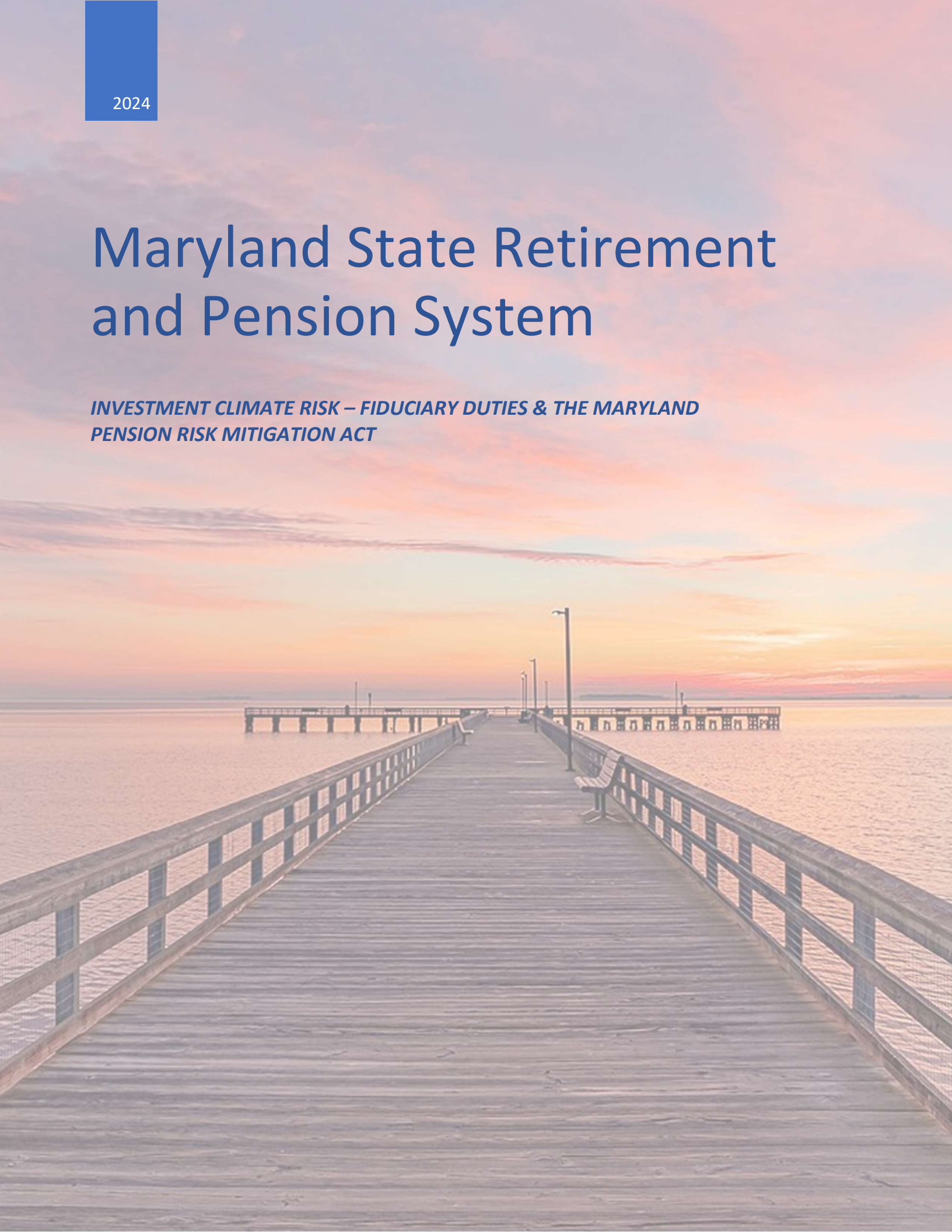
2024

Maryland State Retirement and Pension System

INVESTMENT CLIMATE RISK – FIDUCIARY DUTIES & THE MARYLAND PENSION RISK MITIGATION ACT



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Maryland sunrise cover photo courtesy of @hurricane.shayne

Frostburg
Photo courtesy of Maryland Office of Tourism

Introduction

In accordance with the State Personnel and Pensions Article § 21-116.1 enacted into law by chapters 24 and 25 of the acts of 2022, *State Retirement and Pension Systems – Investment Climate Risk – Fiduciary Duties*, the Board of Trustees is submitting an assessment of risk for the several Systems. This report is also responsive to the State Personnel and Pensions Article § 21-116(e), *The Maryland Pension Risk Mitigation Act.*

The overarching risk to the System is a failure to meet pension obligations in full and on time. There are many potential causes for such a failure. This report will focus on risks associated with the investment program.

The Board of Trustees is charged with the responsibility of managing the assets of the Maryland State Retirement and Pension System. Investment policies are designed to support the fulfillment of the Board's mission to optimize risk-adjusted returns to ensure that sufficient assets are available to pay benefits to members and beneficiaries when due.

In pursuing this mission, the most powerful tool at the Board's disposal is its long-term strategic asset allocation policy. The strategic asset allocation policy establishes a mix of investment types (stocks, bonds, real estate, etc.) that collectively are modeled to produce the required return with the least risk over the horizon of the pension liabilities. The Board works with its independent investment consultant and staff to establish this long-term policy. Beyond this top-down approach, the Investment Division also

contributes to the System's risk management process in its implementation of the strategic asset allocation.

A mix of techniques are utilized at both levels of the investment process. The Board of Trustees and the Investment Division regularly engage with other market participants, including public pension plan peers, financial institutions, and academia, to ensure the System's investment policies and procedures represent leading practices.

Collectively, the Board's strategic allocation and the implementation of that allocation by staff could lead to heightened risk of a funding shortfall if:

1. The collection of assets in the strategic asset allocation fail to achieve the expected returns
2. The collection of assets in the strategic asset allocation achieves the average return over long periods of time, but experiences extreme negative returns in the near term, reducing the value of System assets
3. The implementation of the strategic asset allocation by Investment Division staff markedly underperforms the benchmark returns
4. The implementation of the strategic asset allocation does not maintain sufficient liquidity to make benefit payments

This year's submission includes several enhancements given the progress made by the System over the last year. Highlights are summarized below in Figure 1.

2023 Report	2024 Report
Document organized according to the language of *The Maryland Pension Risk Mitigation Act*	Document organized according to the language of *The Maryland Pension Risk Mitigation Act* and *State Retirement and Pension Systems – Investment Climate Risk – Fiduciary Duties*
Carbon footprint data applied to public equity investments	Carbon footprint data applied to public equity and corporate fixed income investments
Limited use of climate metrics beyond carbon emissions data	Utilization of Refinitiv Environmental Innovation Score to identify public companies that may benefit in a lower carbon economy
Limited discussion of private markets	Expanded discussion of private markets including examples of investments well-positioned for the energy transition

Figure 1

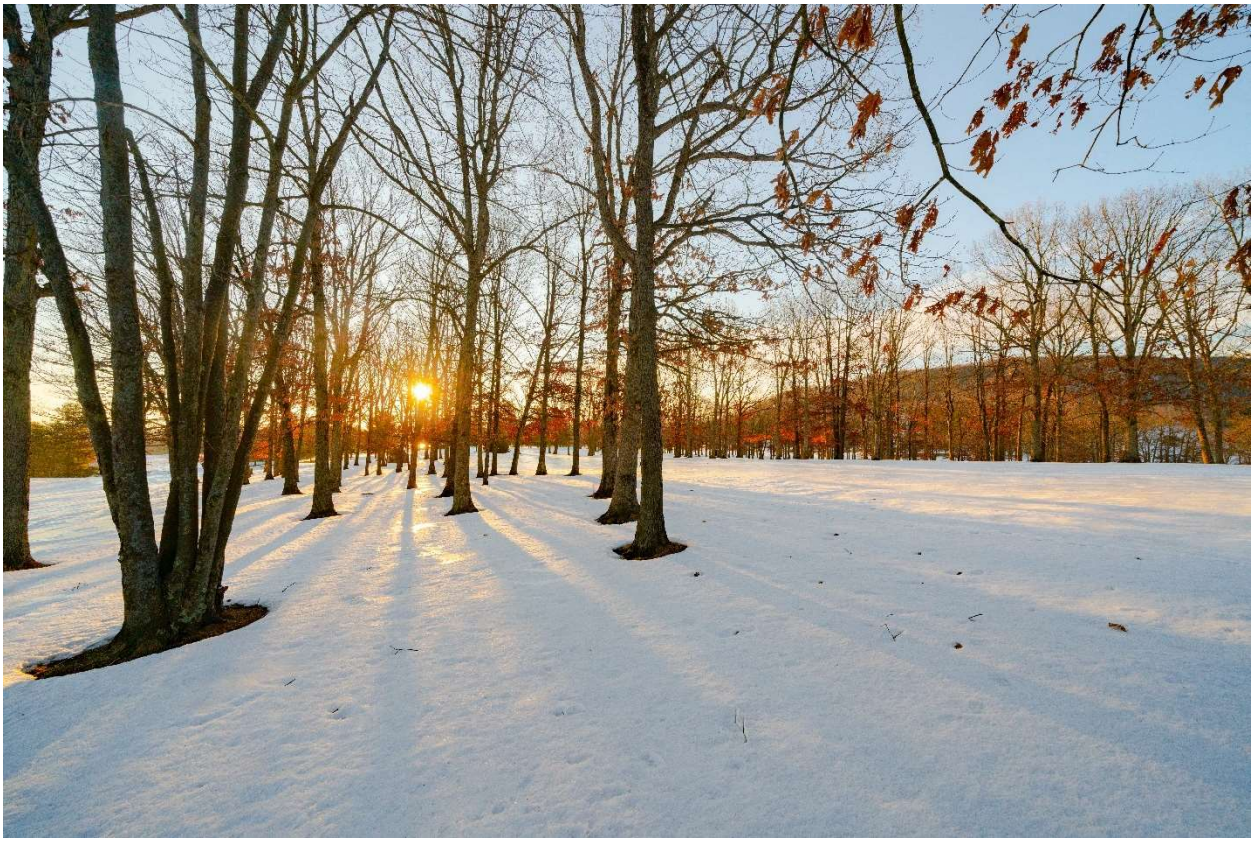
This report also includes language adopted in the Board's Investment Policy Manual[1] ("IPM") over the last year that affirms the System's commitment to building a long-term sustainable portfolio. The Chief Investment Officer and the Senior Governance Manager worked closely with the Board of Trustees to achieve several milestones: approval and addition of policy language to incorporate all requirements of *State Retirement and Pension Systems – Investment Climate Risk – Fiduciary Duties* in February 2023; approval of a framework for sustainable investing in May 2023; and adoption of further policies and procedures related to sustainable investing in the IPM in September 2023.

[1] https://sra.maryland.gov/investment-policy-manual

The IPM also includes important language relating to fiduciary responsibility, which reads: "The sole objective in investment decisions for all Fiduciaries of the System is to achieve optimal returns and safety of principal for sufficient liquidity to provide benefits to participants. A long-term sustainable portfolio is comprised of investments that can thrive for lasting periods of time, while mitigating idiosyncratic risk and minimizing systemic risks that may impede the portfolio's continued success. The path to a long-term sustainable portfolio shall not supersede fiduciary responsibility. A long-term sustainable portfolio and actions taken to support its pathway supports fiduciary standards and focus on desirable long-term return outcomes. The System may achieve this objective by using ESG factor insight and data in conjunction with traditional analysis to identify potential risks to performance. Fiduciaries of the System shall consider the impact of these potential systemic risks on the assets of the several systems. Such considerations include but are not limited to monitoring net-zero aligned investments and climate solutions to ensure a path to a long-term sustainable portfolio, consistent with the fiduciary responsibilities set forth in Title 21, Subtitle 2 of the State Personnel and Pensions Article."

Consistent with the Board's fiduciary responsibility and achieving a long-term sustainable portfolio, this risk assessment includes data relating to the impact of System assets on the climate, which may provide insight in identifying potential risks to investment performance. This report also includes information and capabilities regarding the energy transition readiness of the System's investments, as well as ways staff monitors and assesses the degree to which managers and consultants have considered and integrated climate risk and climate change into their investment process. Moreover, climate risks are managed through proxy voting, engagement and advocacy policies adopted by the Board of Trustees.

In addition to climate risk analysis, this assessment also includes other strategic and implementation-based risk analytics which model how the System may perform under different scenarios and market environments. This comprehensive risk analysis should lead to a more sustainable long-term portfolio with the appropriate balance between risk and return.



Maryland winter
Photo courtesy of Maryland Office of Tourism

Climate Risk Assessment

A review of the total investment portfolio to determine the level of climate risk across industry sectors and assets classes that prioritize high-impact sectors responsible for greenhouse gas emissions

Staff has access to climate risk metrics from several sources through its subscription with BlackRock Solutions, the provider of the System's primary risk management analytical tool, Aladdin Risk[2]. This section utilizes Scope 1 emissions (direct emissions from controlled and owned sources) and Scope 2 emissions (indirect emissions from purchased electricity) from Sustainalytics, a leading climate risk vendor in the marketplace.

While this section does not address Scope 3 emissions (all other indirect emissions), the analytics still include a degree of ambiguity. For example, emissions are self-reported in some jurisdictions requiring vendors to use estimation models to expand the coverage universe. While industry measurement and reporting standards are still in the development phase, the marketplace continues to improve. Industry

[2] Aladdin has been the System's main risk platform since 2021 and allows staff to analyze the System's investment portfolio using market data from many sources. Please see Figure 14 as it pertains to climate risk analytics specifically. Staff regularly evaluates the marketplace for additional solutions that could enhance its risk management practices.

datasets are being studied at academic institutions such as Massachusetts Institute of Technology[3], for example, amid the demand for more standardized and accurate information.

The first step in analyzing the level of carbon emissions from the System's portfolio is to understand coverage across the broad capital markets. The following sections show carbon emissions and universe coverage across the public equity and corporate fixed income markets.

Public Equity Market Analysis

Figure 2 and Figure 3 provide an overview of total carbon emissions and exposure to high impact[4] sectors for relevant public equity benchmarks across the global economy. The Russell 3000 Index, representing U.S. stocks, is the largest in terms of market capitalization and has a carbon footprint of 2.4 billion tons of CO2 equivalents. The MSCI Emerging Markets stock index is smaller in size but generates significantly greater emissions due its sector composition and reliance on more carbon intensive energy sources.

Index	Region	Market Capitalization (USD)	Number of Stocks	Total Carbon Emissions (tons of CO2 equivalents)	Emissions Coverage (%)
Russell 3000 Index	United States	$46.4 trillion	2,979	2.42 billion	98.2%
MSCI World ex-USA Index	Developed countries excluding the United States	$17.8 trillion	871	2.39 billion	98.5%
MSCI Emerging Markets	Developing countries	$6.9 trillion	1,443	8.04 billion	98.5%
MSCI All Country World Index	*Global*	*$66.8 trillion*	*2,924*	*12.36 billion*	*98.5%*

Figure 2

Index	Utilities Exposure (%)	Energy Exposure (%)	Materials Exposure (%)	Industrials Exposures (%)	Total High Impact Sector Exposure (%)
Russell 3000 Index	2.3%	4.1%	2.7%	9.9%	18.2%
MSCI World ex-USA Index	3.5%	5.8%	8.1%	16.0%	33.4%
MSCI Emerging Markets	2.7%	5.1%	7.9%	6.8%	22.5%
MSCI All Country World Index	*2.6%*	*4.6%*	*4.5%*	*10.6%*	*22.3%*

Figure 3

Figure 4 and Figure 5 provide further details on the carbon footprint of the MSCI All Country World Index, a comprehensive universe of listed stocks in developed and emerging economies, using the Sustainalytics

[3] https://mitsloan.mit.edu/centers-initiatives/sustainability-initiative/carbon-confusion

[4] Throughout this report, "high impact" refers to higher emitting sectors such as utilities, energy, and materials.

data set via Aladdin. Carbon emissions are highest in the utilities sector followed by materials, energy, and industrials. Staff tracks the evolution of emissions over time as well using this data set.

MSCI All Country World Index

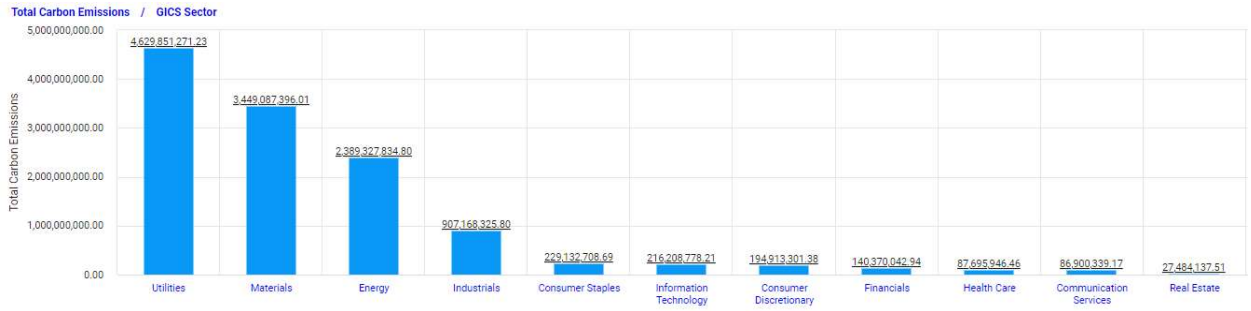


Figure 4

Figure 5

Corporate Fixed Income Market Analysis

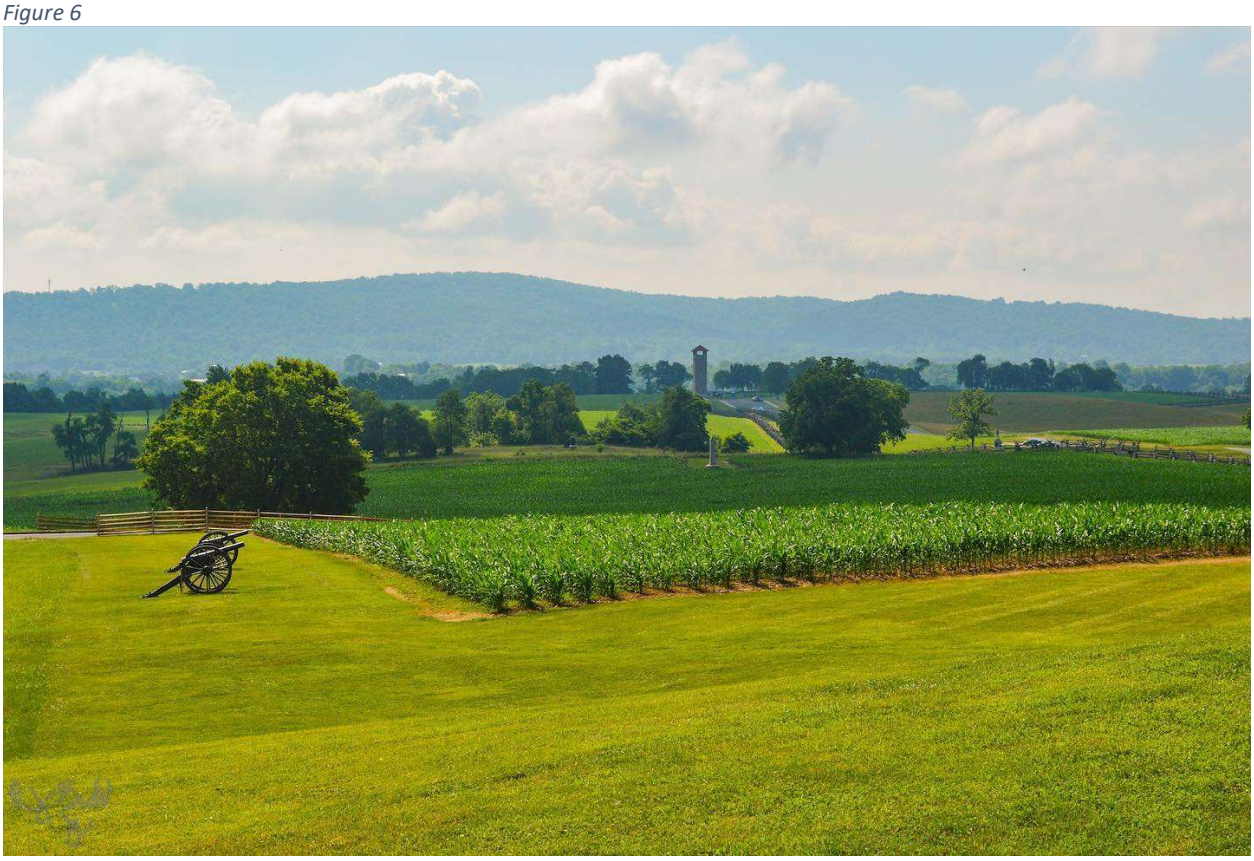
Beyond public equity markets, emissions coverage falls significantly when analyzing corporate fixed income markets[5] especially in the high yield and bank loan security universe. Given the sparse coverage and high number of issues in these markets, the System must conduct additional analysis to determine the best use of this dataset in its investment practices. Figure 6 shows higher exposure to high-impact sectors in the high yield and leveraged loan indices as compared to investment grade corporates, using Sustainalytics data set via Aladdin.

Index	Number of Bonds	Utilities Exposure (%)	Materials Exposure (%)	Energy Exposure (%)	Industrials Exposure (%)	Emissions Coverage (%)
Bloomberg US Corporate Investment Grade Index	7,773	9.1%	2.9%	6.3%	9.9%	75.4%
Bloomberg US Corporate High Yield Index	1,921	4.8%	9.0%	10.0%	15.5%	39.1%

[5] Large segments of the United States fixed income universe – Treasury bonds and mortgage-backed securities, for example – are not covered by the Sustainalytics emissions metric.

Morningstar LSTA Leveraged Loan Index	1,496	1.7%	8.1%	1.6%	22.2%	10.4%

Figure 6



Antietam National Battlefield
Photo courtesy of @cornstubble_nature

Public Equity Portfolio

Figure 7 shows high impact sector exposure in the System's portfolio as well as emissions data for the portfolio and its benchmark, using Sustainalytics data set via Aladdin. The System's public equity portfolio has a lower carbon footprint than its benchmark, which is the result of portfolio implementation decisions made by staff. For example, staff may allocate capital to a manager whose strategy tends to invest in companies outside high impact sectors. Security selection decisions made at the manager level also play a role. For example, while the portfolio has a small overweight to basic materials, it has a lower emissions profile than the benchmark in this sector. The cumulative effect of active management decisions results in a more environment-friendly portfolio in terms of carbon emissions.

Sector	Market Value ($ millions)	Portfolio Total Carbon Emissions	Benchmark Total Carbon Emissions
Basic Materials	$871.2	10,045,926	14,227,121
Energy	$1,025.4	36,575,124	37,626,217
Industrials	$2,523.9	2,972,983	3,537,068

Utilities	$454.1	25,737,939	30,024,664
Total	$18,964.6	5,455,634	6,029,236

Figure 7

While emissions data coverage is robust in the public equity markets, Staff believes this analysis is a starting point rather than a conclusion. There is more work to be done in terms of scrutinizing the emissions data and understanding implications for prospective returns.

Investment Grade Corporate Bond Portfolio

Figure 8 shows exposures to high impact sectors in the investment grade corporate bond portfolio[6] along with carbon emissions data as compared to the benchmark, using Sustainalytics data set via Aladdin. Given the relatively low coverage of the emissions data in this sector, it is important to highlight the challenges in interpreting this data. Within the System's portfolio, 71.2% of the investment grade corporate bond holdings have an emissions result. While coverage is slightly higher in the benchmark at 75.7%, it is significantly lower than the public equity universe. These caveats notwithstanding, this analysis provides a reasonable reference point as staff begins to evaluate portfolios from a carbon footprint perspective.

Sector	Market Value ($ millions)	Portfolio Total Carbon Emissions	Benchmark Total Carbon Emissions
Basic Materials	$15.7	30,550,667	11,494,568
Energy	$56.2	27,547,297	20,331,150
Industrials	$106.4	2,856,352	1,933,289
Utilities	$89.6	16,683,429	8,804,598
Total	$998.1	4,515,651	3,558,297

Figure 8

Private Markets

The System's private markets consultant, Hamilton Lane, assists staff in analyzing climate risk across several portfolios. While comprehensive emissions data is not currently available for these portfolios, Hamilton Lane is working to improve data capture in several ways.

Hamilton Lane is in the third year of its annual ESG/DEI survey process with the most recent survey sent to approximately 450 general partners. In 2023, portfolio company questions related to ESG – including request for scope one, two, and three emissions data – were added to its data collection template that covers more than 1,500 private funds.

In addition, Hamilton Lane became a signatory of the ESG Data Convergence Initiative[7] with the goal of influencing more general partners – the current count is 240 – to sign-on and report the Initiatives' key performance indicators which include emissions data at the portfolio company level.

[6] Investment grade corporate bonds are held in other parts of the System's portfolio in accounts with other fixed income securities where emissions coverage is virtually non-existent; this section focuses on accounts that hold only investment grade corporate bonds to for the ease of presentation.

[7] https://www.esgdc.org/

Hamilton Lane also led a $30 million funding round in Novata in February 2023[8]. According to the press release, "Novata is a public benefit corporation that enables the private markets to achieve a more sustainable and inclusive form of capitalism. Novata ESG solutions, technology platform and contributory database simplify the processes of selecting reporting metrics; collecting and storing relevant data; conducting analysis; and reporting to key stakeholders, including limited partners and regulators."

Real Estate

For its core real estate portfolio, the System utilizes the Global Real Estate Sustainability Benchmark ("GRESB") to assess the ESG performance. GRESB is an investor-driven organization committed to assessing the ESG performance of real assets globally. GRESB performs annual assessments on participating companies and funds to capture information regarding the ESG performance and best practices of real estate portfolios. The assessments provide a consistent, global framework for investors to engage with managers relating to ESG performance. Key aspects of the GRESB analysis include energy consumption, greenhouse gas emissions, water consumption, and waste management.

The System measures the ESG performance of its core real estate managers, representing approximately 80% of the System's private real estate portfolio. Core investments are primarily stabilized assets which are intended for a longer-term holding period, compared to investments in the value-add and opportunistic portfolios. Value-add and opportunistic funds have shorter term holding periods, making annual comparisons less informative and potentially misleading. These characteristics make the year-to-year comparisons in the core portfolio less noisy and more meaningful. The System's core real estate managers have been steadily improving their GRESB scores over the past 5 years, as shown in Figure 9.

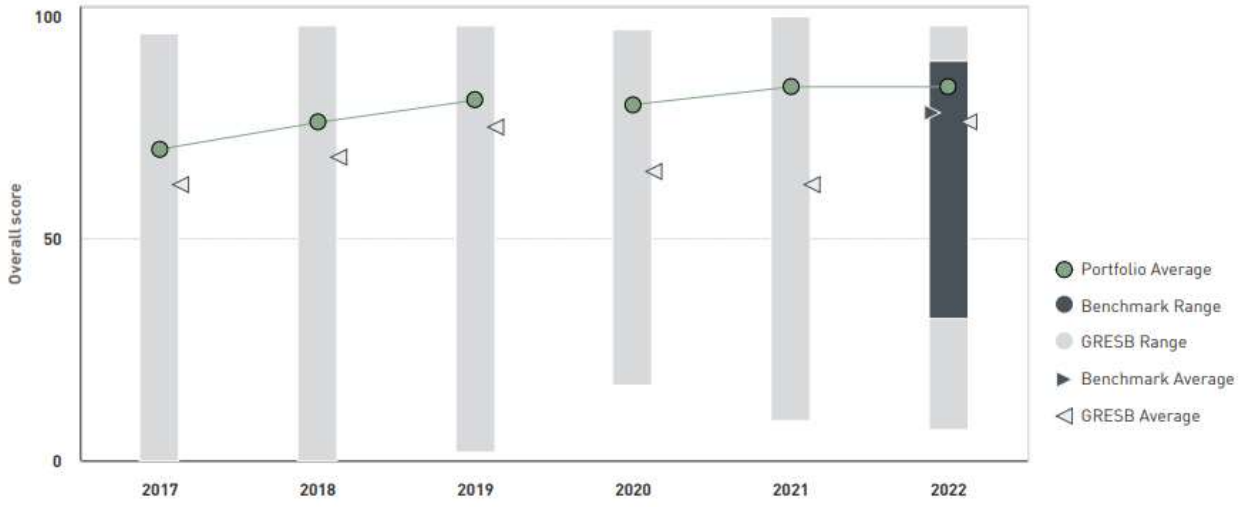
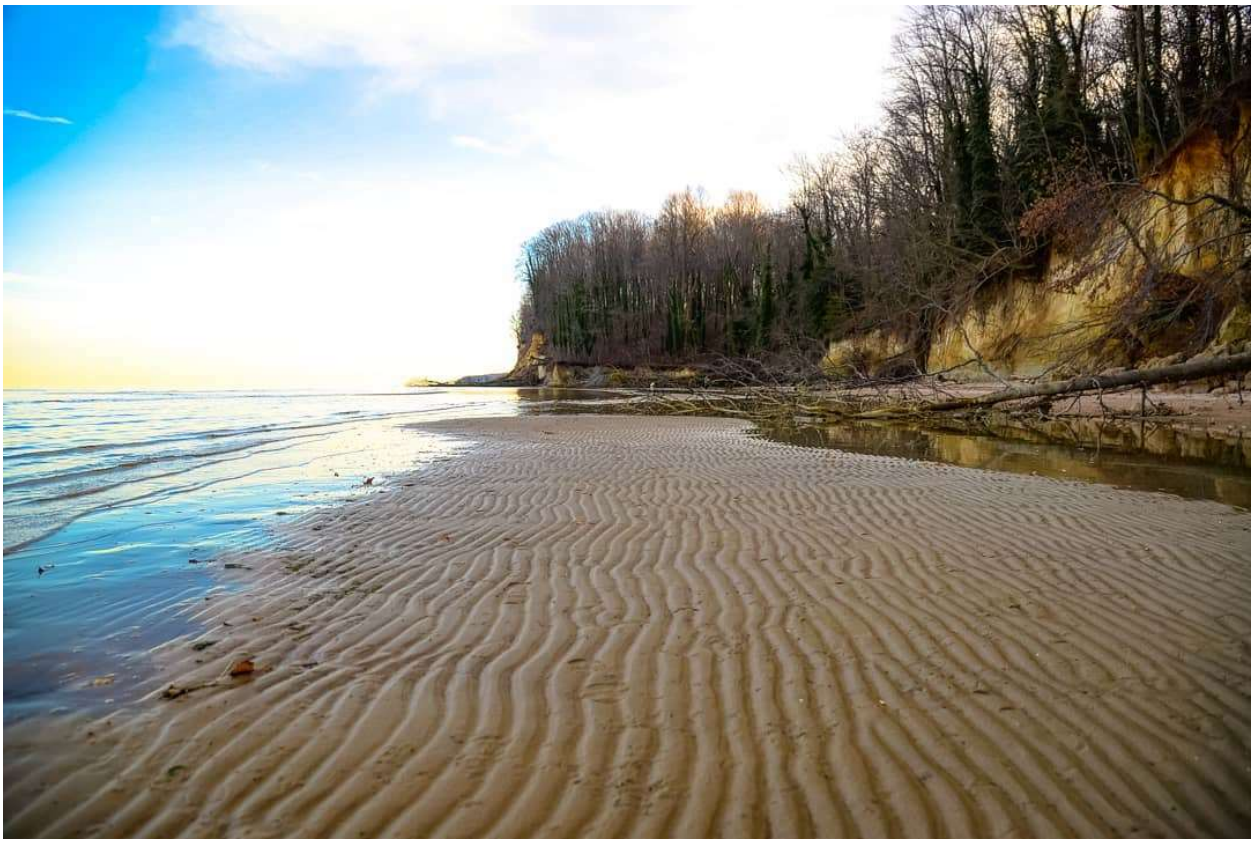


Figure 9

[8] https://www.hamiltonlane.com/en-us/news/novata-30-million-esg-investment



Chesapeake Beach, Calvert County
Photo courtesy of @angel_beil

Identifying investment opportunities in emerging technologies in renewable energy and transitioning, reducing, and eliminating carbon-emitting technology

Public markets examples

Staff utilizes Refinitiv's Environmental Innovation Score[9] as one way to identify companies that could benefit from the transition to a lower carbon economy. Refinitiv's methodology for this innovation metric is based on relative company performance (i.e., a percentile ranking where a higher score is better) within a given sector and covers themes such as product innovation, green revenues, research and development, and capital expenditures.

Staff is in the early stages of working with these data sets, limiting the ability to produce comprehensive and meaningful analyses of the System's portfolio at this time. However, these scores facilitate anecdotal observation of investments into forward-thinking companies as shown in Figure 10 which is especially important in high impact sectors. The table includes those companies with a score of 99 or

[9] The System has had access to the Environmental Innovation Score since 2021 when Aladdin was procured for risk management analytics. For more details on methodology, please refer to source materials here: https://www.lseg.com/content/dam/data-analytics/en_us/documents/methodology/lseg-esg-scores-methodology.pdf.

better and more than $1 million of invested System assets (i.e., not an exhaustive list, only the highest scores for this metric). Figure 10 reflects public equity investments only.

Company	Sector	Subsector	Environmental Innovation Score	Market Value ($ million)
Energias de Portugal	Utilities	Alternative Electricity	99.3	$5.2
BASF	Materials	Diversified Chemicals	99.8	$8.6
Air Products and Chemicals	Materials	Specialty Chemicals	99.5	$5.0
Eaton	Industrials	Diversified Industrials	99.9	$8.0
Wartsila	Industrials	Machines, Engines	99.7	$6.1
ABB	Industrials	Electrical Components	99.5	$5.1

Figure 10

Staff will expand upon this analysis as it further reviews these data sets. There is substantial work to be done in evaluating ESG scores and understanding various methodologies across vendors given the self-reported nature of the underlying data, inconsistent regulation across geographies, and the overall evolving nature of the industry.

Private markets examples

As described in the Climate Risk Assessment section, ESG data coverage – including metrics that address transition readiness – is rather sparse in private markets. Staff works with its private markets consultant to identify examples of companies seeking to capitalize from the transition to a lower carbon economy. Figure 11 shows a sampling of companies or funds in which the System has invested at least $1 million. Many other investments, including those in the venture capital portfolio, are currently smaller in size but may grow to become more meaningful positions in the future.

Company	Portfolio	Invested ($ millions)	Business Description
Assurua Renewable Project	Private Credit	$3.0	Brazilian platform of wind, solar, and hydro-generating assets
ConnectGen LLC	Natural Resources	$24.5	Renewable developer focused on US offshore wind projects
Cypress Creek	Private Credit	$1.1	Develops, finances, builds, and operates solar power projects in the US
EcoCeres Inc	Private Equity	$8.5	Produces renewable fuel and operates as a biorefinery platform intended to covert

Company	Portfolio	Invested ($ millions)	Business Description
			waste-based biomass into value-added products
Northern Trace III	Commodities	$150.0	California Carbon Allowances (fund investment)
Power Factors Holdings LLC	Private Equity	$8.4	Develops and operates a cloud-based remote asset management platform for the wind and solar industry

Figure 11

In addition to the above examples, the private infrastructure portfolio is currently being built out following a change to the strategic asset allocation in 2021. Staff expects meaningful exposure to assets that will support the transition to a low carbon economy in this portfolio. To date, the System has made the following fund commitments:

- ISQ Global Infrastructure III ($120 million commitment). ISQ targets global infrastructure investments across a diversified set of subsectors. The general partner invests in opportunistic renewables development, such as platforms, re-powerings and distressed opportunities, infrastructure to support renewables development, such as transmission, battery storage or supplemental peaking / support units, distributed generation, and waste & wastewater assets.
- IFM Global Infrastructure Fund ($300 million commitment). IFM seeks to create a diversified portfolio across infrastructure subsectors and regions and may pursue investments within the renewable energy industry.
- Brookfield Infrastructure Fund V ($300 million commitment). Brookfield seeks to invest in high-quality, essential infrastructure assets in the renewable, transport, utilities, midstream and data infrastructure sectors. The fund has only made a few investments to-date, but the general partner has invested 20-40% of its prior funds within the renewable sector.
- Stonepeak Opportunities Fund ($150 million commitment). Stonepeak Opportunities Fund represents Stonepeak's first dedicated middle-market infrastructure fund. Stonepeak targets digital, energy transition, transportation, logistics and social infrastructure investments across North America and Europe. Stonepeak has identified various investment themes within energy transition, including decarbonization, electrification and global energy security, and no longer plans to pursue energy assets without a decarbonization focus.
- Global Infrastructure Partners V ($200 million commitment). GIP plans to construct a diversified portfolio of infrastructure investments across the energy, transportation, water/waste and digital sectors. The general partner expects decarbonization to be an underlying theme across its investments in the Fund. These investment opportunities may include renewables, LNG, road-to-rail substitution, sustainable aviation fuel, transportation electrification, circular economy/recycling, energy-from-waste, renewable natural gas, and green data centers.

Annapolis Rock
Photo courtesy of @alejovoltsender

Process for regular reassessment of the potential systemic risks of the impact of climate change on System assets

For several years, staff has worked with Meketa Investment Group, the System's general investment consultant, to incorporate climate analysis into the strategic asset allocation process.

Methodology

To avoid becoming overly dependent on current conditions and future assumptions, Meketa's climate scenarios use a top down, multifactor framework to assess long-term trends and scenarios. Meketa specifies broad, economically linked factors and projects future behaviors based on underlying historical relationships. Meketa's macroeconomic model can contextualize past environmental changes (e.g., mean global temperature rise over the pre-industrial baseline) alongside economic and financial factors and projects various climate scenarios going forward over a long timeframe. Their approach is dependent on the continuation of historical trends.

Meketa's macroeconomic model generates many simulations describing how different asset classes and macroeconomic factors could potentially behave over a forecast period given what is known about past behavior. Beginning with the most recent available actual data, possible future values are projected by randomly selecting values consistent with the factor's past distribution of returns. Additionally, historical relationships among and between factors are also considered in each iteration of projected values. This process repeats to generate a sufficiently long simulation period. These simulations can be thought of as

different plausible ways the world could look in the future based on what has been seen in the past. By examining groups of simulations that display characteristics being investigated (e.g., examining all simulations where global temperature rises by a given amount), the methodology draws conclusions about the paths of asset classes and factors that are consistent with the topic of investigation. For this analysis, Meketa iteratively generated monthly return data beginning with the latest available actual returns for 47 different economic, financial, and climate factors. The starting point for the analysis is the end of the 2022. Meketa investigated several different types of climate scenarios and focused on three relatively broad situations which examine subsets of the 5,000 climate simulations generated.

Assumptions and Limitations

The climate scenarios are dependent on the following assumptions:

- 1.5 Degree Scenario: Simulations where the global average temperature anomaly above pre-industrial average is constrained to 1.5 Degrees +/- 0.25 degrees.
- 3.0 Degree Scenario: Simulations where the global average temperature anomaly above pre-industrial average is constrained to 3.0 Degrees +/- 0.25 degrees.
- Technology Scenario: Simulations where there is a 3% annual reduction in carbon intensity of electricity production over the next 10 years.
- Policy Scenario: Simulations with rises in oil and natural gas prices consistent with the carbon taxation of $100/tCO2 where fossil fuel reserve owners do not have increasing profits over the next 10 years.
- Past asset behavior is like future asset behavior.

Figure 12 shows the return assumptions produced by the scenario simulations as well as the baseline using Meketa's 2023 capital markets assumptions[10]. In general, 20-year return expectations are highest for the technology scenario characterized by efficiency gains. The policy scenario, on the other hand, produces the lowest return expectations due to the assumed taxation impact.

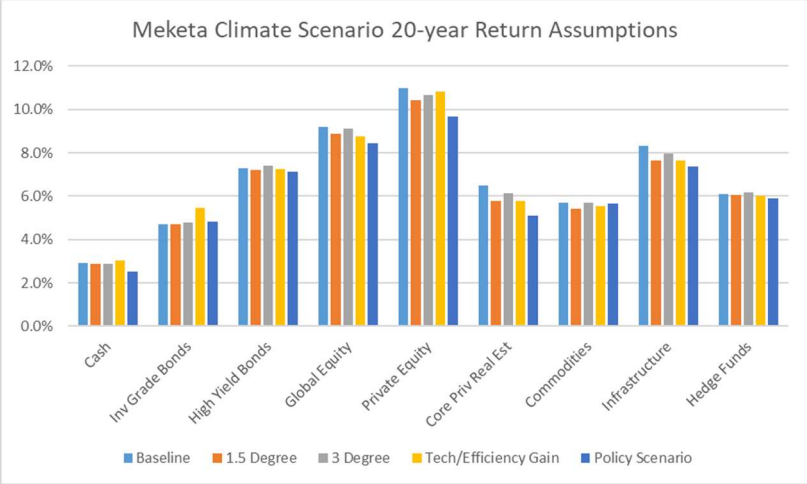


Figure 12

Expected return forecasts for the System's strategic policy benchmark, adopted in 2023, under the various scenarios are presented in Figure 13. The policy mix is expected to outpace its actuarial target in the base case and each of the climate scenarios[11].

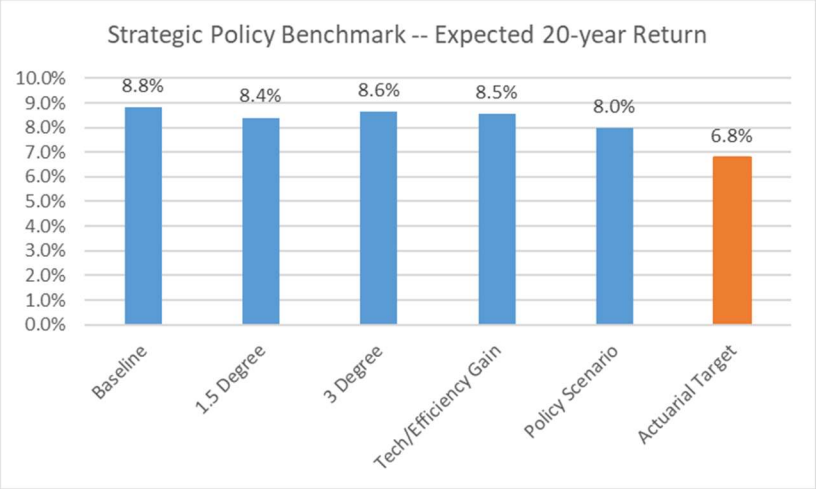


Figure 13

[10] Meketa updates its capital markets assumptions annually. Due to the stock market rally in 2023, the soon-to-be-published 2024 capital markets assumptions will likely suggest lower prospective returns in some areas but will also reflect significantly higher interest rates.

[11] See preceding footnote regarding Meketa's 2024 capital markets assumptions.

Utilization of the best data and practices available in current science, investment strategies, and climate risk analyses

The preceding sections of this report demonstrate how climate risk is addressed in the System's investment practices and analytical tools. Through Aladdin, the System's primary tool for risk management, staff has access to ESG analytics from several vendors. Figure 14 includes a sampling of these analytics.

Sustainalytics	Refinitiv	ISS	Clarity AI
• Controversy categories • Overall product involvement • Carbon – Total Emissions • ESG Risk Category, Score, Percentile	• ESG Score • Controversies Score • Resource Use, Emissions, and Environmental Innovation scores • Workforce, Human Rights, Community, Product Responsibility scores • Management, Shareholder, CSR scores • Total CO2-equivalent Emissions to Revenue	• ESG Rating Decile Rank • ESG Rating Overall • GQS Overall Score • SDG Impact Rating	• ESG Risk Score • ESG Impact • UN Sustainable Development Goals • SFDR • EU Taxonomy

Figure 14

Staff are early in their engagement with these datasets and recognizes there are challenges in their application including security universe coverage, widespread use of proxies, and lack of consistency across vendors and throughout time. Notwithstanding these challenges, staff are committed to the continued integration of these tools into its suite of analytics and will evaluate additional products and services as the System's needs evolve and opportunities become available.

Staff continue to engage with peer-based organizations to stay apprised of the latest trends. As a recent example, the System became a signatory to the Ceres Freedom to Invest Initiative in November 2023. Freedom to Invest, which is coordinated by Ceres, was launched in March 2023. The campaign emphasizes the importance of prudent risk management to protect investments and business operations. It asserts that asset managers and owners need the freedom to invest responsibly – to reduce material financial risks to their portfolios and protect the long-term value of their holdings in the interests of their clients and beneficiaries. Ceres is a nonprofit organization that works with capital market leaders to address sustainability and climate challenges through its networks and global collaborations of investors, companies, and nonprofits.

Environmentally-sustainable investment opportunities to support a low-carbon economy

As a matter of routine practice, Staff use multiple sources for investment idea generation from both a top-down thematic and bottom-up fundamental approach, including but not limited to attendance and participation in industry conferences, consultant pipelines, incoming inquiries from managers, and a newly created Theme Team. Using a wheel and spoke model, the Theme Team began its work in 2023 and serves as an initial research hub for thematic investment idea generation. Since its creation, the team has conducted meetings with managers focused on such themes as Inflation Reduction Act 45Q tax credits related to carbon capture, sustainable food systems, industrial water resource optimization, and many others.

On a monthly basis, Staff track and report manager meetings and includes separate tracking specifically for climate themed discussions. Staff tracks meetings where climate risk consideration is embedded in the investment process and those that offer a climate themed strategy. Staff conducted over 1,500 manager meetings in calendar year 2023. Approximately 48% of those meetings were with investment managers that incorporate climate risk into the investment decision making process or related to a dedicated climate themed strategy.

Develop transition assessments related to high impact sectors

As discussed in the Climate Risk Assessment, the System is in the early stages of incorporating more analytical resources into analyzing transition risk, such as Refinitiv's Environmental Innovation Score. The prior year was dedicated to ensuring the Investment Policy Manual was updated to reflect the System's vision for a long-sustainable portfolio. With this work complete, the System can devote more time and attention to researching the climate risk data sets and understanding how these resources can help meets its risk and return objectives.

Evaluate whether managers are taking steps to transition to a more sustainable business model aligned with a low-carbon economy

The annual compliance questionnaire was updated to assess ESG and climate risk profiles of external managers and consultants. The recently added questions request detailed climate risk measurement, overall resiliency, and approach to physical, financial, and transition risk. These questions were designed to understand policies and practices of managers and consultants from both an internal lens and to understand the approach to their portfolio companies.

Identify, analyze, define and prioritize asset class specific metrics to evaluate transition readiness and resiliency for companies in high impact sectors

The preceding Climate Risk Assessment shows many examples and descriptions of ways the System works with managers, data providers, index providers, and consultants to analyze climate risk. While much research lies ahead, the System's relationships and analytical tools provide a solid base. The System intends to expand upon this foundation going forward and maintains ongoing dialogue with various entities to consider potential upgrades to the resources at its disposal.

Direct engagement with managers, brokers, and other entities

As stated in the IPM, "Consistent with fiduciary responsibilities, the System may use engagement and advocacy as tools to mitigate material risks and enhance opportunities for the investment of System assets, including the consideration of ESG factors that are relevant to a risk and return analysis." The IPM provides further details on proactive engagement, ad hoc engagement, and advocacy.

Proactive Engagement: Under the direction of the Chief Investment Officer and working with legal counsel ("OAG"), staff may propose focused engagement opportunities to the Corporate Governance and Securities Litigation Committee for recommendation to the Board. These recommendations would be the result of identifying a focus list of companies using the tools and resources described in the Climate Risk Assessment.

Ad Hoc Engagement: On a case-by-case basis, a Trustee or public representative of the Investment Committee may present to staff a situation whereby the value of a publicly traded company or private fund in which the System is invested may be adversely affected by material risk factors, illegal behavior,

reputational risk concerns, or ESG issues. In these instances, staff and the OAG will follow the steps outlined in the Investment Policy Manual that ultimately could result in a letter on behalf of the Board being sent to the public company or private fund manager.

Advocacy: Advocacy refers to engagement with regulatory agencies or lawmakers on issues that could impact the System. In these cases, a Trustee or public representative would contact the Executive Director who would consult with the OAG, the Chief Investment Officer, and the Chair of the Board to evaluate the matter's consistency with the System's proxy voting guidelines. Further action may include communication to the concerned party or additional analysis by the Corporate Governance and Securities Litigation Committee for guidance on next steps.

Proxy voting

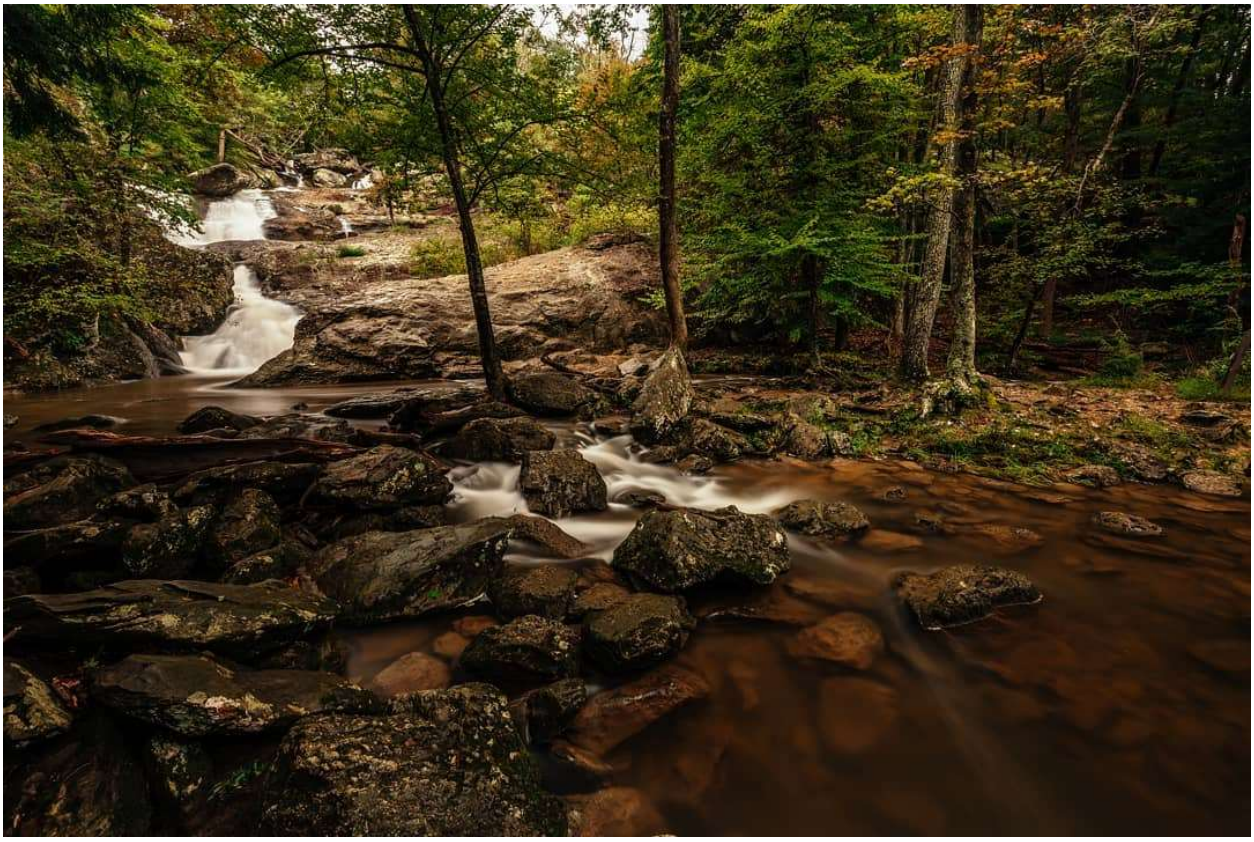
The IPM includes the System's proxy voting guidelines and are regularly updated[12]. The main sections of the guidelines are:

1. Routine/Miscellaneous
2. Board of Directors
3. Shareholder Rights & Defenses
4. Capital/Restructuring
5. Compensation
6. Social/Environmental Issues
    a. Animal Rights
    b. Consumer Issues
    c. Climate Change and the Environment
    d. Diversity
    e. General Corporate Issues
    f. International Issues, Labor Issues, and Human Rights
    g. Sustainability

A periodic review and assessment of the effectiveness of procedures used for direct engagement and proxy voting

As described in the IPM, "Staff will provide regular reporting to the Corporate Governance and Securities Litigation Committee ("CGSLC") on its engagement and advocacy activity and outcomes under this section. As is necessary and appropriate, Investment Division staff shall perform a periodic assessment and review of the engagement procedures to evaluate their effectiveness and report the results to the CGSLC for its review and consideration of any proposed changes to this policy."

[12] The System's proxy voting record can be found here: https://sra.maryland.gov/proxy-vote-record.



Cunningham Falls State Park
Photo courtesy of @ahwagner

Identify recent studies or actions by other U.S. state public pension plans, financial institutions, or risk experts, including those related to disclosure, risk assessment, investment principles, or other related issues or activities

MSRPS Fiduciary Responsibilities Concerning ESG Investing and Engagement. At the Board of Trustees education day in October 2023, the Office of the Attorney General ("OAG") led a session on ESG investing. After covering fiduciary fundamentals, the OAG provided a background on ESG investing and engagement. The OAG also reviewed the latest Department of Labor guidance on ESG investing and exercise of shareholder rights, trends in state and local pension legislation (i.e., anti- vs pro-ESG legislation), Maryland-specific considerations, and other topics such as private fund structures and confidentiality.

Colorado PERA Investment Stewardship Report[13]. During the 2023 legislative session, Colorado lawmakers passed a bill designed to reduce greenhouse gas emissions in the state including a provision that requires a description of climate-related investments, impacts, and strategies vis-à-vis the public employees' retirement association (PERA). PERA's stewardship approach is guided by four practices: protect, integrate, advocate, and evaluate. The report also addresses industry perspectives on sustainable investing and PERA's commitment to sensible investment practices with the goal of its members' financial security in retirement.

[13] https://www.copera.org/investment-stewardship-report

Montgomery County (MD) ESG Report[14]. The Montgomery Country Employee Retirement Plans' annual report addresses industry developments, current manager ESG updates and corporate engagement, consultant initiatives, recent board actions, and staff research. The report mentions several anti-ESG actions including a lawsuit brought against three New York City pension funds over fossil fuel divestment[15].

New York Common Climate Action Plan Progress Report[16]. In 2019, the New York Common Retirement Fund ("NYCRF") released a Climate Action Plan to address climate risk in its portfolio. The plan uses minimum standards to assess companies' readiness for the transition to a lower carbon economy and climate-related risk. In December 2020, NYCRF adopted a goal of net zero emissions from its investment portfolio by 2040. Its third progress report on the Climate Action Plan was published in July 2023. The report includes an update on its Sustainable Investment and Climate Solutions Program, transition readiness watchlist, and engagement and advocacy initiatives.

The Nature Conservancy Endowment Impact Report[17]. The Nature Conservancy (TNC) published its inaugural report on portfolio decarbonization and diversity, equity, inclusion, and justice. The report provides an overview of the sustainable investing market, describes TNC's environmental and values-based restrictions, and introduces a climate tech taxonomy for tracking investments in companies seeking to capitalize on the transition to a lower carbon economy. Several co-investments – in areas such as fish farming modernization, alternative dairy products, and vegetation management digitization – are highlighted as examples.

MainePERS Divestment Report[18]. A Maine divestment law that restricts future investment in fossil fuel companies and requires divestment of existing holdings by 2026 became effective in October 2021. MainePERS retained a specialty consultant in June 2022 to review divestment plans and quantify the impact on the portfolio including divestment costs. Following the specialty consultant's report, MainePERS sought advice from the state's Office of the Attorney General regarding divestment provisions and fiduciary duty. As noted in the report, MainePERS projects the portfolio's exposure to fossil fuels will decline by roughly one-third by 2026.

California Climate Corporate Data Accountability Act (SB 253)[19]. As reported by Thomson Reuters, "California has become the only U.S. state to enact a first-of-its-kind mandatory climate emissions disclosure rule, compelling companies to integrate company-wide disclosure and reporting." The law applies to both public and private companies that do business in the state and generate more than $1 billion in annual revenue. Importantly, the law requires that companies report on Scope 3 emissions which are indirect and range from suppliers to use of products.

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[14] https://www.montgomerycountymd.gov/mcerp/Resources/Files/Attachment%202%20-%20ESG%20Annual%20Report%202023%20-%20FINAL(1).pdf

[15] https://comptroller.nyc.gov/newsroom/nyc-pension-funds-lawsuit-challenging-fossil-fuel-divestment-is-a-waste-of-time-and-courts-should-end-this-drain-on-public-resources/

[16] https://www.osc.ny.gov/files/reports/special-topics/pdf/progress-report-climate-action-plan-2023.pdf

[17] https://www.nature.org/content/dam/tnc/nature/en/documents/2023-Endowment-Impact-Report.pdf

[18] https://www.mainepers.org/wp-content/uploads/Divestment-Report-FINAL_01042023-submitted-1.17.2023.pdf

[19] https://www.thomsonreuters.com/en-us/posts/esg/california-climate-reporting-law/

COP28 ends with call to 'transition away' from fossil fuels; UN Chief says phaseout is inevitable[20]. According to UN News, COP28 in Dubai included the following highlights: creation of loss and damage fund for vulnerable countries, $3.5 billion in commitments to the Green Climate Fund, $150 million announced for the Least Developed Countries Fund and Special Climate Change Fund, an increase of $9 billion annually by the World Bank for climate project finance, nearly 120 countries backed COP28 UAE Climate and Health Declaration, over 130 countries signed up to COP28 UAE Declaration on Agriculture, Food, and Climate, and 66 countries endorsed the Global Cooling Pledge to reduce cooling related emissions by 68% from today.

Recommend best practices and consider whether these best practices can be incorporated into the investment policy manual

As mentioned in the Introduction of this report, the Chief Investment Officer and the Senior Governance Manager worked closely with the Board of Trustees on to achieve several milestones: approval and addition of policy language to incorporate all requirements of *State Retirement and Pension Systems – Investment Climate Risk – Fiduciary Duties* in February 2023; approval of a framework for sustainable investing in May 2023; and adoption of further policies and procedures related to sustainable investing in the IPM in September 2023.

Examine the potential magnitude of the long-term risks and opportunities of multiple scenarios and related regulatory developments across industry sectors, asset classes, and the total portfolio of the several systems

Strategic Asset Allocation[21]

The Board conducts a formal strategic asset allocation study every three to five years working with its general investment consultant and staff. The following exhibits incorporate various statistical and scenario-based approaches to understand how the System's strategic policy benchmark might perform in the future. This analysis is based on Meketa's 2023 capital markets assumptions which is the latest available information at the time of publication. While the strategic policy risk and return forecasts will change when Meketa's 2024 capital markets assumptions are incorporated, staff does not anticipate major allocation changes when the Board conducts its formal study later this year.

[20] https://news.un.org/en/story/2023/12/1144742

[21] For more information related to the System's strategic asset allocation framework, please refer to page 15 of the Investment Policy Manual: https://sra.maryland.gov/sites/main/files/file-attachments/investment_policy_manual_-approved_by_board_september_19_2023_1.pdf?1695413289.

Figure 15 shows the strategic policy targets across asset classes as well as summary risk and return forecasts over the next 20 years.

Asset Class	Strategic Policy
Public Equity	34.0%
Private Equity	16.0%
Rate Sensitive	20.0%
Credit	9.0%
Real Estate	10.0%
Natural Resources & Infra	5.0%
Absolute Return	6.0%
Expected Return (20-year)	***8.82%***
Standard Deviation	***12.9%***
Sharpe Ratio	***0.46***

Figure 15

Figure 16 presents hypothetical outcomes under various market events that have occurred in the past such as the COVID outbreak and Global Financial Crisis of 2008.

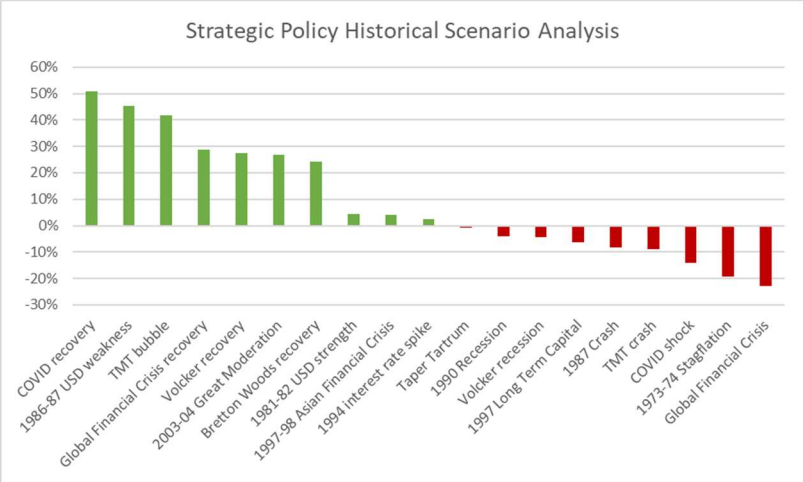

Figure 16

Figure 17 displays return outcomes under various stress tests based on correlated shocks derived from changes in factors such interest rates, stock prices, and foreign exchange.

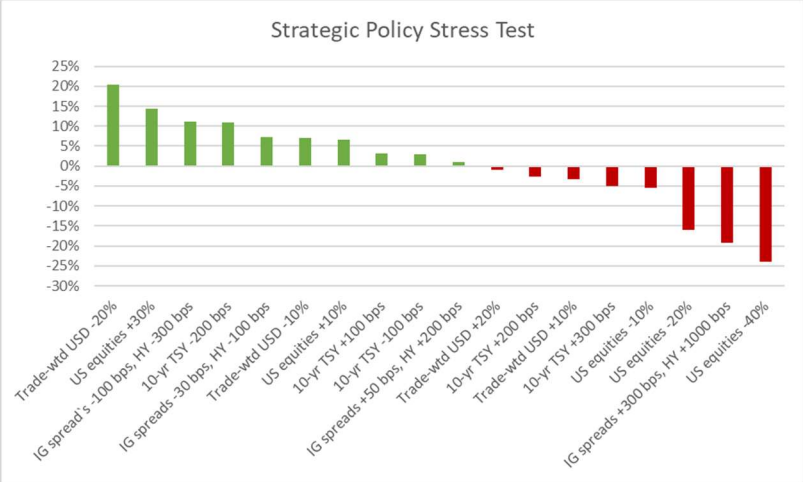

Figure 17

Figure 18 reflects the probability of the System's assets achieving its 6.8% actuarial target[22] over several time horizons. As of June 30, 2022, the System's funded ratio was 77.2%, slightly lower than the 77.3% predicted for that date, but higher than the 76.9% reported in the prior year[23]. The System continues to remain on track to be 80% funded by 2026; 85% funded by 2030; and 100% funded by 2039.

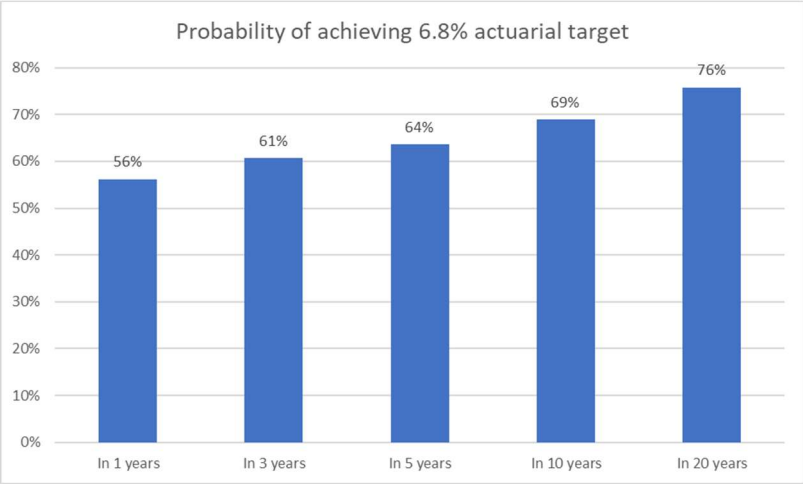

Figure 18

[22] For further information, please see the Actuarial Valuation Reports at https://sra.maryland.gov/actuarial-valuation-reports.

[23] Please refer to the Annual Financial Reports for more information at https://sra.maryland.gov/annual-financial-reports.

Implementation Risk Management

Once the Board establishes the System's strategic asset allocation, the Chief Investment Officer, working with staff, specialty consultants and asset managers, is responsible for implementation. To capture the different types of risks associated with the implementation process, the Investment Division estimates tracking error, which measures the variability in the difference between realized and benchmark returns, broken down according to three distinct phases of the investment process as follows:

1. Allocation risk – the risk that results from an over- or under-weight position in a particular asset class
2. Style risk – the risk that results from assigning a benchmark to a manager that is different from a particular asset class benchmark
3. Selection risk – the risk that results from a manager building a portfolio of securities that is different from the constitution of the assigned benchmark

The System's portfolio produces an estimated tracking error, or "total active risk," of 1.46% versus the strategic policy index as of 9/30/2023, as shown in Figure 19. This means approximately 67% of the time, the realized return will be within a range of +/- 1.46% around the expected outperformance above the benchmark return. The vast majority – nearly 90% – of total active risk can be attributed to security selection decisions, a function of the staff's belief that markets exhibit varying degrees of efficiency across asset classes and geographies, providing opportunities for skilled investors to add value. Selection risk within asset classes where private markets investments play a prominent role constitutes the bulk of overall selection risk.

Asset Class	Allocation risk (bps)	Selection risk (bps)	Style risk (bps)	Total active risk (bps)
Public Equity	-13	6	5	-2
Private Equity	0	47	0	46
Nominal FI	5	-5	0	0
Inflation FI	1	0	0	1
US Credit	-2	23	0	21
Non-US Credit	0	-1	0	-1
Real Estate	0	31	0	31
NR & Infra	11	21	0	32
Commodities	-2	0	0	-2
Absolute Return	0	8	13	21
Multi Asset	-2	0	-2	-4
Cash	0	0	0	0
Total Plan Overlays	2	1	-2	2
Total System Portfolio	**1**	**130**	**15**	**146**

Figure 19

To contextualize estimated tracking error, Figure 20 displays historical realized tracking error since the late 1990s using monthly returns calculated by the System's custodian bank that serves as the performance book of record. There are two noticeable spikes, one around the bursting of the tech bubble and another around the great financial crisis, during the first half of the time series. Following each of the episodes of market tumult, an extended period of subdued volatility took hold. The latest plots in the time series reflect the current market environment characterized by the global pandemic and subsequent high inflation environment.

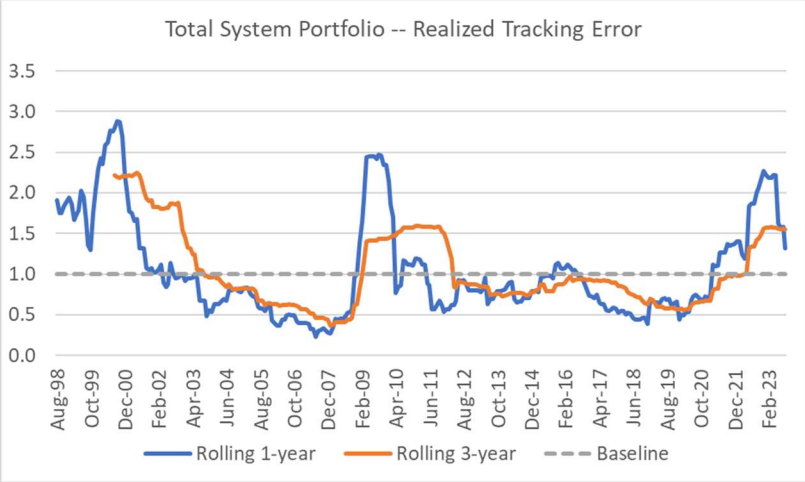

Figure 20

Staff has made significant progress over the last year in its utilization of data analytics, establishing appropriate governance policies and risk reporting. Going forward, staff will continue the education process relating to the quantitative tools at its disposal and apply these systems to the risk management and reporting function. While there is no industry standardization in this area and challenges associated with assumptions and accuracy in the models persist, staff is confident that the System's Annual Risk Assessment will continue to expand and provide more meaningful and insightful analysis.