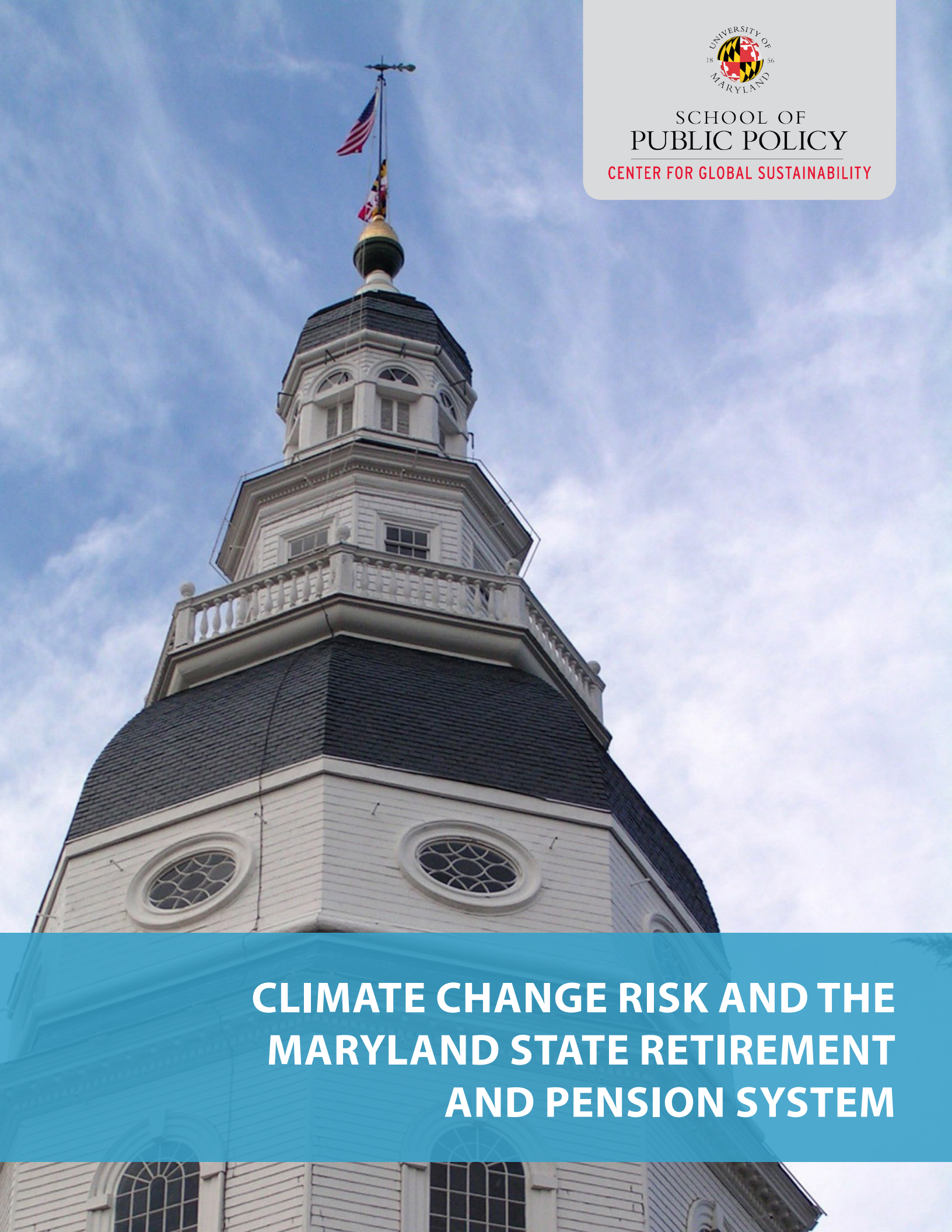

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CLIMATE CHANGE RISK AND THE MARYLAND STATE RETIREMENT AND PENSION SYSTEM

Climate Change Risk and the Maryland State Retirement and Pension System

a report prepared by

SCHOOL OF
PUBLIC POLICY

CENTER FOR GLOBAL SUSTAINABILITY

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ACRONYMS

AODP	Asset Owners Disclosure Project
AUM	Assets Under Management
CalPERS	California Public Employees' Retirement System
CalSTRS	California State Teachers' Retirement System
CEPB	The Church of England Pensions Board
CGS	Center for Global Sustainability
DDQ	Due Diligence Questionnaire
EPA	United States Environmental Protection Agency
ESG	Environmental, Social and Governance (ESG) issues
G7	Group of 7 (Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States)
G20	Group of 20
GHG	Greenhouse Gas
INCR	Investor Network on Climate Risk
INDC	Intended Nationally Determined Contribution
JCP	Joint Committee on Pensions
LGS	Local Government Super (in New South Wales, Australia)
NDC	Nationally Determined Contribution
NYSCRF	New York State Common Retirement Fund
OTPP	Ontario Teachers' Pension Plan
OPTrust	OPSEU (Ontario Public Service Employees Union) Pension Trust
ROI	Return on Investment
SRA	(Maryland) State Retirement Agency
SRI	Socially Responsible Investing
SRPS	(Maryland) State Retirement and Pension System
TCFD	Task Force on Climate-related Financial Disclosures
UNEPFI	United Nations Environment Programme Finance Initiative
UNFCCC	United Nations Framework Convention on Climate Change
UNPRI	United Nations Principles for Responsible Investment

EXECUTIVE SUMMARY

Climate change poses a real and meaningful threat to economies, industries, and companies at global, national, and local levels. The physical impacts of climate change create multiple, well-documented risks to people, governments, and business, but the risks are not limited to physical damages: other important risks include loss of competitiveness and value associated with the transition to a low carbon economy, and legal liability for the mismanagement of such risks. These risks are particularly relevant to public pension funds, which have long-running, predefined obligations to beneficiaries and need to sustain growth over longer time horizons.

In recent years, the financial community and many state governments have begun working to understand the nature and extent of the climate-related risks to which their investments are exposed. Major efforts have been undertaken to promote climate risk assessments and to establish standards for related disclosures; many thought-leaders now argue that climate risk management is mandated by fiduciary duty. Stockholders, including major pension funds, are pushing companies to quantify their emissions and "stress test" their exposure to climate risks. Such risks accrue to all investors; fiduciaries need to understand the implications of these risks for their portfolios.

This is particularly true of state pension systems, and this report highlights the importance of incorporating such risks in the context of Maryland's State Retirement and Pension System (SRPS). The Maryland SRPS currently manages over $47 billion in assets on behalf of over 380,000 members across numerous state and local government agencies. While some other state pension systems are beginning to systematically address their climate risk exposure, SRPS has implemented only some of the important policies and actions related to climate risk management.

Fortunately, industry leadership groups, working with diverse stakeholders, have begun developing best practices for managing climate risk. These include clearly articulating a fund's investment philosophy and governance principles with respect to climate change, conducting a climate risk assessment, leveraging stockholder privileges to engage with corporate boards, and reallocating assets. Each of these practices requires, and is strengthened by, transparency of strategy and action. While SRPS has embraced some of these best practices, it has only partially implemented others. We highlight that the State of Maryland could benefit from (1) clarifying its investment principles, (2) undertaking a comprehensive climate risk assessment, and (3) increasing its corporate engagement and transparency.

The report offers several policies the Maryland State Retirement and Pension System could adopt in order to address its climate-related financial risks, and in doing so seeks to start a conversation and initiate a process of stakeholder engagement that can illuminate how the State might proceed in incorporating climate impacts into its investment strategy.

INTRODUCTION

Climate change poses a significant threat to natural and human systems, including national economies and economic sectors. Even in the near term, climate change is expected to create substantial disruption. Impacts on the United States over the next 5 to 25 years are expected to include:

- Increasing damage to coastal property and infrastructure, bringing the average annual price tag for hurricanes and other coastal storms to $35 billion;
- A decline in yields of corn, wheat, soy and cotton in Midwestern and Southern counties of more than 10%; and
- A need for an additional 95 gigawatts of new power capacity at a cost to ratepayers of up to $12 billion per year.[a]

The impacts of climate change are already evident in Maryland. A recent EPA report highlights some of these:

> In 2003, the storm surge in Chesapeake Bay from Hurricane Isabel flooded downtown Annapolis, North Beach, and several communities on the Eastern Shore, causing about $400 million in damages. While recent hurricanes have had minimal impacts on Ocean City, about 25 percent of its structures are vulnerable to flooding. On the lower Eastern Shore, communities like Hooper's Island, Smith Island, and parts of Crisfield are so low that water in ditches along the streets rises and falls with the tides. These towns will become more vulnerable to storms and erosion as sea level rises.[1]

In addition, the historic flash flooding event that killed two people and caused massive destruction last year in Ellicott City – more than 6 inches of rain in only two hours – is the type of extreme event expected to be more common with climate change.[2]

In recent years, the financial community has begun working to understand the nature and extent of climate-related risks to which their investments are exposed. At the same time, climate change is creating opportunities for new products, services, and markets as the world begins transitioning to a low carbon economy.

In particular, pension systems and other major investment funds are beginning to systematically review their climate risk exposure.[b] Some now argue that climate risk management is mandated by fiduciary duty. Stockholders, including major pension funds, are pushing companies to quantify their emissions and "stress test" their exposure to climate risks.[3]

The Maryland State Retirement and Pension System (SRPS) is an example of a fund that could consider climate risk but has not yet done so in a systematic manner. Maryland's State Retirement Agency's mission is "To administer the survivor, disability, and retirement benefits of the System's participants, and to ensure that sufficient assets are available to fund the benefits when due."[4] SRPS currently manages over $47 billion in assets[5] on behalf of over 380,000 members across numerous state and local government agencies. The System is financially obligated to its beneficiaries for many decades into the future; thus, prudent management of the SRPS portfolio requires a longer time horizon than typical investment funds.

a The Risky Business Project was initiated in 2013 by former New York mayor Michael Bloomberg, former Secretary of the Treasury Hank Paulson, and philanthropist Tom Steyer. The economic risk assessment includes detailed projections by region. In the mid-Atlantic, the primary climate impacts are associated with sea level rise, storm surges, and the effects of extreme heat. See: Risky Business (2014).

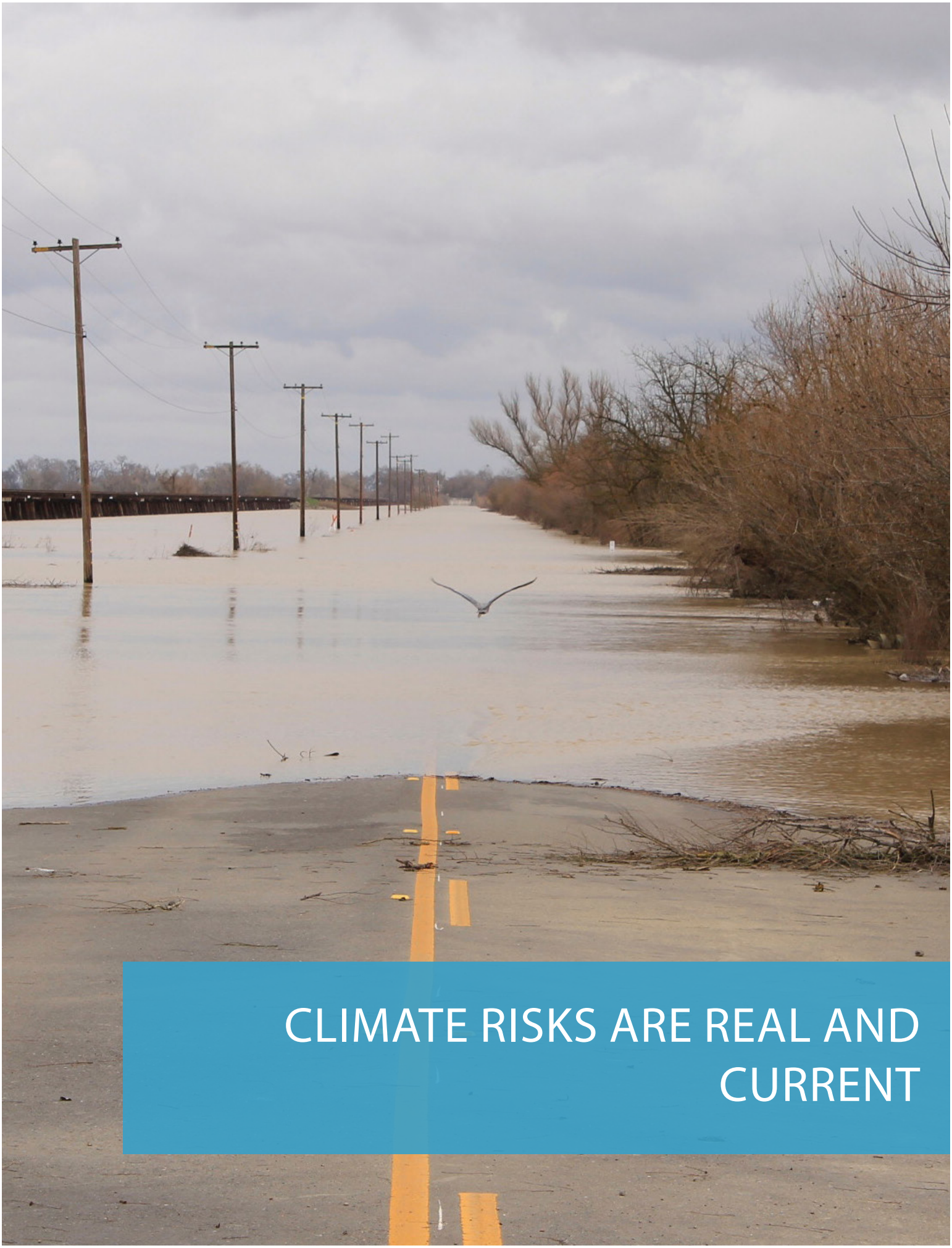
b For example, both the California Public Employees' Retirement System (CalPERS), the New York State Common Retirement Fund (NYSCRF), and several other pension funds have commissioned reports analyzing their climate risk. BlackRock, the world's largest asset manager, recently published a whitepaper detailing the need for all investors to adapt their portfolios to climate change. See: California Public Employees' Retirement System (CalPERS) (2016b); New York State Common Retirement Fund (NYSCRF) (2015); BlackRock Investment Institute (2016).

While SRPS has a well-diversified portfolio with most of its funds invested outside of Maryland, the state's vulnerability to climate change creates an interest for the state to lead on all facets of climate policy, including management of climate risks for institutional investments.

In light of these emerging trends, and increasing questions by residents of the State of Maryland about how to address climate risks, this report aims to:

- Synthesize the latest research on investment risks, opportunities, and responsibilities posed by climate change;
- Explore the extent to which Maryland's State Retirement and Pension System (SRPS) reflects these risks;
- Describe best practices for managing institutional investment portfolios in the face of climate change;
- Offer recommendations for how Maryland SRPS can incorporate climate risk and opportunity into its management practices.

This report seeks to begin a dialogue about climate risks and opportunities facing the Maryland State Retirement and Pension System. By shining a light on how researchers and investors are understanding and responding to the economic impacts of climate change, this report can help SRPS develop a more deliberate, effective approach to managing climate risk within its portfolio. While more assessment may be warranted, advancing the dialogue with stakeholders can illuminate how the State might proceed in incorporating climate impacts into its investment strategy.



CLIMATE RISKS ARE REAL AND CURRENT

CLIMATE RISKS AND IMPLICATIONS

It is now broadly agreed that (1) the earth's climate is warming, (2) this warming is primarily driven by anthropogenic greenhouse gas emissions, (3) climate change is impacting natural and human systems, and (4) these impacts will intensify unless actions are taken to significantly curtail greenhouse gas emissions in the very near future.[6] The economic system is deeply entwined with these impacts, and effects are already being seen at global, national, and local levels. Perhaps the most visible economic impact of climate change stems from the increased incidence of extreme weather events around the world, which are often exacerbated by shifting population patterns and increasing capital investment in vulnerable areas such as coastlines. For example, in 2016, the United States experienced 15 distinct "weather and climate disasters" for which damage and other costs totaled at least $1 billion; the total economic losses from these 15 events is estimated to exceed $45 billion.[7] As already noted, Maryland has recently suffered from extreme weather events linked to climate change. A Maryland state Senator noted that global warming was thought to have contributed to the once-in-1,000-year flood in Ellicott City.[8] Climate events in other parts of the world have also had enormous economic and humanitarian consequences.[c]

Yet the impact of climate change extends far beyond these "acute" events; more "chronic" threats include more frequent nuisance flooding from sea level rise and reduced water availability[9] due to changes in precipitation, snowmelt, or evaporation patterns[10]. The consequences of these trends range from regular disruptions of business operations to large scale shifts in the regional viability of agriculture[11] or other industries. In Maryland, where sinking land and eroding beaches have resulted in greater sea level rise than in most coastal areas, the chronic effects of climate change are of great concern.[12] The state has 3,190 miles of shoreline and approximately 265,000 acres of both urban and rural land located less than five feet above the high-tide line. In Dorchester County, wetlands have already become inundated by rising sea water, and by the end of the 21st century, as much as 50% of the county (270.5 sq. miles) may be under water, causing irreversible damage to the state's coastal ecosystems and local economies.[13]

Beyond these single impacts, experts suggest that climate change should be viewed as a "threat multiplier"[14] that can exacerbate other vulnerabilities facing a given business or industry. Both acute and chronic threats are unevenly distributed, and efforts should be made to anticipate their impacts at spatial- and time-scales relevant to investment decisions. However, information that is easily usable to facilitate such decision-making is frequently lacking.

These potential impacts on businesses create several types of risk for individual companies and for industries and sectors. The G20's Financial Stability Board has identified three distinct types of climate risk for businesses and the financial sector more broadly.[15] Perhaps most immediately salient to investors, transition risks result from the need to decarbonize the global economy and the increasing recognition that such actions are necessary in the very near term. Significant climate policies are being adopted, e.g., recent legislation enacted in California.[16] Greenhouse gas regulations threaten to diminish asset values across a broad range of companies, industries, and financial systems; the sooner and clearer these market signals are solidified, the lower the risk of continued investment in assets that may need to be retired prematurely. Climate change also creates physical

c For example, in 2011, flooding in Thailand shut down many international businesses including the Honda Motor Company, contributed to a GDP decline of nearly 9 percent, and caused total losses exceeding $45 billion. When Typhoon Haiyan struck the Philippines in 2013, it brought winds exceeding 170 mph, caused a wall of water 25 feet high, damaged or destroyed more than a million homes, and resulted in more than 6,000 deaths. See: Miller and Swann (2017), pp. 78-80.

risks to assets, infrastructure, and corporate value chains[d] due to both acute and chronic climate disruptions. Finally, the potential for litigation over harms caused by corporate carbon emissions or other climate risk mismanagement creates liability risks for companies and their insurers.[e]

Climate risks are particularly relevant to pension funds. Each of these threats is present today – with some probability of near-term harm – but also becomes increasingly prevalent in future decades as climate change accelerates, decarbonization efforts intensify, and climate-associated loss and damage accumulates. Pension funds have long-running obligations to beneficiaries and need to sustain growth over longer time horizons; thus, they cannot ignore these slower-developing financial risks.[17] Finally, pension funds are often exposed to climate risks in many industries due to the size and diversity of their portfolios.[f]

In addition to these economic risks, climate change also creates investment opportunities. Such opportunities can be broadly divided between investments in businesses that will benefit from policies and preferences to reduce emissions – sometimes referred to as "mitigation" of climate change – and those that can benefit from investment in sustainable, resilient infrastructure and other forms of adaptation to climate change. On the mitigation side, intensive efforts will be needed over the next several decades to decarbonize the global economy – predominantly via investment in clean energy and energy-efficiency technologies. For example, according to the International Energy Agency, the world needs to invest $13.5 trillion in clean energy and energy efficiency over 15 years to implement the Nationally Determined Contributions (NDCs) submitted to the United Nations Framework Convention on Climate Change (UNFCCC).[18] To make progress consistent with the Paris Agreement's goal of limiting warming to 2°C above preindustrial levels, investments of $16.5 trillion will be required by 2030 ($1.1 trillion per year).[19] In addition to renewable energy, which will require investments of $400 billion per year,[20] significant investments in energy storage, carbon capture and sequestration, electric vehicles, and land based mitigation will also be needed. While the US is currently experiencing some reversals in direction under the Trump Administration,[g] businesses needing to make longer term investments are focusing on what the policy matrix is likely to be not just for the next four years but often for a decade or beyond for more long-lived investments. In addition, the shift to a lower carbon energy system is being driven by trends in technologies which seem likely to continue despite recent actions by the Trump Administration, particularly insofar as many state and city governments have shown a willingness to continue and even strengthen climate change policies.[21]

Miller and Swann (2017) provide a helpful overview of climate adaptation investment opportunities.[22] For example, the ability to project climate impacts on fine spatial and temporal scales is currently lackluster and likely a hindrance to adaptation efforts. Thus, the authors identify "climate data, information, and analytical services" as having a large, unmet market potential, although several firms have started to emerge in this space.[23] Infrastructure projects that increase resilience to extreme weather events and sea-level rise also present an important investment opportunity.[24]

d Value chain risks include threats to availability of key inputs, input price fluctuations, and impacts on the logistics/ supply chains that deliver inputs to firms or deliver finished goods to market.

e For example, ExxonMobil currently faces fraud investigations by the state attorneys general of New York and Massachusetts, as well as a class-action lawsuit brought by stockholders alleging that the company violated the federal Securities Exchange Act. Both cases involve the company's failure to disclose financial risks related to climate change. See: Hasemyer (2016); Schwartz (2017).

f While fossil fuel stocks may be only a few percent of a typical portfolio, climate risks are much more pervasive and include utilities (major consumers of fossil fuels), coastal infrastructure and real estate, and agricultural commodities in regions subject to drought and extreme temperatures.

g Changes in national climate policies are also being at least partly offset by state and city climate policies. See: Megerian (2017).

Given the global need for infrastructure improvement as developing countries' populations boom and developed countries replace degraded infrastructure,[h] there will be ample opportunity, and an increasingly compelling economic case, for engineering services, advanced building materials, and other innovations that increase the resilience of these major investments to disasters such as flash floods and wildfires.[i] Of course, such designs and technologies will be valuable for privately owned commercial and residential buildings as well.

A third category of adaptation investments comprises insurance products that protect policyholders against the increased risk of natural disasters and climate damage. This can include expanded demand for traditional insurance policies as well as policies that incorporate resilience measures to both reduce risk of economic losses and insure against them.[25] Insurance against other types of climate disruptions, such as crop losses, drought, and even low output of renewable energy (such as hydropower) have been tried successfully but have not been deployed at large scale. Finally, global warming will create or greatly expand markets for new types of products and services,[26] including international shipping through newly available routes, water desalinization, and new approaches to controlling vectors of disease like mosquitos.[27]

Some funds have made initial steps toward understanding their impact using so-called "carbon footprints" that assess the emissions profile (considered a proxy of regulatory risk) in their portfolio. However, because of the diversity of risks from climate impacts, an investment fund's climate risk ultimately extends far beyond its carbon footprint. While regulatory pressures do pose transition risks for these investments, companies in a fund's portfolio may also be exposed to physical risks to assets, infrastructure, and supply chains, and liability risks for poor climate management. Further, climate change presents an opportunity to invest in technologies and services which have vast future market potentials. Attempting to quantify the carbon footprint of an investment portfolio is a worthwhile venture, but still does not provide a comprehensive view of the climate change risks (or opportunities) that the portfolio faces. Additionally, because the financial sector (in the US and globally) lacks consistent standards for disclosures of corporate greenhouse gas emissions portfolios, such measurements can be complicated with arbitrary or inconsistent assumptions.

h For example, the American Society of Civil Engineers estimates that the U.S. needs to invest nearly $4.6 trillion in infrastructure systems over ten years, with a current funding gap of over $2 trillion. See: American Society of Civil Engineers (ASCE) (2017).

i A major investment fund dedicated to such products and services has already been recognized by an award from an international donor fund, the Global Innovation Lab for Climate Finance. See: Global Adaptation & Resilience Fund (GARF) (2017).

RISK IDENTIFICATION AND TRANSPARENCY IN THE CONTEXT OF FIDUCIARY DUTY

There are currently many efforts to encourage publicly traded companies, asset managers, and asset owners to assess their climate risk exposure and establish standards for related disclosures.[j] For example, the G20 has established a Task Force on Climate-related Financial Disclosures (TCFD).[k] TCFD's final report, published June, 2017,[28] outlined four types of broadly applicable climate-related financial disclosures, with specific disclosures suggested within each of these four thematic areas. Specifically, the Task Force recommends voluntary disclosures surrounding:[29]

- Governance: board of directors, executive leadership roles in assessing and managing climate risks
- Strategy: the nature, extent, and potential impact of climate risks and opportunities on different time scales, with an emphasis on comparative scenario analysis
- Risk Management: processes for identifying and managing climate risk, including how these risks are incorporated into broader risk management frameworks
- Metrics and Targets: measuring and tracking performance towards climate risk management goals, including disclosure of GHG emissions

Recommendations from an earlier draft of the TCFD report spurred some debate. For instance, a recent report[30] by research firm IHS Markit[l] contends that singling out climate risks could have unintended consequences, such as obscuring other risks with similar financial consequences that do not face the same disclosure requirements. IHS Markit also argues that TCFD's recommendations amount to a "radical departure from the established concept of materiality,"[31] which traditionally leaves room for corporate discretion regarding what information is relevant to their business and investors. The report also takes issue with the use of scenarios and metrics, which are not standardized and depend on assumptions that may vary across companies and over time; it argues that such information does not allow for comparison or adequately align with financial risk and opportunity. TCFD addressed many of these concerns in its final report, clarifying that Governance and Risk Management disclosures should always be provided, while the Strategy and Metrics/ Targets disclosures are "subject to an assessment of materiality."[32] Further, the Task Force clarifies the purpose of scenario analysis as a tool for providing information about the resiliency of organizational strategies to a variety of possible climate change and policy outcomes, and creates a tiered recommendation whereby larger organizations may perform a "more robust scenario analysis."[33] Ultimately, methodological and decision-process transparency for such analysis is key to starting constructive conversations about relevant risks for investors.[34]

Further, several recent developments suggest that investors and regulators do find climate risks material to financial decisions. As of October 2013, publicly traded United Kingdom companies are required to report their GHG emissions as part of their annual Directors' Report.[35] In 2015, France became the first country to adopt mandatory

j These include, but are not limited to, the Climate Disclosure Standards Board (CDSB), the International Integrated Reporting Council (IIRC), and the Sustainability Accounting Standards Board (SASB).

k The Task Force comprises 32 members from across the globe, half of whom are financial sector experts; all decisions are made by consensus. For more information see: Task Force on Climate-related Financial Disclosures (TCFD) (2017a).

l The report was funded by oil and gas firms BP, Chevron, ConocoPhillips, and Total, but the findings are attributed only to IHS Markit.

climate risk reporting for institutional investors, including pension funds. Companies have until the end of June 2017 to disclose the physical and transition climate risks they face.[36] Shareholders are also taking measures into their own hands, approving climate change resolutions for five major energy companies in the first half of 2017. For example, in late May, shareholders of oil industry giant ExxonMobil passed a proposal requiring the company to "stress test" its profitability in the face of climate change regulations.[m] Additionally, ahead of the G7 meetings in May 2017, a group of over 280 institutional investors managing over $17 trillion in assets wrote an open letter to G7 leaders urging them to support implementation of the Paris Agreement with measures including "climate-related financial reporting frameworks."[37] Still more recently, in June 2017, Sweden's largest pension fund, AP7, announced it had sold its investments in six companies it said violate the Paris climate agreement.[38]

Some analysts argue that public pension fund trustees are obligated by fiduciary duty to account for climate risk in their investment portfolios. Because pension fund trustees, investment managers, and other fiduciary agents must act in the interest of all plan beneficiaries (present and future, balancing these interests) and "ensure stability while pursuing growth,"[39] the Center for International Environmental Law (CIEL) finds that climate change will confront pension plan trustees "with unique questions that will at once reshape our understanding of fiduciary duty and simultaneously demand strict adherence to the foundational principles that define that duty."[40] In fact, CIEL argues that climate risk triggers trustees' fiduciary duties to inquire, monitor, diversify, act impartially, act loyally, and act in accordance with plan documents. While climate risk is systemic in nature, with risks overlapping (and in some cases multiplying) across economic sectors and levels, some sectors (e.g., fossil fuels, utilities) are particularly vulnerable.[41] Based on these duties, trustees can (1) alter their investment policies to incorporate climate risk, (2) divest or significantly reduce holdings most vulnerable to climate risk, (3) engage with corporate boards and use shareholder management powers to ensure that their companies are taking steps to mitigate climate risks, and (4) actively pursue clean energy investments to hedge against transition risks.[42]

While such approaches are becoming more common, active climate risk management is still not mainstream practice among pension funds. However, climate risk management does have a precedent in environmental, social, and governance (ESG) screening for pension investment decisions. In fact, around $2.7 trillion of U.S. state and local pension funds apply some component of ESG or SRI (Socially Responsible Investing) to their investment process.[43] While returns on equities managed by ESG criteria have been lower than market, this comparison does not account for the benefits of changes in asset allocation.[44] Larger pension funds have been able to meet ESG objectives through infrastructure investments, while smaller ones have been able to achieve comparable results with municipal bonds. South Africa now requires pension funds to employ environmental, social, and governance (ESG) analysis in investment decisions as a way of encouraging more finance for "responsible investments, including social innovation."[45]

m The proposal was sponsored by the California Public Employees' Retirement System (CalPERS), New York State Common Retirement Fund (NYSCRF), and the Church of England, and was approved by nearly two thirds of shareholders; a similar proposal failed by roughly a 2:1 ratio just a year earlier. See: Lee and Hulac (2017); Hulac (2017a).

MARYLAND STATE RETIREMENT AND PENSION SYSTEM

STATE RETIREMENT AND PENSION SYSTEM OVERVIEW

The Maryland State Retirement and Pension System (SRPS) mission is "To administer the survivor, disability, and retirement benefits of the System's participants, and to ensure that sufficient assets are available to fund the benefits when due."[46] The System's first key goal is "To prudently invest System assets in a well-diversified manner to optimize long-term returns, while controlling risk though excellence in execution of the investment objectives and strategies of the System."[47] SRPS currently manages over $47 billion in assets[48] on behalf of over 380,000 members across numerous state and local government agencies.

The System is managed by a Board of Trustees consisting of 15 members,[49] who also serve on several of five committees.[n] An organizational chart for the Maryland SRPS is presented as Appendix I. The State Retirement Agency's (SRA) Executive Director reports directly to the board and oversees approximately 205 employees across five divisions – Investments, External Affairs, Administration, Finance, and Information Systems. Of these 205 SRA employees, 16 Investments staff work with at least 25 external investment managers to invest the system's assets.[50]

The SRPS portfolio is diversified across and within asset classes. SRPS's Investment Portfolio Allocation is described in several charts in Appendix II. The largest asset class in SRPS's portfolio is public equity (~37%), followed by rate sensitive investments (~22%) and real assets (~13%); combined, these three asset classes make up over 70% of the SRPS portfolio (Figure 1). It's clear that SRPS has investments which are likely subject to climate risks. For example, the System's real assets consist of real estate, commodities, and natural resources and infrastructure, which could all face physical risks from climate change (some may also face transition risks). Additionally, as of June 30, 2016, one of SRPS's ten largest stock holdings is an oil and gas company that faces substantial risks from climate change.[51] It should be noted that, as state pension funds like Maryland's may opt to increase their use of indexing or passive investing strategies, some higher-climate-risk investments could become more prevalent; this report seeks to highlight such potential risks for a fuller awareness of the overall portfolio's vulnerability.

FIGURE 1 - INVESTMENT PORTFOLIO ALLOCATION AS OF JUNE 30, 2016

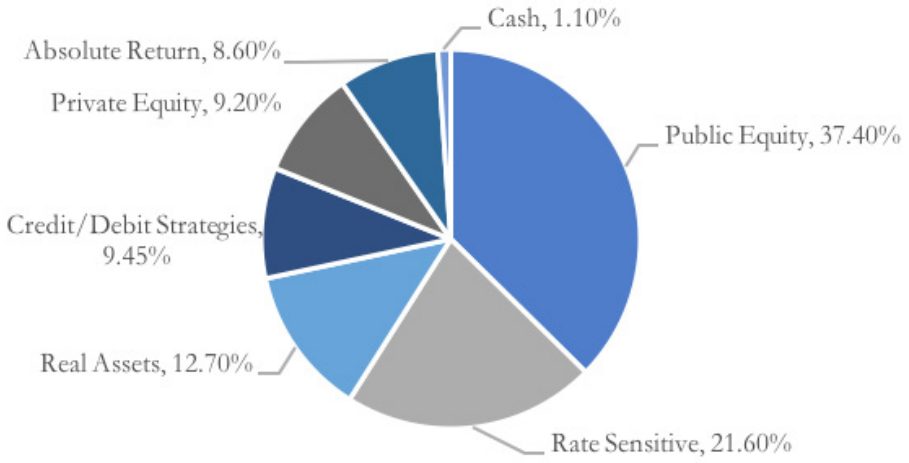


Figure 1. Maryland SRPS Investment Portfolio Allocation. Data from Maryland State Retirement and Pension System (SRPS) (2017). "Quarterly Investment Update: Asset Class by Market Value and Allocation."

n Administrative Committee, Audit Committee, Corporate Governance Committee, Investment Committee, Securities Litigation Committee. See: Maryland State Retirement and Pension System (SRPS, c).

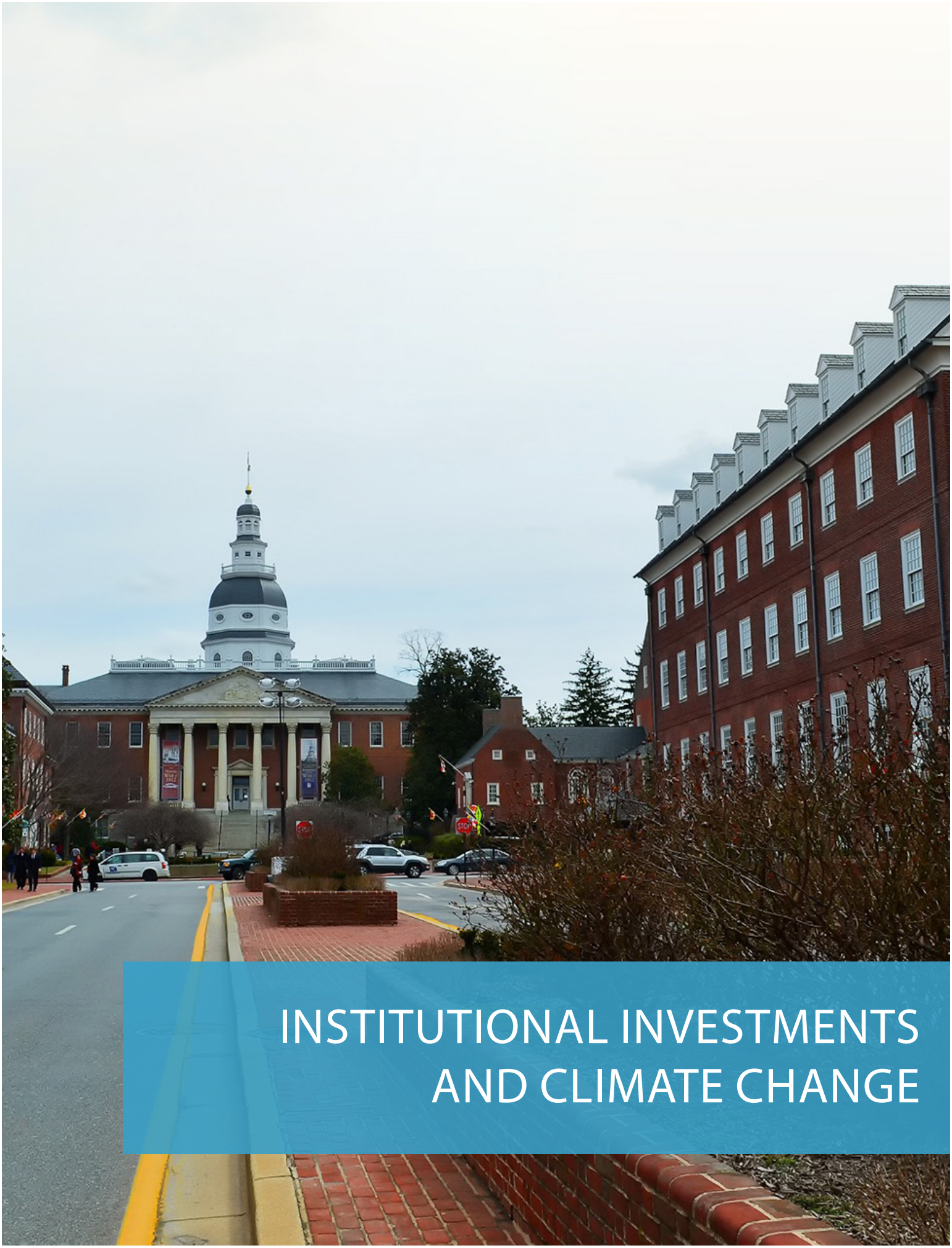
STATE RETIREMENT AND PENSION SYSTEM POLICIES ON CLIMATE CHANGE

In April 2016, several members of the Maryland General Assembly Joint Committee on Pensions (JCP) sent a letter to the SRPS Board of Trustees inquiring about "how the State Retirement and Pension System (SRPS) factors the growing risk of climate change into the pension fund's investments."[52] Andrew Palmer, Chief Investment Officer of Maryland's State Retirement Agency sent a memorandum to the SRPS Board of Trustees and Members of the Investment Committee responding to these inquiries in the fall of 2016.[53] The Palmer memorandum outlined several "tools" available to SRA staff for addressing climate change impacts to the System's investments, as well as examples of how these tools had been utilized. These include climate change education (two examples listed), proxy voting (one policy cited), manager and company engagement (two examples listed), integrating ESG risk awareness into the investment process (five examples), and targeted investments (four examples).[54]

These actions, while often laudable, present a portrait of sporadic, rather than systematic, climate risk management by SRPS. For example, the System's engagement activities consist of signing the United Nations Principles for Responsible Investment (UNPRI), encouraging SRPS affiliates to become signatories, and joining the Investor Network on Climate Risk (INCR) and the Ceres Coalition. SRPS signed on to each network in 2008.[55] Missing are examples of how SRPS engages more actively and directly with boards of companies to address long term climate risks. SRPS's Investment Policy Manual does state that the System generally votes for "proposals requesting reports on the level of greenhouse gas emissions from the company's operations and products" and "shareholder proposals requesting the company adopt greenhouse gas (GHG) reduction policies and/or emissions reduction goals."[56] However, a record of such proxy votes is not readily available from SRPS.

Additionally, SRPS's process oriented efforts all focus on ESG risk awareness, usually via Due Diligence Questionnaires (DDQs) and Annual Compliance Questionnaires. While the inclusion of ESG considerations is commendable, SRPS provides no indication of how prevalent climate risk is within the ESG awareness process, or how ESG diligence is weighted in due diligence evaluations. Climate risk and ESG are related but not identical; greater clarity regarding the specific ways in which climate risk does or does not factor into the due diligence process is needed to evaluate SRPS's efforts in this area. Unfortunately, searches for "climate change," "climate," "carbon," and "greenhouse gas" on the SRPS website and within the SRPS Comprehensive Annual Financial Report[57] yield no results. Similarly, searches for "ESG," "environmental," "social," "governance," "due diligence," and "DDG" do not return any results describing how ESG risk factors into the due diligence process.

The Palmer memo also acknowledges that there is a growing body of research on climate change investment impacts,[58] highlighting in particular a 2015 report by Mercer, a global consulting firm, which models risk under different climate change scenarios.[59] Oddly, the report does not mention an earlier (2011) Mercer report entitled "Climate Change Scenarios – Implications for Strategic Asset Allocation," for which Maryland SRA is listed as a participant,[60] and limits its review to Mercer's 2015 report. The memorandum also outlines the actions of a few larger state pension plans, suggesting that fund size and staffing levels are important factors for climate change investment policy. Finally, the memo suggests that an initial effort at climate risk management will be estimating the SRPS portfolio's carbon footprint, while acknowledging the informational and methodological limitations to such estimates. Divestment or clean energy investment targets are not supported by SRPS staff, while an evaluation of specific asset classes (natural resources, infrastructure, commodities) in context of the Paris Agreement is recommended for the next regular allocation review.[61]



INSTITUTIONAL INVESTMENTS AND CLIMATE CHANGE

BEST PRACTICES FOR CLIMATE RISK MANAGEMENT

While it has become widely accepted that climate change presents a variety of short and long-term risks (and opportunities) for asset owners, investors have generally been slow to act on these risks. Financial markets tend to be myopic in nature, focusing primarily on immediate risk and reward and undervaluing the longer risk horizon.[62] For pension funds, and other long-term investments, the failure to adequately integrate climate factors into both short and long-term investment strategies will likely result in lower returns, and a permanent loss of capital.[63] Fortunately, industry leadership groups have begun establishing a set of best practices for managing climate risk and leveraging opportunities. These practices can be generally understood in four categories: philosophy and governance, risk assessment, active ownership, and asset reallocation. Transparency is a fifth best practice which cuts across each of the other categories.

Effective climate risk management begins with a clear philosophy and governance structure. CIEL argues that modifying fund investment principles "to acknowledge and incorporate [climate] risk" is essential (although not sufficient) for guarding against that risk.[64] Similarly, Mercer lists developing "investment beliefs" as the first step in addressing climate risk, noting that such beliefs help plan trustees "establish a shared understanding and formal strategic approach to oversight of climate risk."[65] These guiding principles may be codified in formal plan documents and policies. A fund's "structure and approach"[66] to climate risk oversight, monitoring, and management, including board and management responsibilities,[67] should be clearly defined and disclosed. Specific investment policies (e.g., risk management methods, targets and metrics, engagement strategies) and processes for putting them into practice all flow from this understanding of how climate change relates to the fund's most central objectives.[68]

After acknowledging and articulating a shared philosophy on climate risk management, describing and measuring that risk is crucial. Funds should understand the nature, extent, and potential impact of climate risks and opportunities on different time scales and under different scenarios. They should also devise clear processes for identifying, tracking, and managing climate risk.[69] One common approach is reporting a fund's greenhouse gas emissions footprint. TCFD[70] and the Asset Owners Disclosure Project (AODP) both recommend such disclosures, with AODP[71] also recommending that owners calculate their risk of stranded assets.[72] However, as previously discussed, climate risks (and opportunities) extend well beyond the risks associated with GHG regulation; thus, more comprehensive approaches to analyzing climate risk than carbon footprints are desirable.

There are many methodologies for tracking climate risk, including mining ESG research for climate-specific information (e.g., fossil fuel consumption, GHG emissions, water use, waste disposal) and conducting risk bottom-up analyses at the company, sector, or geographic level.[73] Mercer, for example, has developed a top-down modeling approach for quantifying climate risk at the portfolio, asset-class, and sector level.[74] Mercer considers the cost of climate change mitigation, adaptation, and physical damages; includes four risk factors (Technology, Resource Availability, Physical Impacts, and Policy Response) and four climate change scenarios (warming of 2°C, 3°C, and 4°C with different levels of damages); and factors in asset allocation and sensitivity to determine expected impact on returns.[75] Results from such analyses can help identify investment and engagement strategies for mitigating climate risks, as well as climate-related financial opportunities that can be leveraged to maximize return on investment (ROI). For example, modeling for a representative US pension plan allocation reveals that climate impacts will be "most pronounced at

the industry sector level" rather than asset-class.[76] Mercer's representative plan was found to be least prepared for a 2°C "transformation" scenario (in which emissions are reduced quickly to limit long-term climate impacts) over both 10 and 35-year time horizons. Cumulative losses compared to the base case are projected to be 3% over 10 years,[77] amounting to $1.4 billion in foregone value for a plan the size of SRPS.

Once funds have a clear sense of which of their assets are most vulnerable to climate change, one course of action is "active ownership,"[78] or engaging companies and asset managers to ensure that they are preparing for the impacts of climate change.[79] The most significant tool in asset owners' corporate engagement toolbox is the shareholder resolution or proxy vote, which can be used to require disclosure of GHG emissions, set GHG reduction policies or targets, request climate risk analysis (including scenario analysis), call for business strategies that account for potential GHG regulations, or promote climate change expertise on corporate boards.[80] BlackRock, an asset management company, emphasizes dialogue with companies in which it holds stock, noting that "polluters have the greatest capacity to move the dial if they modify their behavior."[o] Similarly, pension funds can require asset managers to disclose their own proxy voting and engagement approaches with respect to climate risks.[81] Finally, Mercer notes the importance of both "collaborative corporate engagement" and engagement with policymakers and regulators on issues such as climate risk disclosure frameworks.[p,82]

Finally, pension funds can adjust their asset allocation to reduce climate risk exposure and leverage climate opportunities. There are three broad types of reallocation – divestment (avoidance), hedging, and investing in opportunities. CIEL advocates avoidance of fossil fuel and other especially vulnerable assets, noting that "there is no legal obstacle to risk-based negative screening – or selling or avoiding high-risk investments generally – as long as the rest of the portfolio is performing adequately."[83] Mercer also considers divestment a potential option for reducing climate risk exposure, but calls it a "relatively blunt instrument" which requires considerable due diligence before such a decision is made.[84] AODP notes that 17 of the most progressive asset owners have set "emissions intensity reduction targets" for the coming year,[85] while the Forum for Sustainable and Responsible Investment (US SIF) notes that divestment requirements or other restrictions on fossil fuels applied to $152 billion in money manager assets and $144 billion in institutional assets as of January 2016.[86]

Funds may also choose to hedge against climate risk by investing in low-carbon indices. Mercer describes three such types of indices, two of which maintain broad sector exposure but limit carbon intensity within sectors, along with a third category of "fossil-free" indices aiming to eliminate "direct carbon exposure."[87] BlackRock tested a "best-in-class" type index that selected climate leaders on a monthly basis; this portfolio outperformed a benchmark by nearly 7% with a CO2 footprint almost half as low.[88] Investing in climate change opportunity sectors can also aid in portfolio diversification while creating the potential for new "return drivers."[89] CIEL emphasizes the huge growth potential of clean energy industries,[90] while Mercer considers a broader set of "sustainability-themed investment strategies" that

o The company also notes that "Just 80 companies are responsible for more than half the global emissions by publicly listed companies." See: BlackRock Investment Institute (2016), p. 14.

p The Forum for Sustainable and Responsible Investment (US SIF) provides a good example of collaborative corporate and policymaker engagement. US SIF has hundreds of members including financial planners, brokers, NGOs, pension funds, asset owners, foundations, and research firms, and seeks to create a rapid shift towards environmentally and socially responsible financial investment practices, which are sustainable over the long-term. To this end, US SIF works to identify and propagate industry best practices, create visibility for these practices among the media and public officials, educate policy makers about ESG integration and socially responsible investing (SRI), promote disclosure of financial contributions by publicly traded companies, and support climate change related legislation and regulation. See: The Forum for Sustainable and Responsible Investment (US SIF) (2016).

include energy efficiency, health, water, and climate change adaptation.[91] Importantly, the longer time horizon of institutional investors makes them well positioned to invest in emerging technologies whose true value could take a decade or more to materialize as the low-carbon economic transition plays out.[92]

Ultimately, transparency is the thread that binds these practices together. The TCFD is clear that its recommendations apply to asset owners and managers (including public and private sector pension plans) and makes specific mention of the need to disclose climate risk to asset owners' beneficiaries.[93] Similarly, AODP evaluates asset owners on governance & strategy, portfolio risk management (including proxy voting record and disclosure of stranded asset risks), and metrics & targets (including disclosure of portfolio carbon footprint and percent of assets invested in low carbon holdings).[94] TCFD also notes that "because asset owners and asset managers sit at the top of the investment chain, they have an important role to play in influencing the organizations in which they invest to provide better climate-related financial disclosures."[95]

PENSION FUND RESPONSES TO CLIMATE RISK

Most pension funds are now taking some action to understand and reduce their exposure to climate-related financial risks. In fact, according to the Asset Owners Disclosure Project, three-fifths of the top 500 global asset owners have begun to address climate risks,[96] including 180 of 307 pension funds evaluated.[q] Table 1 lists several plans which are leading the way on climate risk management. These plans vary widely in terms of assets under management (AUM), membership, and number of investment staff. Their approaches to climate risk management also differ, but each is actively working to reduce climate risk in its portfolio, and exemplify many of the best practices outlined above.

For example, the Ontario Public Service Employees Union Pension Trust (OPTrust) recently published a position paper stating that it cannot ignore the systemic global risks posed by climate change, while warning other institutional investors to focus more heavily on long term considerations to avoid a "tragedy of the horizon."[102] The position paper represents a strong, if early, step for the fund in articulating its philosophy regarding how climate change bears on its investment strategy.

This is indicative of a larger trend; in fact, AODP finds that 42% of asset owners now include climate change in their investment policy framework.[r] Further, 18% of the 500 asset owners/ managers evaluated by AODP have staff responsible for incorporating climate change into investment decisions, including 97% of asset owners ranked as "Leaders."[103]

Regarding risk assessment, a number of pension funds have enlisted consulting firm Mercer to prepare individual portfolio climate risk assessments, including the California Public Employees' Retirement fund (CalPERS), the California State Teacher's Retirement System (CalSTRS), the New York State Common Retirement Fund (NYSCRF), and the Ontario Public Service Employees Union Pension Trust (OPTrust), among others.[104] Smaller funds, like SRPS, have contributed to other Mercer reports which have examined the economic, environmental and social risks and opportunities that climate change presents to asset owners and investment managers under both 2°C and 4°C global warming scenarios.[105] 13% of asset owners now report their carbon footprints, although only 6% attempt to calculate their exposure to potentially stranded assets.[106]

TABLE 1 - PUBLIC PENSION FUNDS ADDRESSING CLIMATE RISK

PLAN	ASSETS UNDER MANAGEMENT	MEMBERS	AODP 2017 RANKING[97]
CalPERS[98]	$320,710,000,000	1,800,000	28
NYSCRF[99]	$183,640,000,000	1,088,000	3
OPTrust[100]	$19,000,000,000	90,000	61
LGS[101]	$10,000,000,000	90,000	1

** NOTE: all numbers are approximate*

q This includes SRPS, whose ranking tied for 218th out of 500 asset owners evaluated with a rating of D, indicating an owner "taking first steps acknowledging climate-related financial risk." See: Asset Owners Disclosure Project (AODP) (2017), p. 5.

r It should be noted, however, that only a fifth of asset owners have a "dedicated climate change policy," while another fifth have ESG policies which broadly encompass climate risk but do not address it specifically. See: Asset Owners Disclosure Project (AODP) (2017), p. 37.

Pension funds frequently leverage their rights as shareholders to drive change across different issue areas, and have become more active on climate-related issues. For instance, while CalPERS has decided against divesting from fossil fuel companies, it is using proxy voting to place climate change risk management experts on corporate boards.[107] CALPERS and NYSCRF often support proposals requiring companies to disclose information about how their businesses will be impacted by climate change, including recent shareholder resolutions at Occidental Petroleum[108] and Exxon.[109] In 2016, about one in six asset owners cast their proxy votes for at least one climate-related shareholder resolution.[110]

Many pension systems are also reallocating their assets to reflect their new philosophies on and understanding of their climate-related investment risks. For example, NYSCRF is shifting capital to companies with lower emissions, pursuing sustainable investments through the FTSE Environmental Technology 50 Index, and has invested in World Bank green bonds.[111] Similarly, the Local Government Super (Australia) specifically targets "deeper green" investments that reflect climate change, pollution and waste, resource scarcity, food security and sustainable agriculture, biodiversity, and human rights considerations. Local Government Super also holds a $300 million Green Bond through the Treasury Victoria and a $500 million climate bond through Westpac.[112] Overall, AODP found that US asset owners in their index had (on average) only about 1% of assets under management allocated to low carbon investments, although only about a fifth of US asset owners publicly disclose these investment levels.[113]

Additionally, some states have pursued legislative action related to pension fund climate risk management. For example, a bill currently in committee in the California State Senate would require CalPERS and CalSTRS to "consider financial climate risk, as defined, in their management of any funds they administer."[114] Perhaps most significant is the bill's emphasis on disclosure, mandating analysis of fund climate risk, carbon footprint, "alignment of the . . . portfolio with the Paris climate agreement and California climate policy goals," and discussion of the board's engagement activities with carbon intensive investees in the funds' annual reporting.[115] The bill does not come without costs, however; CalSTRS argues that it cost more than a quarter million dollars a year to comply with the reporting requirements, while CalPERS notes that it would be required to track and report on the climate risk of over 60,000 securities investments.[116] (Such costs could be expected to decline with the more widespread adoption of the risk screening tools and services now emerging in response to recent demands.)

CalSTRS also points out that "no other state has enacted legislation requiring their pension funds to consider financial climate risk," although California passed a law in 2015 requiring public pension systems to divest from thermal coal companies.[117] In New York, a bill currently in committee would mandate that the Common Retirement Fund divest from companies with "the largest carbon content fossil fuel reserves" within one year and divest from all other fossil fuel companies by the end of 2019.[118] A similar bill stalled in committee two years ago.[119] Internationally, legal mandates regarding climate risks do exist; in 2016, the European Parliament passed a law requiring pension funds to consider the environmental, social and governance risks (including climate risks) of their investments, with associated reporting requirements.[120]

HOW THE STATE RETIREMENT AND PENSION SYSTEM'S APPROACH COMPARES

The Maryland State Retirement and Pension System has already embraced some of these best practices, but others are only partially implemented and could be improved. Overall, AODP gave SRPS a D ranking ("Bystander") for 2017, tied for 218th out of 500 asset owners in the index in terms of climate disclosure.[121] (Appendix III presents AODP's Global Climate 500 Asset Owners Index rankings for United States Pension Funds; SRPS is tied for 28th out of 121 US pension funds reviewed.)

While it has pursued some best practices, SRPS has bypassed or only partially implemented others. For example, SRPS has not clearly articulated its philosophy about how climate risks bear on its investment strategy, and has not taken any actions to quantify or disclose its climate risk exposure (portfolio GHG footprint, stranded assets exposure, or more comprehensive risk assessment). However, SRPS does have clear policies on the use of proxy voting as a tool to seek investee GHG disclosure or emission reduction targets. Still, the System does not seem to be fully leveraging its proxy voting power to press for climate change experts on corporate boards or climate risk disclosure under various climate change mitigation scenarios (such as the 2°C Paris Agreement scenario). SRPS's proxy voting record is not readily available online, and it is not clear to what extent SRPS is using its proxy voting power to engage in dialogue with high climate risk investees. Additionally, Andrew Palmer's 2016 memorandum to the SRPS Board of Trustees notes that the System has made several targeted investments to leverage climate opportunities, including $25 million invested in the North Sky Clean Tech Fund IV.[122]

That memo also argued that the System is limited by the size of its fund (in terms of AUM and staff size).[123] While more resources and staff do certainly make pursuing such initiatives easier, the previous section demonstrates that AODP "Leaders" come in all shapes and sizes, including pension funds much smaller than SRPS. Even for externally managed funds like SRPS, climate risk should be among factors explicitly raised with external managers and consultants, a growing practice as indicated in the recent Ceres Blueprint.[124] Additional collaborative efforts and cost sharing, as in the Mercer reports, is also possible. Certainly, SRPS could be much more transparent about its current efforts, plans, and limitations with investors; currently, publicly available information on the fund's climate risk management efforts are difficult to come by.

POLICY OPTIONS

There are several policies the Maryland State Retirement and Pension System could adopt in order to help address its exposure to climate-related financial risks.

RECOMMENDATION 1: CLARIFY INVESTMENT PRINCIPLES

The first, and perhaps most powerful, change SRPS can make is to clearly articulate its investment principles with respect to climate change. CIEL calls this "the most fundamental" action a pension fund can take to address its climate risk, noting that industry leaders like CalPERS have already altered their philosophies to reflect climate change impacts.[125] Mercer similarly includes "Investment Beliefs" as the first step in addressing climate risk, noting the value of such beliefs in helping plan trustees form a shared vision to guide their strategy.[126] Importantly, these guidelines can help plans adjust to future changes in greenhouse gas regulation, climate change impacts, etc., even if immediate investment changes are not warranted when the beliefs are first articulated.

While SRPS is currently party to the United Nations Principles for Responsible Investment (UNPRI), the Investor Network on Climate Risk (INCR), and the Ceres Coalition, climate change is not an explicit part of the System's investment strategy, aside from a few brief mentions in SRPS's Investment Policy Manual.[127] SRPS's board could work with the SRA, its advisors, fund asset managers, and other stakeholders to develop these guiding principles, potentially as part of a broader statement on ESG. Key considerations include "industry best practice, beneficiary timeframes and views, fiduciary duty, and stakeholder expectations."[128]

These guiding beliefs should then be incorporated into the plan documents, including policies and procedures on risk management, engagement strategies, and asset manager selection/ evaluation. Resources like UNEPFI's Global Framework for Climate Risk Disclosure[129] and Ceres' Climate Change Governance Checklist[130] can be readily translated into concrete policies. Acceptance of such approaches is rapidly increasing: AODP finds that more than two in five asset owners now include climate change in their investment frameworks, with many factoring climate risk into asset manager agreements (20%) or dedicating staff to climate risk management (18%).

RECOMMENDATION 2: ASSESS CLIMATE RISKS

Andrew Palmer's 2016 memorandum to the SRPS Board of Trustees stated that a first step to addressing SRPS's climate risk would be estimating the fund's carbon footprint, noting that "beginning to measure the risk is a first step in managing the risk" despite data and methodological limitations to such estimates.[131] However, while it does address (and dismiss) the possibility of reducing exposure to carbon-intensive industries or increasing investment in transformational ones, the memo scarcely mentions the broader set of risks and opportunities driven by global climate change (see Climate Risks and Implications). Given the issues surrounding corporate emissions disclosure, estimating the portfolio's climate footprint may prove difficult while also failing to accurately reflect SRPS's true climate-related risk exposure.

A better approach would be to conduct or commission a portfolio climate risk assessment. Following previous practices, such an evaluation would consider a broad set of climate-related costs; would include multiple risk factors and climate change scenarios; and would factor in asset allocation and sensitivity to determine expected impact on returns.[132] The result is a portfolio-specific analysis of climate change risks and opportunities, including investment and engagement strategies to mitigate risk, leverage opportunities, and maximize ROI.[133]

Other resources, approaches,[s] and services are available for performing such climate risk assessments, but to provide useful investment insights, climate risk should be considered in a much broader sense than carbon emissions and the costs of potential GHG regulation. As the importance of climate risks for the financial sector is increasingly recognized, products that respond to this need are emerging. One example is a recent report from the nonprofit group Carbon Tracker, which ranks 69 of the biggest oil and gas companies by their exposure to a low carbon transition.[t] Commercial services are also becoming available, designed specifically to respond to climate risks. For example, Coastal Risk Consulting is a firm specializing in assessing vulnerability to flooding with projections 30 years into the future. For a fee of $500, they offer detailed, site specific projections of future exposure to tidal flooding and risks from severe storms – a cost reasonable for evaluating a real estate portfolio.[u]

s For example, the TCFD has published a Technical Supplement on "The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities," which identifies several publicly-available transition risk and physical risk scenarios. See: Task Force on Climate-related Financial Disclosures (TCFD) (2016).

t A key finding is that $2.3 trillion of upstream projects are inconsistent with the goals of the Paris Agreement. The report also highlights the variation in risk exposure across oil and gas companies – from under 10 percent to over 60 percent based on the application of a carbon supply cost curve to company resources. See: Carbon Tracker (2017).

u An example from the Miami Beach City Hall is included at the firm's website. See: Coastal Risk Consulting (2016).

RECOMMENDATION 3: INCREASE ENGAGEMENT AND TRANSPARENCY

Without reallocating any assets, pension funds can better understand and manage their climate risk by actively engaging with companies, investment managers, and leadership coalitions. SRPS does generally vote for proposals requesting companies to report GHG emissions or adopt emission reduction targets.[134] The System also requires asset managers to account for their ESG risk management in Due Diligence Questionnaires (DDQs) and Annual Compliance Questionnaires. SRPS is party to a few industry groups focusing on responsible investment or climate risk management, but does not appear to be particularly active within these organizations. Opportunity exists for greater leadership, collaboration, and transparency with respect to SRPS investee engagement.

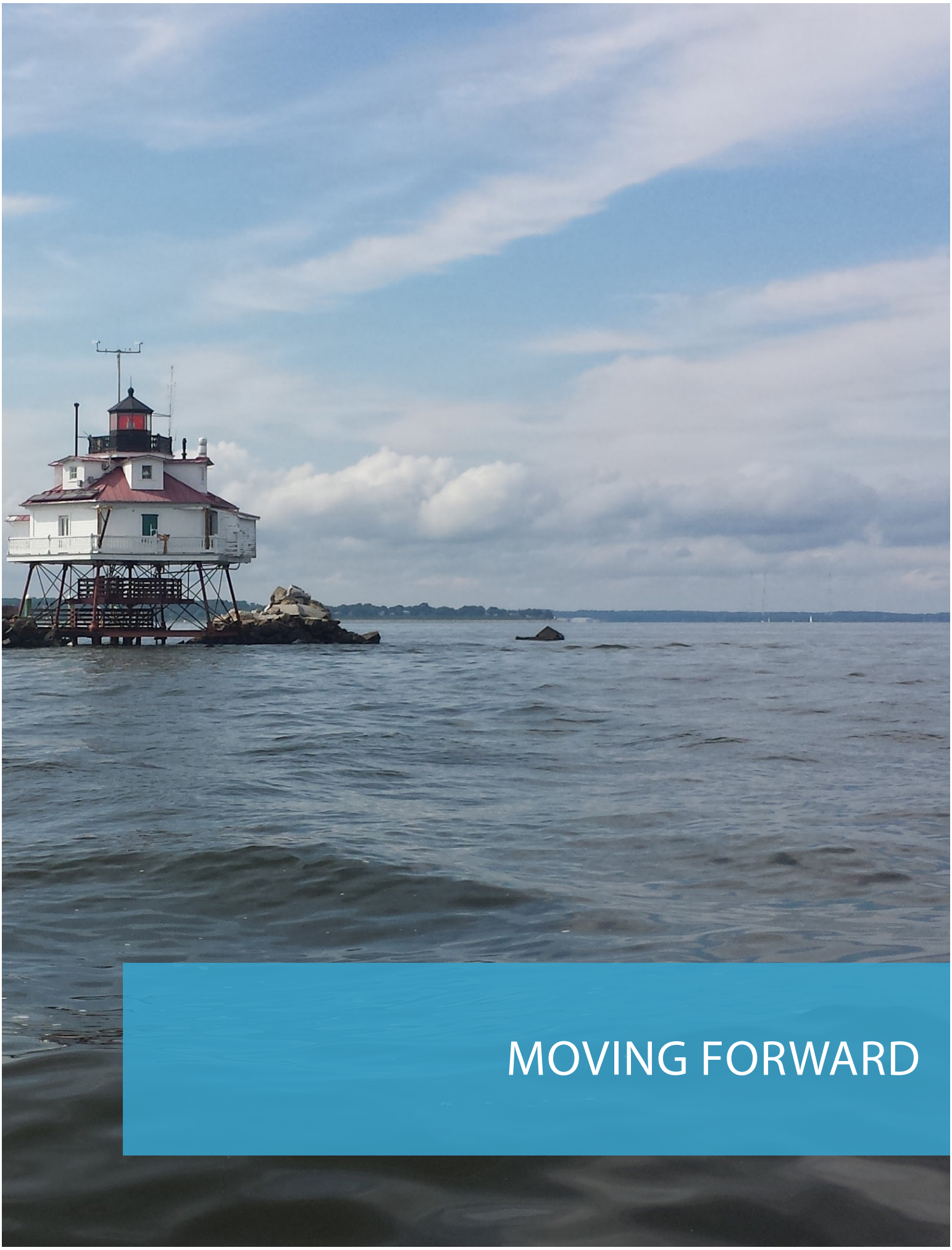
Corporate engagement extends well beyond GHG reporting and reduction targets.[v] Shareholder resolutions can also be used to elicit climate risk analysis (including scenario analysis) or prompt business strategies that account for potential GHG regulations. For example, the recent resolution requiring a climate "stress test" of ExxonMobil was co-sponsored by three pension funds (CalPERS, NYSCRF, Church of England).[135] Proxy resolutions can also be used to compel the inclusion of climate experts on corporate boards.[136] For example, ExxonMobil recently added a climate scientist to its board after shareholders passed a resolution allowing board nominations by investors.[w,137] Finally, shareholders can hold boards to account by voting to replace resistant board members, changing executive compensation (with a focus on long-term performance incentives), or altering company bylaws.[138] Maryland SRPS could extend its proxy voting policy to include climate risk disclosure (especially under 2°C warming scenarios) and board "sustainability competence."[139] SRPS could take more of a leadership role by engaging directly with boards of high-risk investees, co-sponsoring resolutions related to climate risk management, and publicizing its voting record to generate broader public discourse on climate-related financial risk, as some recent, high-profile shareholder resolutions have done. It should also encourage board education on climate risk and engage in conversations about other aspects of corporate climate risk management strategies.

Similarly, Mercer recommends that pension funds require asset managers to regularly describe their activities surrounding climate risk analysis, corporate engagement, and proxy voting, often as part of annual ESG reporting.[140] The integration of ESG into SRPS investment policies is encouraging; however, the prevalence of climate risk within these considerations is unclear, as is the extent to which ESG risk factors are valued in the due diligence process. Similarly, it is not clear if (or how) climate risk management factors into asset manager selection and review.

SRPS should improve the way it reports and communicates climate risk to stakeholders. Access to public equity manager DDQ forms would help assess the current weight of climate risk in investment decisions. The System should make a record of proxy votes for climate-related resolutions cast by or on behalf of SRPS readily available. SRPS could also collaborate with other leading pension funds to co-sponsor shareholder resolutions, commission reports on climate risks/opportunities/ management best practices (e.g., the 2011 Mercer report), and engage with coalitions and task forces that seek to create guidelines for climate-risk disclosure, in line with its newly articulated investment principles. We recommend that SRPS disclose its own climate risk management strategies and activities with the same transparency it should demand of investees.

v And, to reiterate, GHG regulations are only one element of the climate risk any company faces.

w Similarly, BlackRock has given notice that it expects corporate boards to be well-versed in the climate risks their businesses face. See: Kerber (2017).



MOVING FORWARD

While it may eventually be appropriate for the Maryland State Retirement and Pension System to set goals for divesting climate-vulnerable holdings or pursuing transformative investments, such measures would seem to be arbitrary at this time. We recommend that SRPS first clarify its investment principles with respect to climate change management, and begin to codify them in plan documents, policies, and processes. SRPS should also perform a comprehensive climate risk analysis to help illuminate the System's unique risk profile, inform realistic risk management strategies/ goals, and identify assets and industries for which divestment or targeted investment would be most impactful. Increased engagement and industry leadership could also help SRPS better understand and manage its climate risk without reallocating assets.

Disclosing climate risk management strategies and activities will be key to keeping SRPS beneficiaries and other stakeholders informed, while promoting the trust and dialogue necessary to continue improving these practices. Furthermore, public interest in climate change creates opportunities for enlisting broader support and engagement in developing climate risk tools and metrics. Recent experience in Montgomery County, Maryland, provides a possible analog. When the county decided to explore creation of a "green bank," a stakeholder work group was convened in 2015, working in tandem with the Coalition for Green Capital, a nonprofit that promotes the creation of green banks. While the ultimate authority for creating a bank remained with the County Council, the work group played an active role in reviewing the legislation and in design of the bank, including:

- Identifying resources for the Green Bank (e.g., additional capital sources, Board Members);
- Developing guidelines for future bylaws;
- Providing recommendations for the governance and prioritization of Green Bank activities; and
- Exploring approaches for operations and administration.[x]

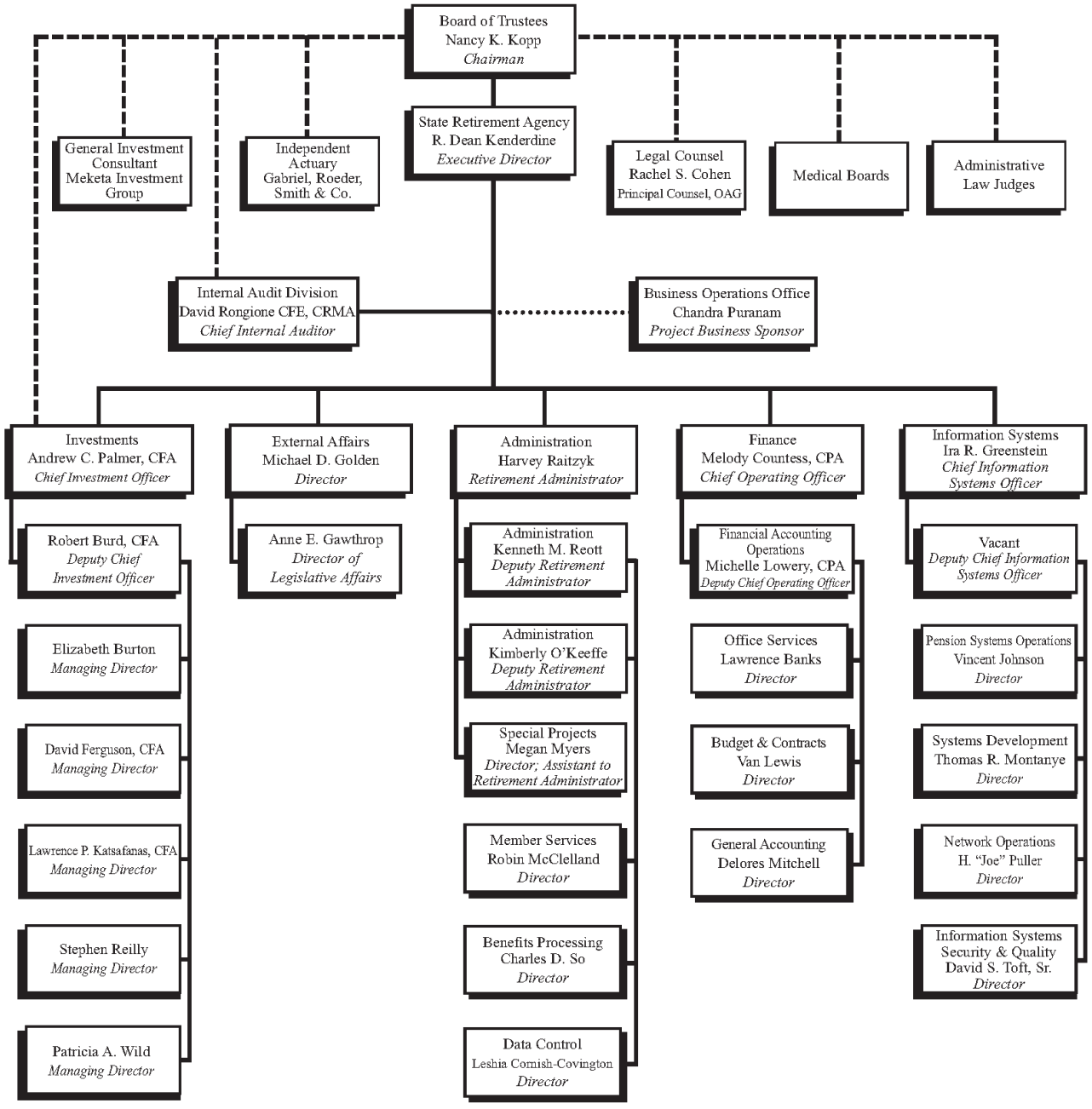
Despite the significant differences between the two (unlike the Green Bank, SRPS is not an economic development tool), a similar opportunity exists for SRPS. By enlisting the expertise and interest of the State's universities, financial experts, and relevant NGOs, SRPS could explore innovative approaches to identify and respond to climate risks and opportunities with limited costs to the pension system. In any case, SRPS should focus on stakeholder engagement as it develops and implements its climate-related investment principles, strategies, and policies. Ultimately, addressing a threat as pervasive and complex as climate change requires more than a series of discrete policy changes or investment actions; rather, commitment to an ongoing process of transparency, dialogue, and learning is needed to help secure Maryland's pension system in the face of this evolving risk.

x See: Montgomery County Department of Environmental Protection.

NOTE: One of the authors of this paper, Alan Miller, was a member of the work group.

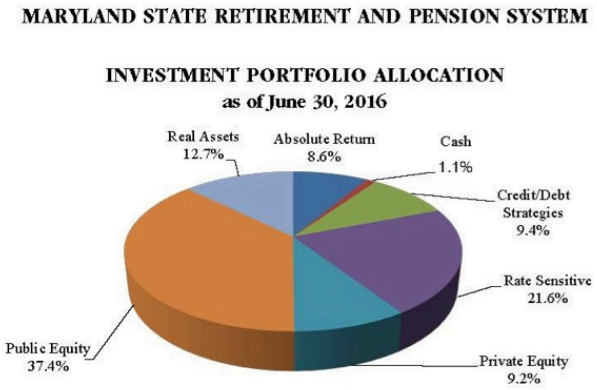
APPENDICES

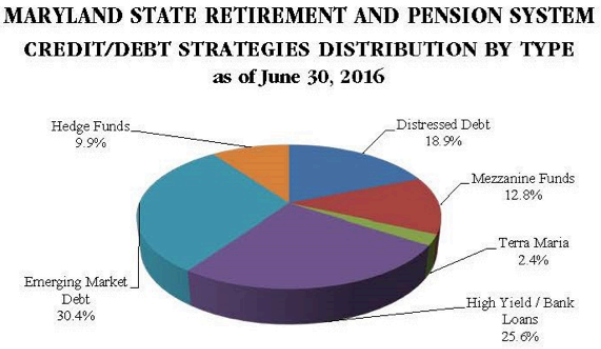
APPENDIX I: MARYLAND STATE RETIREMENT AND PENSION SYSTEM – ORGANIZATIONAL CHART

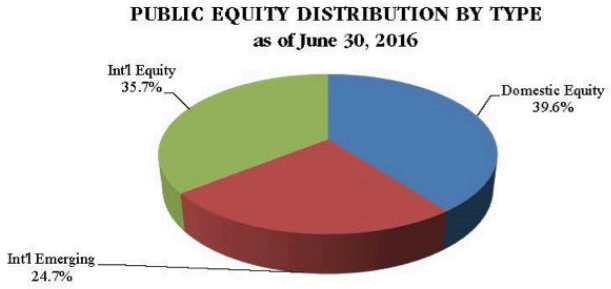


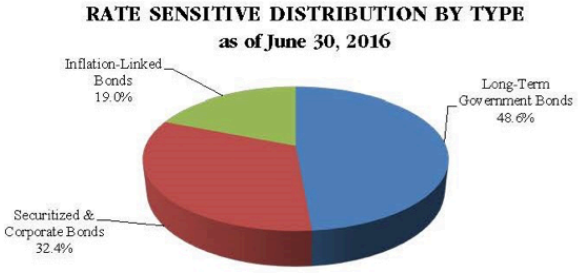
Source: Maryland State Retirement and Pension System (SRPS). "Organizational Chart." Maryland State Retirement and Pension System. n.d. Online. http://www.sra.state.md.us/Agency/Downloads/Org_Chart.pdf.

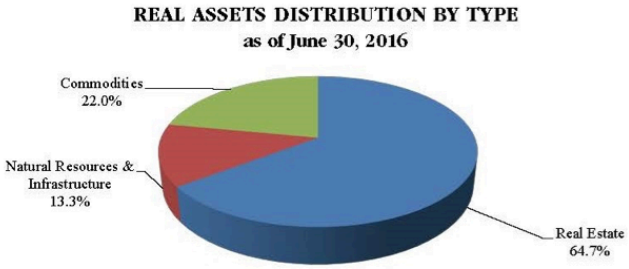
APPENDIX II: MARYLAND STATE RETIREMENT AND PENSION SYSTEM – INVESTMENT PORTFOLIO ALLOCATIONS

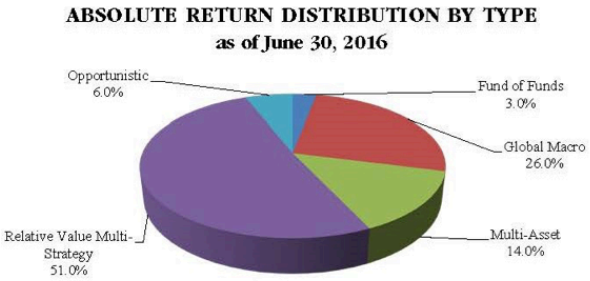












Source: Maryland State Retirement and Pension System (SRPS) (2017). "Quarterly Investment Update: Asset Class by Market Value and Allocation." Maryland State Retirement and Pension System. 31 Mar 2017. pp. 83-84. Online. [http://www.sra.maryland.gov/Agency/Investment/Downloads/Quarterly_Report-2017-03.pdf.](http://www.sra.maryland.gov/Agency/Investment/Downloads/Quarterly_Report-2017-03.pdf)

APPENDIX III: AODP GLOBAL CLIMATE 500 ASSET OWNERS INDEX – USA PENSION FUNDS

2017 RATING	2017 GLOBAL RANK	2017 USA PENSION RANK	ASSET OWNER NAME
AAA	3	1	New York State Common Retirement Fund (NYSCRF)
AAA	17	2	United Nations Joint Staff Pension Fund (UNJSPF)
AA	19	3	Wespath Investment Management (Wespath)
AA	28	4	California Public Employees Retirement System (CalPERS)
AA	29	5	California State Teachers' Retirement System (CalSTRS)
A	33	6	TIAA Global Asset Management (TGAM)
BBB	40	7	Teachers' Retirement System of the City of New York
BBB	40	7	New York City Employees Retirement System (NYCERS)
BBB	46	9	New York City Police Pension Fund
C	86	10	Florida Retirement System
C	93	11	Washington State Investment Board
C	94	12	New York State Teachers' Retirement System (NYSTRS)
C	102	13	North Carolina Retirement System
C	111	14	Teacher Retirement System of Texas (TRS)
D	130	15	Connecticut Retirement Plans and Trust Funds
D	130	15	Illinois State Board of Investment (ISBI)
D	133	17	Ohio Police & Fire
D	141	18	Colorado Public Employees Retirement Association
D	148	19	State of Wisconsin Investment Board
D	154	20	Ohio Public Employees Retirement System (OPERS)
D	154	20	Pennsylvania Public Schools Employees' Retirement System (PSERS)
D	154	20	Pennsylvania State Employees' Retirement System
D	172	23	San Francisco Employees' Retirement System
D	193	24	State Universities Retirement System of Illinois
D	193	24	State of Hawaii Employees' Retirement System
D	196	26	Massachusetts Pension Reserves Investment Trust Fund
D	200	27	Michigan Office of Retirement Services
D	218	28	Los Angeles County Employees Retirement Association
D	218	28	Maryland State Retirement and Pension System
D	218	28	Indiana Public Retirement System
D	236	31	Los Angeles Fire and Police Pensions
D	247	32	UAW Retiree Medical Benefits Trust
D	255	33	State Teachers Retirement System of Ohio (STRSOH)
D	255	33	Arizona State Retirement System
D	255	33	Employees Retirement System of Texas (ERS)
D	255	33	National Railroad Retirement Investment Trust (NRRIT)
D	278	37	DuPont Pension and Retirement Plan(s)
D	278	37	World Bank Group Staff Retirement Plan
D	278	37	Los Angeles City Employees' Retirement System

D	278	37	Maine Public Employees Retirement System
X	300	41	Thrift Savings Plan (TSP)
X	300	41	Washington State Department of Retirement Systems
X	300	41	IBM Corporation Pension Plans
X	300	41	State of New Jersey Division of Pensions and Benefits
X	300	41	Pension Benefit Guaranty Corporation Single-Employer Program
X	300	41	General Motors Pension Plan
X	300	41	Oregon Public Employees Retirement System
X	300	41	Virginia Retirement System
X	300	41	Minnesota State Board of Investment (SBI)
X	300	41	Ford Motor Company Pension Plans
X	300	41	Ford Motor Pension Plans
X	300	41	Teachers Retirement System of Georgia
X	300	41	Office of Retirement Services (Michigan)
X	300	41	Boeing Company Pension Plans
X	300	41	The Boeing Company Pension Plans
X	300	41	AT&T Inc. Pension Scheme
X	300	41	General Electric Pension Plans
X	300	41	Illinois Teachers' Retirement System (TRS Illinois)
X	300	41	Tennessee Consolidated Retirement System (TCRS)
X	300	41	Western Conference of Teamsters Pension Plan
X	300	41	The Retirement Systems of Alabama (RSA)
X	300	41	Public Employees' Retirement System of Nevada
X	300	41	Public School and Education Employee Retirement Systems of Missouri
X	300	41	Illinois Municipal Retirement Fund (IMRF)
X	300	41	Lockheed Martin Pension Plans
X	300	41	United Technologies Corporation Retirement Plan
X	300	41	United Parcel Service Retirement Plans
X	300	41	Hewlett-Packard Pension Scheme
X	300	41	Iowa Public Employees' Retirement System
X	300	41	ExxonMobil Pension Scheme
X	300	41	Fiat Chrysler Automobiles Pension Plans
X	300	41	Public Employees' Retirement Association of Minnesota
X	300	41	Public Employees' Retirement System of Mississippi (PERS)
X	300	41	Northrop Grumman Corporation Pension Plans
X	300	41	South Carolina Public Employee Benefit Authority Retirement Benefits
X	300	41	Texas County & District Retirement System (TCDRS)
X	300	41	Alaska Retirement Management Board (ARMB)
X	300	41	Texas Municipal Retirement System
X	300	41	Bank of America Corporation Pension Scheme
X	300	41	FedEx Corporation Pensions Plans
X	300	41	Honeywell Pension Plans
X	300	41	Wal-Mart Stores Pension Scheme
X	300	41	Johnson & Johnson Pension Scheme
X	300	41	Minnesota Teachers' Retirement Association

X	300	41	Nebraska Investment Council
X	300	41	3M Pension Plans
X	300	41	Pfizer Pension Plans
X	300	41	Minnesota State Retirement System
X	300	41	JPMorgan Chase & Co Pension Scheme
X	300	41	Raytheon Pension Scheme
X	300	41	Dow Chemical Company Pension Plans
X	300	41	New York City Deferred Compensation Plan
X	300	41	Merck & Co Employee Pension Plan(s)
X	300	41	New York State Deferred Compensation Plan
X	300	41	Teachers Retirement System of Louisiana
X	300	41	Kansas Public Employees Retirement Scheme (KPERS)
X	300	41	West Virginia Investment Management Board
X	300	41	Montana Board of Investments
X	300	41	Kentucky Teachers' Retirement System
X	300	41	Exelon Corporation Pension Plans
X	300	41	Central States Pension Fund
X	300	41	Verizon Communications Pension Plans
X	300	41	PG&E Pension Scheme
X	300	41	Arkansas Teacher Retirement System (ATRS)
X	300	41	Caterpillar Inc. Pension Scheme
X	300	41	Public Employees Retirement Association of New Mexico
X	300	41	PepsiCo Pension Scheme
X	300	41	Chevron Pension Scheme
X	300	41	Public Employee Retirement System of Idaho
X	300	41	Prudential Financial Employee Benefit Plans
X	300	41	Florida Prepaid College Board
X	300	41	Oklahoma Teachers Retirement System
X	300	41	Employees' Retirement System of Georgia (ERS)
X	300	41	Orange County Employees Retirement System
X	300	41	Berkshire Hathaway Pension Plans
X	300	41	Con Edison of New York Pension Plans
X	300	41	Ohio Public Employees Deferred Compensation Program
X	300	41	Alcoa Pension Scheme
X	300	41	Los Angeles Water and Power Employees' Retirement Plan
X	300	41	MetLife Inc. Pension Scheme (MetLife Inc. Pension Scheme)
X	300	41	Virginia College Savings Plan

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