is driving them. Staff first conducted emissions measurement in 2021 and presented them at the May 2022 Investment Committee meeting.

This Attachment: (1) details the process staff uses to calculate portfolio emissions in CalSTRS listed equity and corporate credit investments, (2) provides 2023 emissions measurement and analysis for Global Equity, Sustainable Investment & Stewardship Strategies (SISS), Fixed Income and Real Estate, and (3) discusses efforts staff is taking to quantify emissions exposure in areas of the portfolio where emission measurement processes are undeveloped or are still emerging.

Calculating Public Market Portfolio Emissions

CalSTRS calculates its share of a publicly traded company's emissions based on our percentage ownership of that company. For example, if CalSTRS owns one percent of a company, we assign one percent of that company's total emissions to our portfolio footprint. We perform this exercise for each company in our portfolio and then aggregate individual company emissions into a total portfolio footprint. Table 1 provides a simplified example of how carbon emissions are calculated in a portfolio.

Table 1: Calculating Portfolio Carbon Emissions

Company in Portfolio	Enterprise Value of Company	Company Total Scope 1 and 2 Emissions	Amount of Company Held in Portfolio	Company Emissions Assigned to Portfolio	
ABC	$5B	250,000 tons CO2e	$100M	($100M/$5B) x 250,000 tons	5,000 tons CO2e
DEF	$7.5B	400,000 tons CO2e	$175M	($175M/$7.5B) x 400,000 tons	9,333 tons CO2e
GHI	$6B	500,000 tons CO2e	$80M	($80M/$6B) x 500,000 tons	6,667 tons CO2e
JKL	$10B	200,000 tons CO2e	$200M	($200M/$10B) x 200,000 tons	4,000 tons CO2e
MNO	$4B	150,000 tons CO2e	$125M	($125M/$4B) x 150,000 tons	4,688 tons CO2e
		Total Portfolio Value	**$680M**	**Total Portfolio Carbon Emissions**	**29,688 tons CO2e**

As shown above, company ABC has 250,000 total tons of scope 1 and scope 2 carbon emissions and has an enterprise value of $5 billion. An investor holds $100M worth of company ABC in its portfolio, which represents 2 percent ($100M/$5B) of the company's enterprise value. The amount of carbon emissions attributable to the investment portfolio, from its partial ownership of company ABC, is therefore 5000 tons of CO2e (250,000 tons x 2 percent). This process is repeated for the other companies in the portfolio to determine those percentage contributions to total carbon

emissions. Finally, the individual company contributions are added up to get total portfolio emissions, which in this simplified example is 29,688 tons of CO2e.

Challenges Calculating Emissions

While the process to attribute emissions might seem straightforward, determining our ownership relative to a company's total value has proven challenging. CalSTRS' ownership levels are calculated at calendar year end using information provided by our custodian, State Street Bank. They provide us the market value of our equity shares and debt holdings for each publicly traded company we own. We then rely on a third-party data service provider to give us the total equity and debt value for each company we own, as of the same valuation date. Using the method described above, we determine our percentage ownership of each company and multiply that percentage by the company's total disclosed carbon emissions.

During the 2022 emissions measurement process, staff discovered that the equity and debt values provided did not align with CalSTRS' portfolio market values provided by State Street Bank. Further analysis showed that while we can get timely year-end values from our custodian, our data service provider was relying on companies to provide their year-end debt and equity values and these disclosures were being provided at varying points in time throughout the following year. This mismatch in the timing of equity and debt valuation disclosure was strongly influencing emissions calculations and yielding inaccurate results.

Staff engaged with multiple data service platforms and providers, consulted with numerous investment peers and partners, and tested several combinations of emissions data sources and emissions measurement platforms. Staff concluded that presently there is no feasible work around to the corporate emissions data disclosure lag and that the best course of action is to lag our emissions disclosure by one year to ensure there is no timing mismatch and inaccuracies. For this year's disclosure, staff is providing public market emissions for 2023. Rather than disclosing 2024 emissions this year, staff will provide 2024 emissions in our 2026 update.

What to Measure

Public Markets: CalSTRS continues to focus on measuring emissions in public markets securities. CalSTRS public markets investments represent most of the assets in the CalSTRS Investment Portfolio. Due to our long-standing and ongoing engagement efforts to encourage company disclosure on carbon emissions, many public markets companies have been providing climate-oriented data to investors for many years and multiple data service providers have developed corporate carbon footprint models that allow for a reasonably accurate assessment of public company emissions, even with estimations.

Security Coverage: Prior to conducting our initial carbon emissions measurement in 2022, staff collectively determined which securities to include in the process and which emissions metrics to use. Staff continues to believe the following securities are currently not appropriate for emissions measurement:

- **Derivatives:** Staff felt it was most reasonable to focus on long-only securities, where the emissions exposure is easiest to determine and understand. Staff decided not to include derivative-type securities where accounting for emissions is still very unclear and without established standards or best practices.
- **Sovereign debt:** Though a significant part of the Fixed Income portfolio, the methodology to measure emissions in sovereign debt is still being debated and no widely accepted means of determining how to allocate a country's carbon emissions, based on its debt issuance, currently exists.

Emissions Scope: Staff continues to believe measuring scope 1 emissions (direct emissions through burning fossil fuels) and scope 2 emissions (fossil fuel-based energy use) of underlying company investments are appropriate choices. Our on-going review of other net zero portfolio commitments continues to show that most investors that have made a net zero pledge have committed to measuring and managing only scope 1 and scope 2 emissions in their portfolio. The current market consensus is that the methods of accounting for scope 3 emissions (emissions within a company's supply chain and emissions associated with the use of a company's products) are still under debate, and any emissions data produced would likely not be reliable or useful for decision making.

Metrics: Since absolute emissions are the focus of the CalSTRS net zero pledge, staff believes that is the appropriate metric to use when reporting emissions. While a normalized emissions metric (emissions per unit of investment) allows for the comparison of portfolios of different sizes and different securities, staff believes these metrics are too influenced by market movements to provide meaningful data. Staff continues to consider other carbon emissions metrics, including intensity metrics such as emissions per unit of sales or revenue. However, staff believes that such metrics are more appropriate for the granular analysis to be conducted later in the implementation plan when staff begins doing sector and security level analysis.

Timing: Staff initially chose December 31 as an annual point in time to measure our portfolio emissions and continues to believe that December 31 is the most appropriate date.

How to Measure

As part of the public markets emissions measurement analysis conducted over the past year, staff collectively researched multiple data providers, measurement platforms and methodologies, finding that some were more suited for measuring emissions in equity securities and others better suited for measuring debt securities emissions. While staff had intended to find a single platform for measurement that could be used across units, the research led staff to conclude that it would be best for Global Equity and Fixed Income to use different platforms that best suited each unit's needs and aligned with their emission reduction strategies.

Global Equity is using FactSet to conduct their emissions measurement. FactSet is their portfolio performance and risk management platform and using FactSet allows Global Equity staff to integrate carbon emissions measurement into their existing portfolio management process. Fixed

Income chose Aladdin as their measurement platform allowing their emissions measurement to be integrated within their existing portfolio management process. It should be noted that both platforms utilize the same underlying source for company carbon emission data: MSCI.

Public Markets Emissions Measurement Overview

For calendar year 2023, Global Equity, Fixed Income and Sustainable Investment and Stewardship Strategies measured the absolute emissions of their portfolios and compared those emissions against the emissions of their respective portfolio benchmarks.

Table 2: Global Equity Emissions Attribution

CalSTRS Business Unit	2023 Total Portfolio Emissions	2022 Total Portfolio Emissions	Total Portfolio Year Over Year Change	2023 Total Benchmark Emissions	2022 Total Benchmark Emissions	Benchmark Year Over Year Change
Global Equity	6,469,860	7,063,758	-8.41%	6,817,413	6,640,571	2.66%

During calendar year 2023, total Global Equity portfolio emissions decreased 8.41% compared to a 2.66% increase in benchmark emissions over the same period. The increased allocation to the ACWI LCT portfolio was the primary contributor to portfolio emissions decline.

During 2023, the Global Equity portfolio reduced emissions across most sectors. The largest emission reductions were in materials, utilities, and energy. These three sectors are responsible for 77% of emissions across equities. The non ACWI LCT portion of the Global Equity portfolio also contributed to the reduced level of emissions during 2023 as weightings to high-carbon sectors (energy, materials, and utilities) decreased while weighting to technology, a lower emitting sector, increased. Changes in sector exposures were largely due to asset flows and market capitalization changes, as the majority of Global Equity's strategies are passively rather than actively managed.

Table 3: Sustainable Investment & Stewardship Strategies (SISS) Public Portfolio Emissions Attribution

CalSTRS Business Unit	2023 Total Portfolio Emissions	2022 Total Portfolio Emissions	Total Portfolio Year Over Year Change	2023 Total Benchmark Emissions	2022 Total Benchmark Emissions	Benchmark Year Over Year Change
SISS	96,800	211,956	-54.3%	237,531	536,666	-55.7%

SISS Public Portfolio emissions decreased by 54.3% during calendar year 2023, compared to a 55.7% reduction in benchmark emissions over the same period. The SISS Public Portfolio emissions decline was largely due to the transfer of $4.5B of LCT assets – about 50% of the SISS Public Portfolio - from SISS to Global Equity in July 2023. Adjusting for the LCT transfer, SISS emissions declined 6.3% during 2023.

Most of the SISS Public Portfolio emissions reductions were due to lower exposure (from 5% to 2%) to the energy sector, one of the most carbon intensive sectors, and increased exposure (from 17% to 22%) to the less carbon intensive technology sector.

Table 4: Fixed Income Emissions Attribution

CalSTRS Business Unit	2023 Total Portfolio Emissions	2022 Total Portfolio Emissions	Total Portfolio Year Over Year Change	2023 Total Benchmark Emissions	2022 Total Benchmark Emissions	Benchmark Year Over Year Change
Fixed Income	567,224	601,819	-5.8%	562,071	523,406	7.4%

Fixed Income portfolio emissions decreased by 5.8% during calendar year 2023. This decrease was in contrast to benchmark emissions increases as (i) the credit-related portfolio benchmark had marginal overweight exposure to sectors with higher emission intensities (energy, industry, transportation) and (ii) Fixed Income's credit-related portfolios significantly lowered their exposure to higher emitting industry sectors via rotation into lower emitting sectors, particularly when the low-carbon index optimization strategy was initiated during the fourth quarter.

Next steps: Staff will continue to measure public markets emissions and provide annual updates to the Investment Committee.

Private Markets Emissions Measurement Overview

Real Estate Emissions Measurement

CalSTRS' Real Estate holds most of its portfolio assets through "control" investment vehicles. Staff can exercise control over major decision rights, including the right to have its advisors and managers collect emissions measurement data for individual investments. For its "non-control" investments (primarily commingled funds), CalSTRS relies on the asset manager to provide emissions reporting data.

In 2022, staff determined the most efficient way to obtain carbon emissions data was by partnering with GRESB. Over 150 leading institutional real estate investors are members of GRESB and use the GRESB real assets platform framework to measure emissions and help assess climate change risks and opportunities. Emissions reporting is a joint effort between Real Estate staff and an external consultant, incorporating data from multiple separate account/joint venture managers who submit emissions-related property data to GRESB.

Between calendar years 2022 and 2023, while changes occurred in the Real Estate portfolio (new managers, new accounts, asset sales and acquisitions) staff used the same emissions measurement methodology which included:

- 334 properties submitting to GRESB, with scope 1 and 2 emissions data.

- Calculating average 'per square foot' intensities for each property sector, such as office or apartments.
- Estimating emissions for properties without asset-level emissions data by applying the average 'per square foot' intensities for the corresponding property type.
- Using the same methodology to calculate estimated emissions intensity for non-control real estate investments.

Importantly, the major difference in year-on-year emissions reporting was a very significant increase in measurement coverage - from approximately 50% of total Real Estate portfolio value to 97%. While emissions measurement results from 2022 and 2023 are difficult to compare, going forward staff expects year-on-year data to be more meaningful given this increase in coverage levels.

Table 5: Real Estate Emissions Measurement

Reporting Period	Preliminary Scope 1 & 2 Absolute Emissions Estimate	Estimated Emissions Intensity[1]	Real Estate Portfolio Data Set
Calendar Year 2022	158,992 metric tons of CO2e	6.2 tons per $MM of Net Asset Value	Directly owned operating assets (~50% of total Real Estate portfolio value
Calendar Year 2023	176,975 metric tons of CO2e	3.8 tons per $MM of Net Asset Value	Directly owned operating assets; commingled funds, co-investments and other vehicles (~97% of total Real Estate portfolio value) [2]

Next steps: Real Estate will continue to measure portfolio emissions and provide annual updates to the Investment Committee.

Private Equity and Inflation Sensitive Emissions Measurement

Since last year's update to the Investment Committee, Private Equity and Inflation Sensitive have been engaging partners to understand best practices around emissions disclosure and to identify organizations that support emissions measurement and management in the private markets.

In 2024, Private Equity surveyed external managers on their level of net zero integration and found that approximately 80% of GPs are actively measuring and reporting emissions or have plans in place to begin doing so soon. The 2024 survey also showed that many external partners are

[1] The large increase in Real Estate AUM measured skews the absolute emissions numbers so emissions intensity is being provided for better year over year analysis.
[2] The Real Estate portfolio consists of existing and substantially occupied "operating assets" (approximately 50% of the portfolio) as well as properties that are under development, debt investments, and non-control investments such as commingled funds and co-investments. The Real Estate portfolio is actively managed, with many assets being either sold or acquired each year. Thus, the composition of properties held during calendar year 2023 differs from those held during 2022.

providing portfolio company emissions data to the ESG Data Convergence Initiative (EDCI). EDCI is an industry-led initiative that promotes increased GP disclosure of environmental, social and governance metrics, including emissions. CalSTRS has become a member of the EDCI and is expected to have access to emissions reporting data for 49 of the 119 managers in its Private Equity portfolio (representing 54% of total NAV, as of December 31, 2024).

Inflation Sensitive is exploring which industry organizations could provide meaningful emissions reporting for the CalSTRS Infrastructure portfolio (the largest part of the Inflation Sensitive portfolio). In 2024, staff determined that approximately $4.5B infrastructure account and direct investments, representing approximately 33% of total NAV of the CalSTRS infrastructure portfolio, report to the GRESB real assets platform (which includes both infrastructure and real estate).

Next Steps: Private Equity staff will access GP emissions data from EDCI to provide initial emissions measurement for part of the Private Equity portfolio at the next annual update to the Investment Committee. Inflation Sensitive will determine if the GRESB platform is helpful in collecting and reporting portfolio emissions for the next annual update to the Investment Committee.

Identifying and Understanding Emissions Exposure

Emissions measurement tools and processes for CalSTRS listed equity and corporate credit exposures are well-developed and allow staff to conduct meaningful carbon emissions measurement and analysis. However, for other types of investments, particularly investments in private markets, existing tools and platforms lack the sophistication needed for meaningful measurement and analysis. Recognizing the need to understand emissions risk across the portfolio, staff is working to develop a carbon exposure classification system that can support emissions analysis and decision making.

Establishing a Low-Carbon Investment Framework

Despite the on-going challenges around identifying and quantifying carbon exposure in private markets, staff continues to develop a taxonomy for understanding (i) if an investment is currently aligned with the net zero transition, (ii) if an investment is likely to align with the net zero transition over time, or (iii) if an investment is not aligned or where data is not available.

Staff introduced an initial taxonomy at the September 2022 Investment Committee Meeting as CalSTRS' 'Green-Olive-Gray (GOG) Framework' with the following definitions:

- Green: an investment considered to be low-carbon and aligned with the net zero transition,
- Olive: an investment considered to be transitioning, or capable of transitioning to a net zero emissions economy,
- Grey: an investment considered as not aligned to the net zero transition, or where data is not available.

Staff initially anticipated applying the GOG Framework to assets within external manager portfolios and to co-investments. However, staff found that establishing internal definitions and forward-looking expectations around an investment's carbon exposure was too resource intensive and that such definitions and expectations could be secured from outside sources and then applied internally.

Over the past year, staff shifted its focus to exploring existing global taxonomies, including the Net Zero Investment Framework 2.0 and frameworks based on the EU Taxonomy for Sustainable Activities. Staff has conducted "trial" mapping exercises on small portions of both our public and private portfolios to test whether these established frameworks' can be applied across a broader portion of the portfolio.

Next steps: Staff will continue to research existing carbon-based taxonomies and classification systems to determine how such frameworks could be applied across the investment portfolio to support our net zero pledge implementation.