United States Government Accountability Office

Report to Congressional Requesters

May 2021

RETIREMENT SAVINGS

Federal Workers' Portfolios Should Be Evaluated For Possible Financial Risks Related to Climate Change

A Century of Non-Partisan Fact-Based Work

GAO-21-327

GAO@100 Highlights

Highlights of GAO-21-327, a report to congressional requesters

Why GAO Did This Study

Climate change is expected to have widespread economic impacts and pose risks to investments held by retirement plans, including the federal government's TSP. As of November 2020, TSP had 6 million active and retired federal employee participants and nearly $700 billion in assets. GAO was asked to examine how the agency that oversees TSP has addressed its exposure to such risks.

This report examines (1) what is known about retirement plans' exposure to climate change-related investment risks, (2) what comparable retirement plans in other countries have done to address risks from climate change and how they communicate this information to the public, and (3) what steps FRTIB has taken to address investment risks from climate change.

GAO reviewed relevant literature and interviewed representatives from investment consulting firms and other stakeholders knowledgeable about climate change and its possible financial impacts. GAO reviewed documents and interviewed officials from selected retirement plans for public- and private-sector employees in the United Kingdom, Japan, and Sweden identified as examples of plans that are addressing climate risks. GAO also reviewed TSP documents, and interviewed FRTIB officials.

What GAO Recommends

GAO recommends that FRTIB evaluate TSP's investment offerings in light of risks related to climate change. FRTIB did not indicate whether it agreed or disagreed with the recommendation and stated that it subscribes to a strict indexing discipline and efficient market theory.

View GAO-21-327. For more information, contact Tranchau (Kris) T. Nguyen at (202) 512-7215 or NguyenTT@gao.gov.

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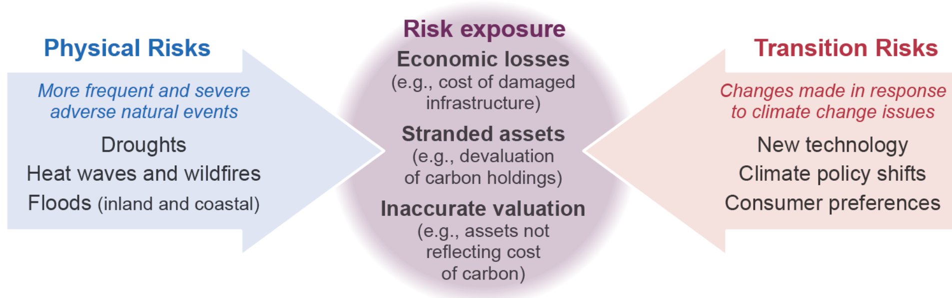
What GAO Found

Retirement plans' investments, including those of the Thrift Savings Plan (TSP) for federal employees, could be exposed to financial risks from climate change, according to GAO's literature review and interviews with stakeholders knowledgeable about climate change and financial markets. Stakeholders said climate-related events, from natural disasters to changes in government policy, are expected to impact much of the economy and thereby investment returns (see figure). Retirement plans can assess their exposure to these risks by analyzing the potential financial performance of holdings in their portfolios under projected climate change scenarios.

How Climate Change Could Impact Retirement Plan Investments



Source: GAO analysis of reports from Mercer and Task Force on Climate-related Financial Disclosures (TCFD). | GAO-21-327

GAO reviewed retirement plans in the United Kingdom, Japan, and Sweden that had taken steps to incorporate climate change risks into their plan management. Officials from these plans described using engagement—such as outreach to corporate boards—to encourage companies in which they invest to address their financial risks from climate change. Officials had taken other steps as well, such as incorporating climate change as a financial risk into their policies and practices. Officials communicate information on climate-related investment risks through public disclosures and reports.

The agency that oversees TSP, the Federal Retirement Thrift Investment Board (FRTIB), has not taken steps to assess the risks to TSP's investments from climate change as part of its process for evaluating investment options. Officials told us that they use a passive investment strategy and do not focus on risks to a specific industry or company. FRTIB is required by statute to invest TSP's funds passively, however, it has previously identified and addressed investment risks. For example, in the 1990s, FRTIB reviewed its investment policies and recommended adding an international equities fund and a small- and medium-capitalization stock fund, both passively managed, to incorporate classes of assets that it determined were missing from TSP's investment mix. Stakeholders in the financial sector, including an advisory panel to a federal financial regulator, have stated that it is important to consider the investment risks from climate change. Evaluating such risks is also consistent with GAO's Disaster Resilience Framework. Taking action to understand the financial risks that climate change poses to the TSP would enhance FRTIB's risk management and help it protect the retirement savings of federal workers.

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Abbreviations

CalPERS	California Public Employees' Retirement System
CalSTRS	California State Teachers' Retirement System
CFTC	U.S. Commodity Futures Trading Commission
CII	Council of Institutional Investors
ERISA	Employee Retirement Income Security Act of 1974, as amended
ESG	environmental, social, and governance
ETAC	Employee Thrift Advisory Council
FERSA	Federal Employees' Retirement System Act of 1986
FRTIB	Federal Retirement Thrift Investment Board
GPIF	Government Pension Investment Fund in Japan
NEST	National Employment Savings Trust in United Kingdom
PRI	Principles for Responsible Investment
TCFD	Task Force on Climate-related Financial Disclosures
TSP	Thrift Savings Plan
USGCRP	United States Global Change Research Program

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
A Century of Non-Partisan Fact-Based Work
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May 25, 2021

The Honorable Margaret Hassan
Chair
Subcommittee on Emerging Threats
and Spending Oversight
Committee on Homeland Security and Governmental Affairs
United States Senate

The Honorable Jeffrey Merkley
United States Senate

Climate change, including rising temperatures and sea levels, is expected to have widespread economic impacts, increasingly disrupting and damaging critical infrastructure and property, labor productivity, and the general welfare in communities. In 2018, the United States Global Change Research Program's (USGCRP) *Fourth National Climate Assessment* stated that under a business as usual scenario, climate change is expected to cause growing losses to U.S. infrastructure and property and impede the rate of economic growth over the 21st century.[1] Domestic and global economies are vulnerable to climate change's risks to financial investments, including those held by retirement plans. Retirement plans manage investments over long time horizons and the economic effects of climate change could negatively affect their returns and thereby the financial health of retirees.

The Thrift Savings Plan (TSP) serves 6 million active and retired participants, which includes federal employees and members of the uniformed services, and is the largest public retirement plan in the United States and the largest defined contribution plan in the world.[2] A number of large retirement plans abroad have adopted investment strategies that

[1]U.S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment,* vol. 2 (Washington, D.C.: 2018). National Climate Assessments, which analyze the effects of global change on the natural environment, among other things, are required by the Global Change Research Act of 1990. See Pub. L. No. 101-606, § 106, 104 Stat. 3096, 3101 (codified at 15 U.S.C. §2936). USGCRP coordinates and integrates global change research across 13 federal agencies. The Office of Science and Technology Policy within the Executive Office of the President oversees USGCRP. The *Fourth National Climate Assessment* is USGCRP's assessment of peer-reviewed scientific literature.

[2]As of November 2020, TSP had about 6 million participants and nearly $700 billion in assets.

take into account investment risks from climate change. However, less is known about the extent to which TSP and most U.S. retirement plans are exposed to investment risks from climate change, and the extent to which TSP has assessed its exposure and implemented strategies to help address any risks.

You asked us to review how the federal agency charged with overseeing TSP—the Federal Retirement Thrift Investment Board (FRTIB)—is considering investment risks posed by climate change. In this report, we examine (1) what is known about retirement plans' exposure to investment risks associated with climate change, (2) what have comparable retirement plans in other countries done to address risks from climate change and how do they communicate this information to the public, and (3) what steps, if any, has FRTIB taken to address investment risks from climate change.

To examine how climate change could expose retirement plans to investment risks, we reviewed relevant literature published by experts knowledgeable about climate change and its impacts on the global economy. These included reports that assessed the impact of climate change on a specific retirement plan, such as the New York State Common Retirement Fund, or a specific segment of the economy, such as the companies represented by Standard & Poor's 500 (S&P500). We interviewed representatives from public retirement plans, investment consulting firms, and other stakeholders knowledgeable about climate change and its economic impact to gain their views on the nature, scope, and magnitude of the investment risks related to climate change.

To examine the actions of retirement plans in other countries, we selected three retirement plans that have each taken action to assess and address investment risks from climate change. Specifically, we selected the United Kingdom's National Employment Savings Trust (NEST), Japan's Government Pension Investment Fund (GPIF), and Sweden's AP7 to examine how they incorporate climate risks in their investment strategies and communications.[3] These plans share certain key characteristics with TSP, such as using a long-term passive investment strategy.[4] For each plan, we reviewed publicly available climate-related disclosures, plan

[3]For more information on the criteria used to select plans in other countries, please see appendix I.

[4]While these plans are established by governments, they can cover private and public sector employees.

documents, and any climate risk assessments. We also conducted semi-structured interviews with plan representatives to learn about their experiences with incorporating climate risk into their portfolio, what options they considered, how they monitor risk and returns, and how this information is publicly communicated. We note that while a particular strategy may have been successful in one or more of the countries included in our review—which may have significantly different cultures, histories, and legal systems—it does not necessarily indicate that it would be successful in the United States.

To determine what steps FRTIB has taken to address the impact of climate change on TSP, we reviewed TSP's five core funds and the federal law that authorizes and provides for the structure of each of the funds. We also reviewed FRTIB documents such as annual reports, its proxy voting policies for fund managers, minutes from Board meetings, and reports written by an investment consultant. We interviewed FRTIB officials, representatives of TSP's primary asset manager (BlackRock), and an investment consultant hired to review TSP's investment offerings.

We conducted this performance audit from October 2019 to May 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Global average surface temperatures have increased by about 1.8 degrees Fahrenheit (for the period 1901-2016), driven primarily by emissions of greenhouse gases, leading to more frequent and intense extreme weather events and other disruptions, according to the USGCRP's *Fourth National Climate Assessment.* As efforts to mitigate climate change focus on curbing such emissions, certain sectors that are dependent on fossil fuels could be significantly affected by a transition to a lower-carbon economy. Additionally, some sectors are expected to suffer larger economic losses than others from direct physical effects of climate change, such as droughts or flooding.

These climate change-related risks may be inadequately reflected in current market prices. According to a September 2020 report on the risks of climate change by the Climate-Related Market Risk Subcommittee of the U.S. Commodity Futures Trading Commission (CFTC)[5], without an effective price on carbon emissions, financial markets lack the most efficient mechanism to price climate risks.[6] The report states that as a result, all manner of financial instruments—including stocks, bonds, futures, bank loans—do not fully incorporate climate change risks in their price.

Certain sectors in particular, such as energy and transportation, may be affected by a transition toward a lower-carbon economy and away from a heavy reliance on fossil fuel energy, driven by potential changes in consumer preferences or taxes on carbon emissions. In the energy sector, for example, changes due to climate change-related policies or widespread adoption of lower-carbon technologies could limit future demand for fossil fuels and lower the value of fossil fuel company reserves. In addition, the negative effects and costs of extreme weather events, such as floods and droughts, are expected to increase. Companies operating in affected areas could experience increased business disruptions and losses in revenue, which in turn could cause the firms to lose value, lowering returns for investors, including retirement plans. For example, the 2020 CFTC report cited a projection of the potential climate-change related annual productivity decline to the U.S. agriculture sector (which comprised approximately 5.4 percent of the nation's output in 2020) to be about 2 to 4 percent under moderate to severe greenhouse gas emissions scenarios.

Governments and global investor groups have considered various initiatives to help address the systemic impacts of climate change. In 2015, 196 parties adopted the Paris Agreement (Paris Climate Agreement), an international treaty which aims to strengthen the global response to the threat of climate change.[7] The Paris Climate Agreement includes a goal to keep the increase in global average temperatures to

[5]Climate-Related Market Risk Subcommittee (2020). *Managing Climate Risk in the U.S. Financial System.* Washington, D.C.: U.S. Commodity Futures Trading Commission, Market Risk Advisory Committee.

[6]The Commodity Futures Trading Commission is a federal regulatory agency whose mission is to promote the integrity, resilience, and vibrancy of the U.S. derivatives markets through sound regulation.

[7]The United States announced its withdrawal from the Paris Agreement in November 2019. The withdrawal took effect in November 2020; however, on January 20, 2021, the United States informed the United Nations that it accepted the Paris Agreement, which went into effect for the country on February 19, 2021.

well below 2 degrees Celsius above pre-industrial levels, and to pursue efforts to limit the increase to 1.5 degrees Celsius, recognizing that this would substantially reduce the risks and effects of climate change. Since then, entities such as central banks and regulatory bodies have taken actions that are consistent with the aims of the Paris Climate Agreement, such as recommending that companies provide climate-related disclosures. Additionally, the Task Force on Climate-related Financial Disclosures (TCFD), which was created by the Financial Stability Board,[8] has developed recommendations for voluntary climate-related disclosures that could help stakeholders understand the concentrations of carbon-related assets in the financial sector and the financial system's exposure to climate-related risks.

Retirement Plans and the Thrift Savings Plan

The two predominant types of retirement plans are defined benefit and defined contribution plans. Defined benefit plans (commonly known as pension plans) generally promise to provide a fixed level of monthly retirement income that is based on a worker's salary, years of service, and age at retirement, regardless of how the plan's investments perform. In contrast, benefits from defined contribution plans are based on the contributions to and the performance of the investments in individual worker's accounts, which may fluctuate in value. In defined contribution plans, participants bear the investment risks associated with their retirement savings. Examples of defined contribution plans include TSP and 401(k) plans, among others.

Generally, when managing their funds, plans can choose between active or passive investment strategies. Active investment managers rely on analytical research, personal judgment, and forecasts to make investment decisions. Passive investors replicate a certain benchmark—also known as a market index—in an effort to match the benchmark's performance. For example, an S&P500 index fund is a passively managed fund that mimics the S&P500, which includes 500 of the largest publicly traded U.S. companies and represents about $31 trillion in market capitalization.

[8]The Financial Stability Board (FSB) is an international body that coordinates the work of national financial authorities and international standard-setting bodies to develop and promote the implementation of financial stability reforms agreed upon by international leaders after the 2007–2009 financial crisis. FSB was created in 2009 and U.S. members include representatives from the Board of Governors of the Federal Reserve System, the Securities and Exchange Commission, and the Department of the Treasury. FSB established the Task Force on Climate-related Financial Disclosures (TCFD). The TCFD is made up of 31 members from across the G20 and was established to develop a set of voluntary, consistent disclosure recommendations for use by companies in providing information to investors, lenders, and insurance underwriters about their climate-related financial risks.

These market indices provide passive investors with access to a broad representative investment portfolio without much buying and selling. Passively managed investments generally incur fewer fees, making them less expensive to manage.

Retirement plans often hire an asset manager or financial services institution to make day-to-day investment decisions and manage risks. In the United States, most private sector retirement plans must comply with the Employee Retirement Income Security Act of 1974, as amended, (ERISA). Among other things, ERISA prescribes standards for fiduciaries of retirement plans, including defined benefit and defined contribution plans. Under ERISA, plan sponsors and other fiduciaries generally must act solely in the interest of the plan participants and beneficiaries (1) for the exclusive purpose of providing benefits to participants and beneficiaries and defraying reasonable expenses of administering the plan; (2) with the care, skill, prudence, and diligence under the circumstances then prevailing of a prudent person acting in a like capacity; (3) by diversifying plan investments to minimize the risk of large losses; and (4) in accordance with documents governing the plan.[9] In addition, plan fiduciaries responsible for making investment decisions are required to select investments and investment courses of action based on financial factors.[10]

The Federal Employees' Retirement System Act of 1986 (FERSA) created the TSP to provide options for retirement planning and encourage personal retirement savings among the federal workforce. Federal employees, including congressional employees and members of Congress, members of the judicial branch, members of the uniformed services, and postal employees are eligible to participate in TSP.

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[9]See 29 U.S.C. § 1104(a).

[10]See 29 C.F.R. § 2550.404a-1(c). In November 2020, DOL stated in the preamble to a final rule on financial factors in plan investments that "[a]t the time of the investment decision, fiduciaries should be focused on whether or not any given factor would materially affect the risk and/or return of the investment over an appropriate time horizon." See Financial Factors in Selecting Plan Investments, 85 Fed. Reg. 72,846, 72,858 (Nov. 13, 2020). On March 10, 2021, DOL announced it intends to revisit the final rule and that it would not enforce the final rule or otherwise pursue enforcement actions against any plan fiduciary based on a failure to comply with the final rule with respect to an investment or investment course of action or with respect to an exercise of shareholder rights. See DOL, *U.S. Department of Labor Statement Regarding Enforcement of Its Final Rules on ESG Investments and Proxy Voting by Employee Benefit Plans* (Washington, D.C.: March 2021).

The Federal Retirement Thrift Investment Board (FRTIB), established under FERSA, administers TSP. FRTIB is composed of five members appointed by the President. FRTIB appoints an executive director to oversee the plan and carry out the policies established by FRTIB, including investing and managing TSP funds in accordance with these policies. In addition, FRTIB was required to establish an Employee Thrift Advisory Council (ETAC), which is a 15-member council that provides advice to FRTIB and the executive director on TSP investment policies and administration.

FRTIB board members and the executive director serve as plan fiduciaries. Similar to ERISA, FERSA, as amended, requires fiduciaries to act solely in the interest of plan participants and beneficiaries (1) for the exclusive purpose of providing benefits and defraying reasonable expenses of administering TSP; and (2) with the care, skill, prudence, and diligence under the circumstances then prevailing of a prudent person acting in a like capacity. To help it fulfill its fiduciary duties, FRTIB selects and closely monitors service provider companies that carry out many of TSP's operations, including managing all but one of the investment funds.

FRTIB generally has less discretion than private sector defined contribution plan sponsors in setting investment policy. The investment options available to TSP participants are largely outlined in federal law, whereas private sector defined contribution plan sponsors are responsible for choosing investment options to offer participants. For TSP, FERSA, as amended, specifies the number and types of funds and requires that some funds replicate the performance of certain commonly recognized indices, which are broad, diversified market indicators such as the S&P500. FRTIB selects the particular indices to replicate.[11]

As of November 2020, TSP had about $700 billion in assets and over 6 million active and retired participants. Participants may allocate their contributions and any associated earnings among five investment fund options: G Fund, F Fund, C Fund, S Fund, and I Fund. TSP participants also may choose one of 10 Lifecycle funds, which diversify participants' investments among each of the five funds in mixes tailored to different time horizons for retirement and withdrawal. The investment mix of each

[11]Additionally, under FERSA, as amended, the Board and the executive director may not exercise voting rights associated with the ownership of TSP securities. Instead, asset managers vote proxies on behalf of TSP's beneficiaries.

Lifecycle fund adjusts quarterly and becomes increasingly conservative as the participant nears retirement.

Retirement Plans Potentially Face Financial Risks from Climate Change which Can Be Assessed Using a Range of Methods

Long Term Investments by Retirement Plans Could Face Climate Change-Related Risks that Vary Across Holdings

The literature we reviewed, and the stakeholders knowledgeable about climate change and the financial sector we interviewed, highlighted how retirement plans' investments—which encompass the global economy over long time horizons—are potentially exposed to financial risks from climate change. According to a September 2020 advisory report to the CFTC, climate change could pose systemic risks to the U.S. financial system since it could affect multiple economic sectors, geographies, and assets in the United States, sometimes simultaneously and within a relatively short timeframe.[12] By the end of the century, with continued growth in emissions at historic rates, annual financial losses in some U.S. economic sectors due to damages from climate change could reach hundreds of billions of dollars (more than the gross domestic product, or GDP, of many states), according to the most recent (USGCRP) *Fourth National Climate Assessment.*[13] Similarly, according to reporting in 2017, the United States could face annual economic losses ranging from 0.5 to

[12]U.S. Commodity Futures Trading Commission, Climate-related Market Risk Subcommittee of the Market Risk Advisory Committee, *Managing Climate Risk in the U.S. Financial System* (Washington, D.C.: September 2020).

[13]U.S. Global Change Research Program, *Fourth National Climate Assessment*, Volume II: Impacts, Risks, and Adaptation in the United States, Report-in-Brief (Washington, D.C.: 2018).

2 percent of GDP, or a 1.2 percent loss for every degree Celsius increase, from 2080 through 2099.[14]

Precisely understanding the potential risks that climate change poses to investments is a challenge because there is uncertainty in how a changing climate could affect the economy and thereby any underlying assets owned by investors, including retirement plans. According to the *Fourth National Climate Assessment,* the largest uncertainty in projecting future climate conditions is the future levels of greenhouse gas emissions, which depend on economic, political, and demographic factors that can be difficult to predict with confidence.[15] Furthermore, according to the September 2020 advisory report to the CFTC, climate change–related risks are particularly difficult to assess and measure for actors in the financial sector since they are highly uncertain and can affect various assets and companies differently.[16] However, the *Fourth National Climate Assessment* also stated that while there is inherent uncertainty in climate science, there is a high degree of confidence in the understanding of climate change's underlying causes—enough to make decisions based on that understanding.[17]

A retirement plan's exposure to these risks depends on the mix of investments, primarily stocks and bonds that are held within its portfolio, and how climate change may affect each of these investments. (See fig. 1.) Retirement plan investments are subject to both physical and

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[14]According to this reporting, these losses are likely to be distributed unequally across the country (with large transfers of value northward and westward that could increase economic inequality). S. Hsiang, et al., "Estimating Economic Damage from Climate Change in the United States," *Science*, vol. 356, no. 6345 (2017).

[15]Uncertainty in climate science, according to the *Fourth National Climate Assessment*, is present in, among other things, climate measurements, the analysis and interpretation of such measurements, and using computer-based models of the processes governing the global climate. See USGCRP, *Fourth National Climate Assessment* (2018).

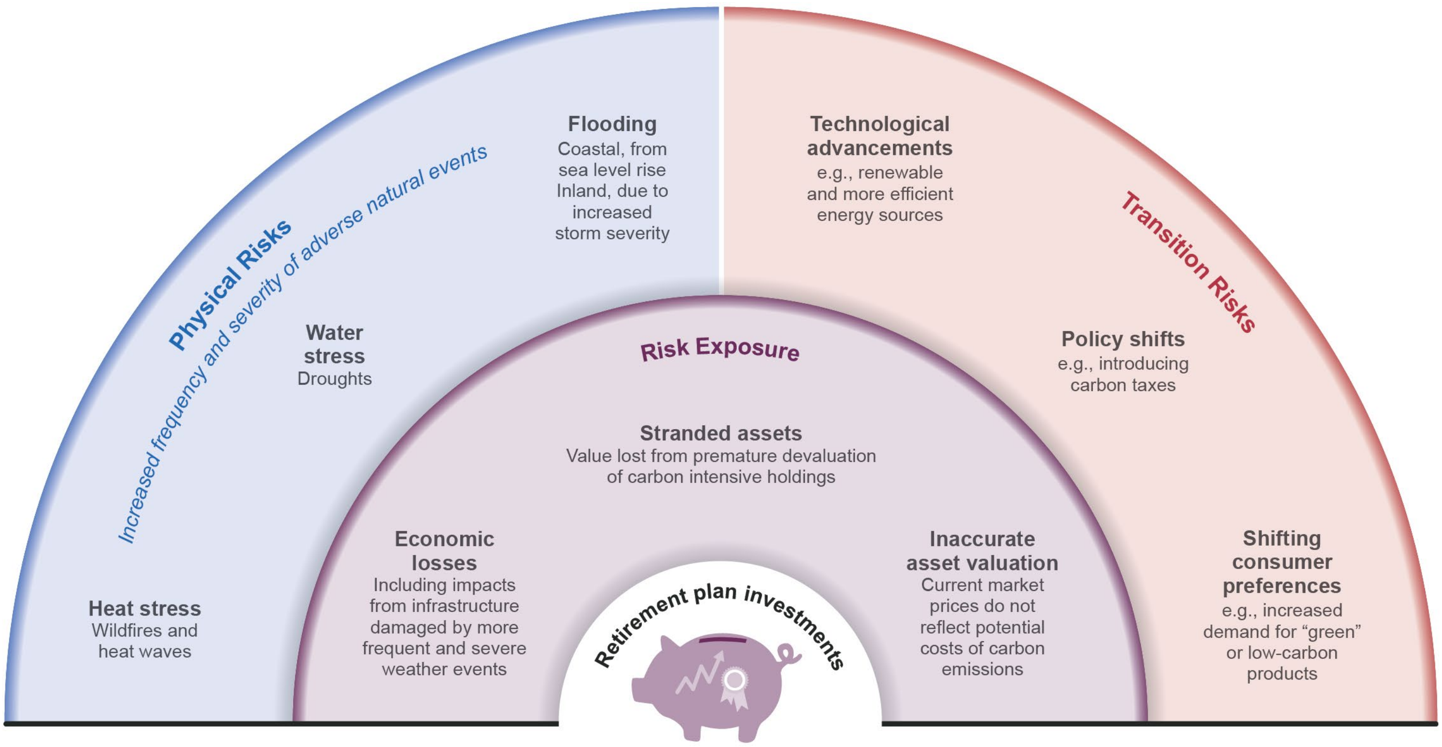
[16]Climate-Related Market Risk Subcommittee (2020).

[17]Methods used to estimate the potential economic effects of climate change in the United States—using linked climate science and economics models—are based on developing research, as we noted in 2017. The methods and the studies that use them produce imprecise results because of modeling and other limitations but can convey insight into potential climate damages across sectors in the United States. For more information, see GAO, *Climate Change: Information on Potential Economic Effects Could Help Guide Federal Efforts to Reduce Fiscal Exposure*, GAO-17-720 (Washington, D.C.: September 2017). Additionally, these modeling activities have continued to evolve since our 2017 report.

transition risks from climate change. Physical risks from climate change can be from acute, adverse events or from longer-term shifts in climate patterns that can have financial impacts for companies, such as direct damage to company assets and indirect impacts from disruptions to supply chains, according to reporting from a stakeholder we interviewed.[18] For example, an increase in the frequency of wildfires could damage property and hinder the operations of some companies, potentially resulting in financial losses for the companies and reduced investment returns for the retirement plans that invest in them. Transition risks from climate change stem from the possible policy, legal, technology, and market changes needed to transition to a lower-carbon economy and may pose varying levels of financial risks to companies and thereby to investment returns.

[18]Companies' financial performance could also be affected by a range of other physical risks from a changing climate, such as changes in water availability and quality; threats to food security; and extreme temperature changes affecting organizations' premises, operations, supply chain, transport needs, and employee safety, according to the report we reviewed. See Task Force on Climate-related Financial Disclosures*, Final Report: Recommendations of the Task Force on Climate-related Financial Disclosures* (June 2017).

Figure 1: Examples of Risks to Retirement Plan Investments from Climate Change



Source: GAO analysis of reports from Mercer and Task Force on Climate-related Financial Disclosures (TCFD). | GAO-21-327

These physical and transition risks can be compounded over the long time periods typical for retirement plan investments and could lead to financial losses, according to the reports we reviewed and stakeholders knowledgeable about the implications of climate change for the financial sector. In 2016, a consulting firm knowledgeable about climate risks estimated that the total value of assets in an average U.S. public pension portfolio could be 6 percent lower by 2050 than under a business-as-usual scenario due largely to transition risks associated with climate change.[19] Additionally, in 2019, one nonprofit group that encourages investors to understand and disclose their environmental impacts reported that it identified about $970 billion in value at risk due to climate change in the worlds' 500 largest companies.[20] Furthermore, of the nearly 7,000 businesses surveyed by this group, over half said they consider their businesses to be exposed to climate change-related risks with potential for substantive financial or strategic impacts. Of particular importance to retirement plans such as TSP that invest in passively managed broad market index funds, one data-analytics firm reported that as of November 2019 almost 60 percent of the companies in the S&P500 index held assets that were at high risk of physical effects of climate change.[21] The data analytics firm also noted that S&P500 companies face transition risks in the form of carbon pricing costs that would equal about

[19]These data resulted from an analysis of projected returns from 2015 to 2050 for a model public pension plan under a scenario where global warming is limited to 2 degrees Celsius above pre-industrial levels by 2100 and compared to a business-as-usual scenario where efforts to mitigate climate change remain fragmented and warming reaches 4 degrees Celsius by 2100. The climate scenarios estimate the effects of both transition and physical risks from climate change. The study noted that the worst physical impacts from climate change are not expected for decades (2100 and later) and therefore beyond the study's time horizon for effects on investment returns. See Mercer and Center for International Environmental Law, *Trillion-Dollar Transformation: A Guide to Climate Change Investment Risk Management for US Public Defined Benefit Trustees* (October 2016). Mercer published a study in 2019 on investment risks from climate change, but it did not include a specific projection for the impact on pension plans. See *Investing in a Time of Climate Change: The Sequel 2019.*

[20]CDP (formerly the Climate Disclosure Project) is an international nonprofit that encourages investors, companies, and cities to measure and understand their environmental impact. The 2019 CDP analysis found approximately $970 billion at risk from climate change for 215 companies—representing $16.95 trillion in market capitalization—that provided estimates of the potential financial implications of climate change (among the 500 world's largest companies by market capitalization that were included in the scope of the analysis). Approximately $250 billion of the $970 billion at risk is linked to asset impairments or write-offs (i.e., stranded assets) as a result of both transition and physical risks from climate change.

[21]The S&P500 is a stock market index including 500 large U.S. companies representing about $34 trillion in market capitalization (as of February 2021) that is tracked by TSP and many other retirement plans. The data-analytics firm Trucost, part of S&P Global Market Intelligence, was established to provide the data, tools, and insights needed by companies, investors, and policy makers to deliver the transition to a low carbon and resource efficient economy. See S&P Trucost Limited, *Understanding Climate Risk at the Asset Level: The Interplay of Transition and Physical Risks* (2019).

40 percent of their revenues under a moderate climate change forecast scenario.[22]

While climate change is expected to affect the entire market, some sectors of the economy in which retirement plans are invested are at heightened risk. For example, investments tied to firms involved in the production and distribution of fossil fuels may be at particular risk from climate change. This risk relates to their long-lived and emissions-intensive assets potentially being retired before the end of their useful lives (i.e., becoming stranded assets) in a transition to a low-carbon economy, according to one stakeholder knowledgeable about energy policy and finance.[23] In 2019, one consulting firm reported that investments in the coal and the oil and gas sectors could each experience a decrease in annual returns of about 9 percent through 2050 under a scenario where emissions reductions are sufficient to limit global warming to 2 degrees Celsius.[24] Additionally, under the same scenario, annual returns for the electric utilities sector could decrease by about 3 percent through 2050. On the other hand, this study also reported that investments in the renewable energy sector, such as in solar energy, are expected to experience an increase in annual returns of about 3 percent under the same scenario. The study noted that the telecommunications and consumer staples sectors faced exposure to physical risks from climate change and, despite a positive impact on annual returns forecast until 2030, are expected to face negative impacts on annual returns from climate change by 2050 under a 2-degrees warming scenario.[25]

Some retirement plans are currently working to better understand the exposure of their portfolios to risks from climate change. TCFD reported that many investors believe climate change-related risks require special attention because they are expected to affect nearly all industries and therefore portfolios cannot fully diversify away from them. The ability of retirement plans to assess the climate change-related risks facing their

[22]This assumes a level of carbon pricing that would be implemented by governments worldwide under a scenario of moderate climate change action from 2030 to 2050.

[23]The stakeholder added that investments in other sectors—including utilities, heavy industry, cement, transportation, and agriculture, among others—also face risks from a transition to a lower-carbon economy.

[24]Mercer, *Investing in a Time of Climate Change (2019)*.

[25]Consumer staples are essential products such as household goods and food and beverage products.

portfolios would be enhanced if more companies made useful climate change information available, according to several stakeholders knowledgeable about climate change and the financial sector we interviewed.[26] Despite this challenge, some retirement plans have taken steps to better understand their exposure. In 2019, for example, the California Public Employees' Retirement System (CalPERS) reported that 20 percent of the assets in its portfolio are in economic sectors that are most exposed to climate change-related risks.[27] Additionally, in 2015, the New York State Common Retirement Fund released a report assessing the climate change-related risks facing its portfolio that found, among other things, the plan's stock portfolio was particularly exposed to climate change-related risks compared to the other types of assets held by the plan. Furthermore, officials with the plan told us they had begun to obtain data on the physical risks from climate change facing their portfolio and would be determining how to best use these data.

Some Plans Have Begun to Assess Their Exposure to Climate Change-Related Risk Using Scenario Analysis Based on Available Disclosures

Retirement plans can use a variety of methods to assess the range of climate change-related risks in their portfolios as part of their overall risk management strategies.[28] These methods, such as analyzing how their portfolios might perform under a variety of projected climate change scenarios or estimating the extent to which their portfolios may be exposed to current or future taxes on carbon dioxide emissions, typically use historical emissions data and other information voluntarily provided by companies. Retirement plans rely, in part, on the generally voluntary

[26]Stakeholders included an academic knowledgeable about energy and finance, a non-profit association representing retirement plans and other institutional investors, and a group formed to help improve the disclosure of climate change-related risks in the financial sector. GAO previously found that, for a group of large and mid-size public companies, disclosures on environmental, social, and governance factors—which include climate change—often lacked detail and consistency and thereby reduced their usefulness to investors. See GAO, *Public Companies: Disclosure of Environmental, Social, and Governance Factors and Options to Enhance Them*, GAO-20-530 (Washington, D.C.: July 2020).

[27]CalPERS made its own definition of risk when determining which assets are in sectors exposed to climate change-related risks. The reported percent of CalPERS' assets that are in economic sectors that are most exposed to climate change-related risks was based on holdings information as of December 2018 and may change as the plan's assets and their values change.

[28]For purposes of our report, we focus on the consideration of investment risks related to climate change that are expected to have financial impacts. Some retirement plans have considered non-financial factors to incorporate social concerns into their investment strategies. For example, according to the Center for Retirement Research (CRR), several states passed laws in the 1970s to screen out "sin" stocks, such as tobacco, alcohol, and gambling. The CRR reported in 2020 that these strategies often did not have an effect on the social causes but in some cases resulted in lower investment returns.

disclosure of emissions and other climate change-related information by companies. Efforts to improve the quality and availability of the disclosures are underway.

Retirement Plans Can Use Analyses Based on Future or Current Emissions

A variety of methods based on either projected or current emissions are available to retirement plans to help them assess the range of climate change-related risks faced by investments in their portfolios (see text box).

Examples of Available Methods to Assess Climate Change-related Risk to Retirement Plan Investments

- **Scenario Analysis:** A scenario analysis allows a plan to assess its portfolio's resilience across potential climate outcomes and the associated financial, policy, and environmental implications over various time periods. For example, a plan can consider the impact on the portfolio's returns if projected warming is consistent with current trends or is within the goals of the Paris Climate Agreement.
- **Carbon Footprint:** Plans can measure emissions associated with their portfolio using data provided at the company level on carbon dioxide and other greenhouse gases resulting from direct and indirect emissions. This measure can help plans understand the effect on their holdings of transitions to address climate change, such as carbon taxes.
- **Carbon Intensity:** Using company-level emissions data, plans can identify the portions of their portfolio that may be more vulnerable to transition risk by measuring the quantity of greenhouse gas emissions per unit of revenue generated by a company.

Note: These examples were cited frequently in the relevant literature we reviewed and by the officials and stakeholders we interviewed. This is not an exhaustive list of methods for assessing the range of climate risks facing retirement plan portfolios.

Source: GAO analysis of documents from Mercer, Task Force on Climate-related Financial Disclosures, Trucost, and interviews with stakeholders. | GAO-21-327

In one method, a scenario analysis, a portfolio's returns are estimated under a range of climate change scenarios in which varying policy responses, emissions levels, temperature changes, and economic damages are applied. The effects on a portfolio's returns are determined by the sensitivity of its assets to these changes. For example, the level of a company's carbon dioxide emissions helps determine the extent to which that company would be affected by a carbon tax. According to representatives from several data analytics firms, scenario analysis can serve as a helpful forward-looking guide for managing risk when faced with uncertainty.

The Task Force on Climate-related Financial Disclosures (TCFD) and the Market Risk Advisory Committee of the U.S. Commodity Futures Trading Commission (CFTC) recommended that retirement plans, and the companies in which they invest, include climate change scenario analysis in their risk management strategies. Such analysis, they said, is a key step in understanding the potential effects of climate change and allows plans and companies to understand how their strategies might change to address such risks.[29] Specifically, in conducting scenario analysis, plans can consider their exposure to risks under a scenario in which global temperature rise is held to the goals of the Paris Climate Agreement, or in other scenarios in which temperatures rise above and below this goal, according to plan officials and stakeholders with whom we spoke.[30]

In 2016, the California State Teachers' Retirement System (CalSTRS) conducted a scenario analysis with a consulting firm to identify the portions of its holdings that were most exposed to climate change-related risks under four possible scenarios.[31] The analysis found that CalSTRS' portfolio, for the period 2015 to 2050, would be most at risk under a scenario where ambitious and stringent polices and mitigation steps were taken to limit global warming to the 2 degrees Celsius target of the Paris Climate Agreement, and that CalSTRS could address its risk by, among other things, reallocating some of its passively managed investments into lower-carbon indices. In 2019, CalSTRS conducted another scenario analysis on whether its portfolio aligned with the emission reduction goals of the Paris Climate Agreement. CalSTRS found that the greenhouse gas emissions from its stock and bond portfolios were at the time aligned with the goals of the Paris Climate Agreement and would remain so until 2031

[29]U.S. Commodity Futures Trading Commission, Climate-Related Market Risk Subcommittee of the Market Risk Advisory Committee, *Managing Climate Risk in the U.S. Financial System* (Washington, D.C.: September 2020).

[30]The Paris Climate Agreement is an agreement within the United Nations Framework Convention on Climate Change (UNFCCC) signed in 2015. According to UNFCCC, the central goal of the Paris Climate Agreement is to strengthen the global response to climate change by keeping the global temperature rise in the 21st century below 2 degrees Celsius above pre-industrial levels.

[31]Mercer, *Investing in a Time of Climate Change: California State Teachers Retirement System Portfolio Climate Change Risk Assessment* (Seattle, WA: February 2016).

and 2033, respectively.[32] CalSTRS officials reported that these data are useful in the long-term management of climate change-related risks, allowing a plan to regularly assess if its portfolio is aligned with present and future goals. CalSTRS has committed to conducting scenario analyses every three years.

Another method plans can use to assess climate change-related risk is carbon footprinting, in which previously reported emissions data help determine a portfolio's exposure to transition risks. For example, CalPERS previously conducted carbon footprinting and identified a small number of companies in its portfolio that contribute a relatively large amount of emissions.[33] As a result, CalPERS convened a group of investors to encourage the high-emitting companies to incorporate climate risks into their corporate governance practices and take concrete actions to reduce their greenhouse gas emissions. CalPERS noted that, as a long-term investor in the broad market, it cannot fully avoid the effects of climate change as it is a systemic risk that must be managed and mitigated.

Plans can also employ a method in which emissions data are used to calculate their portfolios' carbon intensity, or the quantity of greenhouse gas emissions per unit of revenue generated by a company. Since holdings with higher carbon intensity are more likely to face increased transition risk, plans can use this information to assess the exposure of their portfolios.

Under all methods, there is a degree of uncertainty in these assessments. Plans, and the data providers with whom they work, often make estimations of companies' emissions because reported data are not available.

Plans Rely on Climate Disclosures from Companies and Efforts to Improve Them Are Underway

To assess the potential impacts of climate change, retirement plans and their service providers often rely on emissions and other data that are disclosed by companies and which may not be consistent or

[32]CalSTRS assessed how its stock and bond portfolios aligned with a scenario where future greenhouse gas emissions are limited to an amount that meets the Paris Climate Agreement's goal of global warming by 2100 of no more that 2-degrees Celsius over pre-industrial levels.

[33]CalPERS reported that 80 companies out of the 10,000 holdings in its global equity fund, as of June 2015, accounted for 50 percent of the fund's carbon emissions.

comprehensive.[34] In our prior work, we found that this information in public company disclosures on environmental, social, and governance (ESG) factors is not always complete or clear. These disclosures are generally voluntary and do not adhere to a standard methodology.[35] However, disclosing on climate risk is increasingly important in understanding a plan's risk. In 2019, Trucost, part of S&P Global, found that 80 percent of the world's companies reported having some exposure to physical and transition risks from climate change. Such information can be useful to investors seeking to better understand their exposure to climate change-related risk, including retirement plans. When companies do not disclose their emissions or other environmental impacts, plans or their asset managers can hire outside parties to fill in the gaps in data, typically by extrapolations based on current trends. To improve the quality of these data, some investor coalitions are seeking standardized climate-related disclosures from companies.

- **TCFD Framework for Managing and Disclosing Climate Risks.** A framework from the Task Force on Climate-related Financial Disclosures (TCFD) is increasingly used by companies to help investors, including retirement plans, better understand the investment risks posed by climate change, according to several stakeholders we interviewed.[36] According to reporting from TCFD in February 2020, over 1,000 organizations, including many retirement plans, with a market capitalization of nearly $12 trillion had endorsed the framework and its recommendations. TCFD recommends four broad topics for retirement plans and companies to address in managing and disclosing their climate risk: governance, strategy, risk management, and metrics and targets. For example, as part of strategy, TCFD recommends that organizations conduct and disclose scenario analyses of climate change impacts. However, TCFD reported that in 2018 only 9 percent of the over 1,100 companies it

[34]Companies make disclosures of their emissions and other information about their approaches to climate change in submissions to regulators, sustainability reports for the public, and in other documents. The Securities and Exchange Commission requires public companies to disclose material information—which can include information on ESG such as climate change—in their annual 10-K filings and other periodic filings.

[35]GAO-20-530.

[36]The Task Force on Climate-related Financial Disclosures (TCFD) is a group whose members are chosen by the Financial Stability Board from a broad range of economic sectors in the G20. They developed voluntary climate-related financial risk disclosures for use by companies in providing information to investors, lenders, insurers, and other stakeholders.

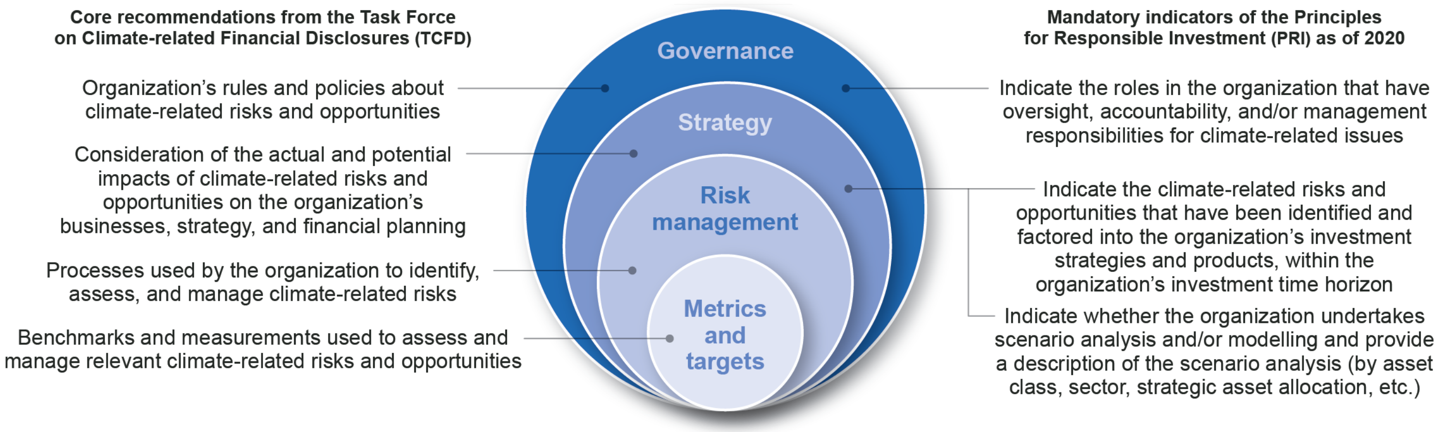
reviewed had disclosed the results of scenario analyses, although the number had increased from previous years.[37] As a result, TCFD officials said they are supporting initiatives to make guidance available on how organizations should conduct scenario analyses. TCFD reported that the continued and widespread use of its recommendations should result in information that is more useful for investors' decision-making because the risks and opportunities associated with climate change will be better understood and more accurately reflected in market prices. In 2020, the Market Risk Advisory Committee of CFTC recommended that regulators should build on the TCFD recommendations in future guidance related to financial disclosures, as the recommendations enhance the quality and comparability of disclosures.

- **Principles for Responsible Investment.** Alongside TCFD, a growing number of retirement plans and other investors have become signatories to the Principles for Responsible Investment (PRI)—an organization that encourages its voluntary signatories to incorporate ESG issues, such as climate change, into their investment analysis and decision-making processes and is supported by the United Nations. With the exception of TSP, the five largest global retirement plans, with assets under management ranging from $462 billion to $1.4 trillion, are signatories of PRI.[38] As signatories, these retirement plans have agreed to encourage appropriate disclosures from the entities in which they invest and incorporate this information into their investment analyses and decision making. While PRI focuses on a range of ESG issues, it has highlighted climate change risk along with the TCFD recommendations that focus on disclosing this risk as a priority. Beginning in 2020, according to PRI, all of its signatories will be required to report on three TCFD-aligned climate change indicators. These reports include describing the organization's oversight of climate risk, the impacts of climate risk on strategy and financial planning, and the resilience of the organization, by conducting scenario analysis (see fig. 2). PRI has announced that, in the future, it may make additional TCFD indicators mandatory to report as PRI develops best practices to support them.

[37]Task Force on Climate-related Financial Disclosures, *2019 Status Report* (June 2019).

[38]Japan's Government Pension Investment Fund, Norway's Government Pension Fund, South Korea's National Pension, and the Netherland's ABP fund, along with the Thrift Savings Plan, were listed as the world's five largest retirement plans in February 2020, according to *Pensions and Investments*.

Figure 2: Principles for Responsible Investment (PRI) Reporting Requirements Based on the Task Force on Climate-related Financial Disclosures (TCFD) Framework as of 2020



Source: GAO analysis of information from TCFD and PRI. | GAO-21-327

Selected Retirement Plans in Other Countries Have Used Engagement and Other Strategies to Address and Communicate About Climate Change Risks

Engagement with Companies Helps Selected Plans Identify and Reduce Their Exposure to Climate Change-Related Investment Risks

Officials from selected retirement plans in the United Kingdom, Japan, and Sweden, all of which use a passive investment strategy, told us that they consider climate change a significant long term risk to their investments and have taken several steps to reduce their exposure.[39] Officials from each of these plans described using engagement—actions meant to influence companies to be more proactive and transparent about their efforts to address financially material risks from climate change—as one of their steps. Officials from the three selected retirement plans told us that since they are large institutional investors with diversified holdings across all sectors of the global economy, they believed engagement allowed them to address their climate risks at the source. As part of their engagement efforts, the three retirement plans take part in a variety of global investor initiatives meant to encourage companies to take action to address and disclose climate risks. For example, all three plans participate to varying degrees in the Climate Action 100+ organization that encourages the world's largest corporate greenhouse gas emitters to take action to reduce their emissions.[40]

Each of the selected plans provided examples of how they or their asset managers engaged with companies to address climate risks. (See appendix I for more information on the plans we selected.)

United Kingdom's National Employment Savings Trust (NEST)

Officials with the United Kingdom's National Employment Savings Trust (NEST) told us that much of their engagement efforts regarding climate risk are focused on encouraging transparency from companies. For example, officials told us that NEST asks companies to disclose information such as their climate change policies, any expertise in climate change within their boards of directors, or whether the companies have set climate change-related goals for themselves. (See sidebar.)

United Kingdom's National Employment Savings Trust (NEST)

NEST is a defined contribution retirement plan established by the government and managed as an independent entity to help employers meet their obligation to automatically enroll eligible workers in a retirement plan. As of March 2021, NEST had $23.7 billion in assets under management and 9.9 million participants.

Source: NEST plan documents. | GAO-21-327

NEST officials told us that if they determine through ongoing outreach with company managers that a company's progress toward alignment with the goals of the Paris Climate Agreement is insufficient or too slow after two years, NEST will consider taking actions, such as proxy voting,

[39]In addition to having passive investment strategies, we selected these plans because they are signatories of the PRI and have taken action to integrate climate risks into their investment management. For all of our selection criteria, see appendix I.

[40]As of November 2020, Climate Action 100+ had over 500 participating investors worldwide and represented $52 trillion in assets under management. According to a 2019 progress report, the organization's engagement activities have helped lead to a threefold increase in the number of companies making disclosures of financially material climate risks that are in line with the recommendations of the TCFD.

against company management.[41] If insufficient improvement has been made after three years, officials said that NEST will consider divesting from the company. However, NEST officials told us the plan would prefer to work with such companies to make the changes necessary to address their climate change risks.

Japan's Government Pension Investment Fund (GPIF)

Japan's Government Pension Investment Fund (GPIF)

GPIF manages and invests Japan's pension reserve fund. The reserve fund earns returns on its investments that are used to cover any future shortfall in the national pension. GPIF is primarily passively managed and as of December, 2020 had $1.7 trillion in assets under management.

Source: GPIF plan documents. | GAO-21-327

Officials for Japan's GPIF told us that the plan engages with its asset managers on addressing climate risks as part of monitoring. (See sidebar.) Officials said that the legal structure of GPIF does not allow the plan to directly engage companies or participate in proxy voting, and GPIF fully delegates its voting rights to its asset managers.[42] GPIF cannot direct its asset managers how to vote, but officials said the plan monitors those votes in accordance with GPIF's stated voting principles. When selecting an asset manager, GPIF assesses the manager's stated philosophy and whether it has specific policies on climate risk.

GPIF officials said engagement is the most appropriate strategy to address investment risks from ESG issues including climate change for universal owners, that is, investors who are broadly diversified across the global market. In its 2019 ESG report,[43] GPIF reported that 90 percent of its stock portfolio is passively invested and that the plan invests in a broad array of companies. As a universal owner, GPIF's investment returns are reliant on long-term growth of the market as a whole. As a result, GPIF reported that it is important for its external asset managers to actively and continually engage companies and work with them to minimize negative externalities in their exposure to long-term financial risks, such as climate risks. However, GPIF officials noted that this is an emerging area and it is difficult to say how effective it may be. Plans and asset managers still face the challenge of how to address climate risks as part of their engagement, and officials said there is no single accepted approach yet.

[41]Publicly traded companies report to their shareholders through annual shareholder meetings and will often provide information on the resolutions that shareholders will be voting on during the meeting. Investors can influence certain aspects of company operations by submitting proxy votes on these resolutions.

[42] GPIF officials also noted that the legal structure does not allow the plan to divest from or select specific companies in which to invest.

[43]*For All Generations ESG Report*, Government Pension Investment Fund, 2019.

Sweden's AP7

Sweden's AP7

AP7 is the government-run investment option available to participants (alongside other investment options offered by private sector financial providers) within the Swedish premium pension system— a mandatory defined contribution plan for all Swedish workers. As of March 2021, AP7 had $91.8 billion in assets under management and 5 million participants.

Source: AP7 plan documents. | GAO-21-327

Sweden's AP7 is committed to a diversified investment strategy, plan officials said, in which the plan holds assets in all sectors of the global economy. (See sidebar.)

As a "universal owner," AP7 had shares in over 3,000 companies around the world and is invested in a significant portion of the global economy, AP7 officials said.[44] They told us they cannot fully diversify their portfolio away from the risks of climate change because climate change affects the entire economy. Given the systemic nature of risks from climate change, AP7 officials said they use engagement with companies in its portfolio to help achieve emissions reductions across the entire economy and thereby reduce AP7's exposure to climate change risks.

In its 2019 Sustainability Report,[45] AP7 noted that it uses four engagement methods to influence companies: (1) actions, such as filing and voting on shareholder resolutions, at company general meetings; (2) outreach to companies to engage in dialogue; (3) publicly listing companies that have violated international norms on various issues, such as the environment, human rights, labor rights, and corruption (referred to by AP7 as blacklisting)[46]; and (4) participating in legal processes such as securities class actions when AP7 believes a company has mistreated shareholders and negatively influenced share prices. For example, in 2019, AP7 reported that during some company general meetings, officials from AP7 strongly encouraged managers to address climate risks by aligning their practices with the goals of the Paris Climate Agreement. As a result of AP7's actions, 12 companies publicly declared they would carry out reviews to ensure their efforts were in line with the Paris Climate Agreement, AP7 officials said.

An AP7 official described how the plan evaluates its portfolio about twice a year to determine which companies should be publicly blacklisted for

[44]According to AP7, universal owners are investors with diversified investments across asset classes, sectors, and geographies with long time horizons.

[45]AP7, *Sustainability Report 2019* (Stockholm, Sweden: April 30, 2020).

[46]AP7 reports that, since 2016, the Paris Climate Agreement to the UN Framework Convention on Climate Change has been included in the norms that help guide its blacklisting efforts.

violating international norms, for example, conducting business in ways that conflict with the Paris Climate Agreement. The official told us that if other engagement strategies did not lead a company to change its behavior, AP7 would reduce its investment in the company for five years before re-evaluating and potentially re-investing. AP7 officials told us that temporarily reducing investments in companies helps decrease the plan's exposure to climate-related risks and incentivizes companies to change their behavior.

Selected Plans Took Other Actions to Address Exposure to Climate Risks

In addition to describing how they engaged or monitored their asset managers' engagement with companies once they identified climate change as a material financial risk to their portfolios, officials from these three selected retirement plans also noted other steps they took to help reduce their exposure to climate risks.

- **Assessing Portfolios:** The plans we reviewed had all taken steps to assess the exposure of their portfolios to financially material investment risks from climate change. For example, GPIF officials said they analyzed the carbon footprint of their plan's portfolio and examined whether their investments are consistent with a global emissions pathway that would limit warming to 2 degrees Celsius. The officials told us the analysis revealed, in part, that their stock investments are more at risk from the effects of climate change than their bond holdings. Similarly, officials with AP7 said they analyzed their portfolio's carbon footprint as well as performed scenario analysis, and that both helped guide AP7's engagement strategy. Finally, NEST officials told us they had assessed their developed market equity portfolio's carbon footprint and found that 30 percent of its companies were responsible for 80 to 90 percent of its carbon emissions. Officials also said they assessed NEST's approach to investing and conducted a quantitative analysis of ESG and traditional financial factors in its portfolio and concluded that carbon footprints had greater statistical significance on financial performance than some traditional financial factors. Officials said they found climate change to be a systemic risk that threatens all of NEST's assets and therefore warrants more attention.
- **Officially Incorporating Climate-Related Risks in Policies and Practices:** To further meet their goals of reducing their exposure to climate-related risks, officials from NEST and AP7 described the importance of incorporating and documenting climate change as a financially material risk into policies and practices. For example, officials with NEST told us they announced a new climate change policy in June 2020 that establishes how NEST considers and

integrates climate change-related risks and opportunities in its management of assets. The policy recognizes climate change as a threat to economic stability and supports limiting global warming to 1.5 degrees Celsius above pre-industrial levels as a way to curb the "catastrophic" consequences of climate change. The policy sets a goal of aligning NEST's entire investment portfolio with limiting warming to 1.5 degrees Celsius by reaching net zero carbon emissions by 2050 or earlier, and an interim goal of reducing by half the emissions from its portfolio by 2030. The policy describes how NEST will incorporate its concerns about climate change risks into how it allocates assets, selects and monitors asset managers, acts as a steward for participants, and participates in the discourse on public policy. Similarly, AP7 officials told us they have incorporated climate risk into the plan's investment policy. AP7's Sustainability Report describes the plan's policy and examples of steps it is taking to address climate risk, including its engagement approach and reporting on its carbon footprint.

- **Changing Investments to Account for Climate Risks:** In an effort to address the risks associated with climate change, two of the plans we reviewed had taken steps to alter their investments. For example, officials with NEST said that they had worked with one of the plan's asset managers to develop a climate-aware equity index fund that has been included in the default investment option of the plan since 2017.[47] The climate-aware fund overweights or underweights the amount NEST invests in companies (relative to the market cap index the fund tracks) based on data that reflect the companies' exposure to climate risks.[48] NEST officials reported that since September 2020 all of their developed equity assets are invested in the climate aware fund. NEST officials told us an investment strategy that takes into account risks from climate change will help the plan avoid financial losses and provide better long-term investment results for participants. GPIF has begun to invest in ESG indices that take risks into account, including those from climate change, according to documents we reviewed and officials we interviewed. GPIF officials said ESG factors such as climate change are material risks in the long

[47]Defined contribution plans often provide a default investment approach, which means contributions go to predesignated funds unless a participant makes changes to their account.

[48]An investment that is overweighted in a portfolio refers to the proportion it holds in the portfolio when compared to the benchmark. Similarly, an underweighted investment would make up proportionally less of a portfolio when compared to the benchmark.

term. The officials said these ESG considerations are a first step in deciding whether they will incorporate ESG factors like climate change across more of GPIF's investments. GPIF officials also told us that they are beginning to work with international organizations, such as the World Bank, so that their asset managers can invest in "Green Bonds" that provide debt financing to climate-related or environmental projects.[49]

Selected Plans Publicly Communicate on Climate-related Investment Risks

In addition to taking action to assess and address climate risk through engagement and other efforts, officials from the plans we reviewed said they regularly communicate information on climate risk to the public to ensure transparency and increase plan participants' awareness of climate change-related investment risks. Officials we interviewed from all three selected plans told us that the investment risks posed by climate change could be considered financially material, and being transparent about the potential effects of these risks is important.

Officials also described the regulatory framework in which they are operating. For example, NEST officials told us the United Kingdom will require retirement plans to disclose their climate policies and carbon footprints. In contrast, officials from GPIF told us that Japan's regulations do not require them to disclose information on ESG issues such as climate change-related risks, but they believe making this information public is important. GPIF officials told us they plan to annually post a report on climate change-related risks on their website in accordance with TCFD recommendations.

In their public communications, the selected plans disclose information on climate-related risks and share information on the plan's strategy, metrics, and targets, among other things.[50]

- Since 2016, the United Kingdom's NEST has been publishing information annually on sustainable investing, including its climate-related activities, such as how the plan determines its investment risks related to climate change. For example, NEST reported that it measures the carbon intensity of its Climate Aware Fund. In its June 2020 climate change policy document, NEST outlined its strategy for

[49]As of 2019, GPIF has invested about $500 million in Green, Social, and Sustainable Development Bonds issued by the World Bank's International Bank for Reconstruction and Development as well as its International Finance Corporation.

[50]The TCFD framework recommends four broad topics for investors, such as retirement plans, to address when managing and disclosing their climate risk: governance, strategy, risk management, and metrics and targets.

meeting its climate–related goals, including investing more in companies that are developing climate solutions (such as renewable energy infrastructure and low-carbon technologies). NEST officials also told us they surveyed the plan's membership and found that many participants were interested in the actions taken by the plan regarding climate change.

- In 2018, Japan's GPIF published its first annual assessment of the impact of climate change on its portfolio. In 2020, GPIF published its most recent ESG report, which included detailed information on GPIF's efforts to meet TCFD's recommended disclosures. For example, to meet TCFD's recommendations for risk management, the report cites GPIF's efforts to develop an organizational framework for monitoring the carbon footprint and carbon intensity of its entire portfolio. The report also noted that GPIF confirms each external asset manager's support for TCFD and that more than 70 percent of them do so. GPIF also noted that this type of reporting was a first step and they intend to improve their analysis and disclosure each year.
- Officials from Sweden's AP7 told us they use multiple sources to disclose climate-related information. For example, in its 2019 Sustainability Report, AP7 reported the carbon footprint of its portfolio and stated that the companies in which the plan invests emit approximately 8 million tons of carbon dioxide equivalents. In addition to including climate-related information in annual sustainability reports, the plan regularly updates its blog on the website to communicate its sustainable investment strategy to participants.

FRTIB Has Not Taken Steps to Assess How Climate Change Could Affect TSP's Investments and Doing So Could Strengthen FRTIB's Risk Management

FRTIB Has Not Taken Steps to Assess Investment Risks from Climate Change as Part of Its Process for Evaluating TSP's Investment Options

FRTIB officials told us they have not assessed how climate change could affect TSP's investments. Since TSP's funds are invested in passively managed index funds, officials said FRTIB does not consider investment risks by specific industry or company. Rather than focusing on risks to a specific industry or company, FRTIB officials said their goal is to ensure each TSP fund is achieving the same returns as its target index.[51] To achieve this goal, FRTIB employs outside firms to manage the assets in TSP's stock and bond funds in accordance with statutory requirements.[52] FRTIB officials explained that the federal statute establishing TSP specifies the asset type for each of TSP's five core funds as well as each fund's investment strategy, including that the funds are not to hold assets that overlap with one another. For example, the statute specifies that one of the funds shall be invested in a portfolio designed to replicate the performance of a commonly recognized index comprised of a reasonably complete representation of the U.S. stock market (i.e., employ a passive investment strategy using an index fund). FRTIB and the executive director are prohibited from exercising voting rights associated with the

[51]Index funds are designed to track the performance of a market benchmark as closely as possible. For example, the TSP's C Fund tracks the performance of the S&P500 Stock Index. Typically, an index fund is comprised of all, or a representative sample, of the stocks or bonds in the index it tracks and is thereby considered a passive investment strategy. FRTIB officials told us their management focus is to minimize each fund's tracking error—that is, to ensure each fund's performance has little to no deviation from the performance of its target index.

[52]The asset management firms execute the daily operations of the funds and ensure that the investments achieve returns that track their respective target indices. In February 2020, FRTIB announced it had re-hired BlackRock as an asset manager for its stock and bond funds. In October 2020, FRTIB announced it hired State Street Global Advisors as a second asset manager that will manage between 10 and 20 percent of TSP's stock and bond assets. FRTIB reported, as part of its risk management strategy, that it sought a second asset manager to help diversify its investment operations.

ownership of TSP's securities. As a result, FRTIB officials told us they delegate such voting (i.e., proxy voting) to its asset managers, who are expected by FRTIB to establish voting policies and adhere to them. (See table 1 and fig. 3.)

Table 1: Relevant Statutory Language, Asset Type, and Target Index for Each Thrift Savings Plan Core Investment Fund

Investment Fund	Relevant Statutory Language and Citation	Asset Type	Target Index (as selected by FRTIB)[a]
G Fund	"a Government Securities Investment Fund… invested in securities of the United States Government." 5 U.S.C. § 8438(b)(1)(A).	U.S. Treasury securities	n/a
C Fund	"a Common Stock Investment Fund… invested in a portfolio designed to replicate the performance" of "a commonly recognized index comprised of common stock the aggregate market value of which is a reasonably complete representation of the United States equity markets." 5 U.S.C. § 8438(b)(2).	U.S. common stocks	Standard & Poor's 500 Stock Index (S&P 500)
S Fund	"a Small Capitalization Stock Index Fund…invested in a portfolio designed to replicate the performance" of "a commonly recognized index comprised of common stock the aggregate market value of which represents the United States equity markets excluding the common stocks included in the Common Stock Index Investment Fund." 5 U.S.C. § 8438(b)(3).	Small-capitalization U.S. common stocks	Dow Jones U.S. Completion Total Stock Market (TSM) Index
I Fund	"an International Stock Index Fund… invested in a portfolio designed to replicate the performance" of "a commonly recognized index comprised of stock the aggregate market value of which is a reasonably complete representation of the international equity markets excluding the United States equity markets." 5 U.S.C. § 8438(b)(4).	International stocks	MSCI EAFE (Europe, Australasia, Far East) Index

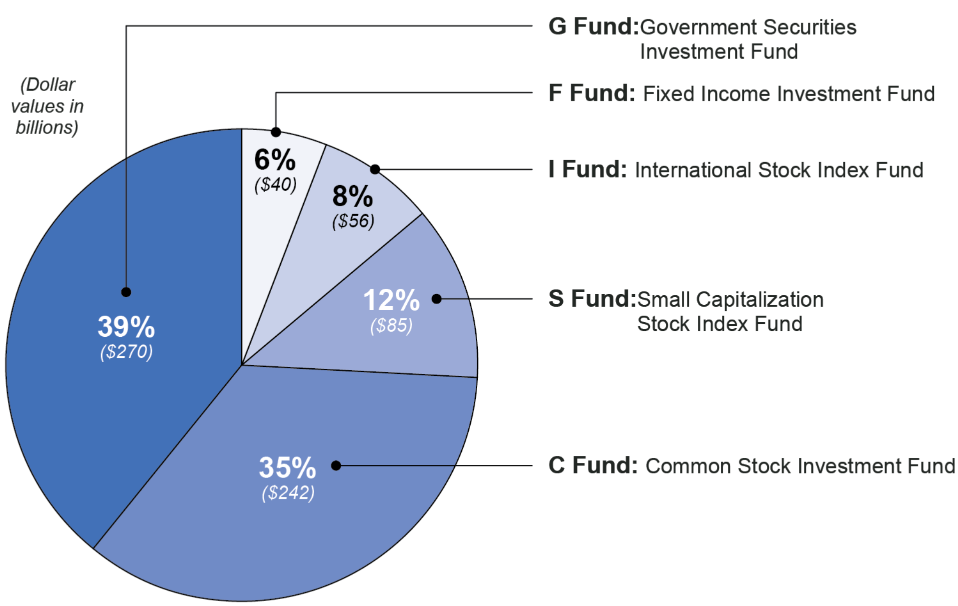
Investment Fund	Relevant Statutory Language and Citation	Asset Type	Target Index (as selected by FRTIB)[a]
F Fund	"a Fixed Income Investment Fund… invested in (i) insurance contracts; (ii) certificates of deposits; or (iii) other instruments or obligations selected by qualified professional asset managers, which return the amount invested and pay interest, as a specified rate or rates, on that amount during a specified period of time." 5 U.S.C. § 8438(b)(1)(B).	U.S. public and corporate bonds	Bloomberg Barclays U.S. Aggregate Bond Index

Source: GAO review of Thrift Savings Plan information and 5 U.S.C. § 8438(b). | GAO-21-327

Note: Thrift Savings Plan (TSP) also offers 10 Lifecycle (target-date) funds. Each of the 10 funds is a diversified mix of the five core funds—G, C, S, I, and F—and is designed to adjust its mix over time to balance risks and return on the path toward a target retirement date.

[a]Investment Board (FRTIB) selected the target index for each fund to meet its respective statutory requirements.

Figure 3: Thrift Savings Plan Assets under Management by Investment Fund, as of November 2020



Source: GAO analysis of Thrift Savings Plan data as of November 2020. | GAO-21-327

Note: Assets in each fund include those allocated to the Thrift Savings Plan's L, or Lifecycle, funds, which contain a mix of these assets based on targeted retirement date. As of November 2020, the L funds had assets under management of about $148 billion. Every quarter, the target allocations of all the L funds except L Income are automatically adjusted, gradually shifting them from higher risk and reward to lower risk and reward as the L funds near their target (retirement) dates.

FRTIB officials told us that beyond monitoring whether TSP's core funds are tracking their respective target indices, they cannot take actions to adjust TSP's holdings or investment strategies in response to specific investment risks. Because TSP's stock funds are required by statute to target the performance of broad market indices, the officials said they do not have the leeway to include, exclude, or adjust how heavily TSP's funds are invested in any particular company or industry.[53] The officials said that if they found a particular company to be at heightened risk from climate change, they could not change how any of TSP's funds are invested in that company to account for the risk. FRTIB has the discretion to select which index to track for each fund, provided the fund meets the applicable statutory requirements. FRTIB officials said making decisions to divest from particular sectors or companies included in the indices they have chosen would reduce TSP's diversification and would constitute a form of active management that is not aligned with their passive approach.

FRTIB officials said investing in broad market index funds that are managed passively is an optimal approach for a plan like TSP according to theories of portfolio investing.[54] They stated that empirical and theoretical studies have shown such investing provides greater diversification and, on average, outperforms active investment strategies on a risk-adjusted basis. In addition, investing in passively managed index funds generally incurs fewer fees than investing in active strategies, officials said. Consistent with modern portfolio theory, using an active investment approach which is less diversified compared to a passive

[53]TSP's F Fund targets the performance of the Bloomberg Barclays U.S. Aggregate Bond Index, a broad index representing the U.S. bond market. FRTIB officials stated this strategy is the result of FRTIB policy set at the inception of the fund (presumably to mirror strategies of the equity funds).The G Fund, which consists exclusively of short-term U.S. Treasury securities specially issued to the TSP, does not target the performance of an index. The G Fund offers the opportunity to earn rates of interest similar to those of U.S. government notes and bonds but without any risk of loss of principal and very little volatility of earnings, according to FRTIB documents.

[54]Modern portfolio theory is a body of academic and empirical work that focuses on choosing a portfolio and not just its individual parts, GAO reported previously. Central elements of the theory include the concepts of (1) diversification, which is the notion that with a well-chosen group of assets participants may be able to limit their losses and reduce fluctuations of investment returns without sacrificing too much potential gain, and (2) rebalancing, which entails bringing a participant's portfolio back to an appropriate asset allocation mix because over time some investments may become misaligned with the participant's investment goals. See GAO, *401(K) Plans: Improvements Can Be Made to Better Protect Participants in Managed Accounts*, GAO-14-310 (Washington, D.C.: June 25, 2014).

investment approach could also magnify investment risks in certain sectors. An investment consultant that has advised FRTIB told us that TSP's approach is similar to many other defined contribution plans that choose to invest in passively managed index funds to match the performance of the market as a whole, for example, in funds targeting the performance of indices such as the S&P500 or the Russell 2000.[55] Furthermore, FRTIB officials noted, the efficient market theory suggests that known risks are already factored into the prices of assets that are broadly traded in financial markets.[56]

While FRTIB officials told us that TSP, as a passive investor in index fund, cannot make changes to holdings in particular economic sectors or companies, FRTIB has periodically reviewed the appropriateness of TSP's investment offerings. Specifically, FRTIB officials told us they have engaged investment consultants about every four or five years to review whether (1) the investment options offered in TSP's funds generally satisfy the statutory requirements and are appropriate in light of what else is offered in the marketplace, and (2) the specific indices FRTIB has chosen are appropriate for their respective funds. For example, in 2017 an investment consultant reviewed the appropriateness of TSP's current investment options and examined whether other investment options should be added. The review concluded there were no gaps in the funds TSP was offering to participants and adding other investment options—including ESG funds—was not warranted.[57] Although climate change is often accounted for as an environmental factor in ESG funds, the review did not specifically mention or consider investment risks from climate change. For example, the review did not include scenario analysis or an assessment of the portfolio's carbon footprint. FRTIB officials said that although its periodic reviews are not part of a formal policy, they have

[55]The S&P500 and Russell 2000 indices represent a broad portion of the overall equities market.

[56]The efficient market hypothesis is the belief that securities markets are efficient in reflecting information about individual stocks and the stock market as a whole and that when information arises, the news spreads very quickly and is incorporated into stock prices without delay.

[57]In the case of ESG funds, the review concluded, among other things, that the decisions that go into constructing an ESG investment option are inherently an active form of investment management that TSP had not employed previously and would involve judgments that are not likely to be shared universally among participants. Furthermore, the review found that stocks typically found in ESG funds could already be found in TSP's current stock funds (i.e., the C, S, & I funds).

conducted such reviews over time because they view it is a good fiduciary practice.

FRTIB has previously taken steps to change TSP's plan design to address investment risks revealed by prior reviews. As we reported previously, in the early 1990s FRTIB reviewed its investment policies and, based on factors including diversification, risk and return, cost, and industry practices, identified classes of assets that were missing from TSP's investment mix.[58] This led FRTIB to recommend adding two new funds—one for international stocks (the I Fund) and one for stocks in small- and medium-size U.S. companies (the S Fund). In 1996, FERSA was amended to require the addition of the I and S Funds. The I Fund and the S Fund both began in 2001. Additionally, in 2005, FRTIB introduced target-date funds (i.e., Lifecycle or L funds). FRTIB did this under its existing authority because it determined that such target-date funds would be combinations of TSP's five existing statutorily-defined funds, tailored to different time frames for withdrawal. FRTIB developed target-date funds partly based on its analysis that found TSP participants were not periodically rebalancing their investment portfolios or diversifying their holdings among the five funds, and a target-date fund would automatically do so for participants.

FRTIB has the authority to offer participants access to a wider range of mutual funds outside of TSP's current offerings (through what is referred to as a mutual fund window) and this could include mutual funds designed to address climate risk, should FRTIB or its service provider choose to include them.[59] FRTIB officials told us that an effort to offer more investment choices is underway and that FRTIB is currently planning to offer the mutual fund window sometime in 2022. The goal, according to FRTIB officials, is to provide interested TSP participants a wider array of investment options outside of the plan's core funds. A mutual fund window would allow access to mutual funds that may include overlapping assets. FRTIB awarded a contract to administer the mutual fund window in November 2020.[60] While FRTIB officials did not say whether the mutual

[58]GAO, *Federal Retirement Thrift Investment Board: Many Responsibilities and Investment Policies Set by Congress*, GAO-07-611 (Washington, D.C.: June 21, 2007).

[59]See 5 U.S.C. § 8438(b)(5).

[60]FRTIB officials said implementing the mutual fund window depended on first awarding a new recordkeeping contract to a provider with the operational capacity to offer such investment choices to participants. FRTIB awarded the recordkeeping services contract to Accenture Federal Services.

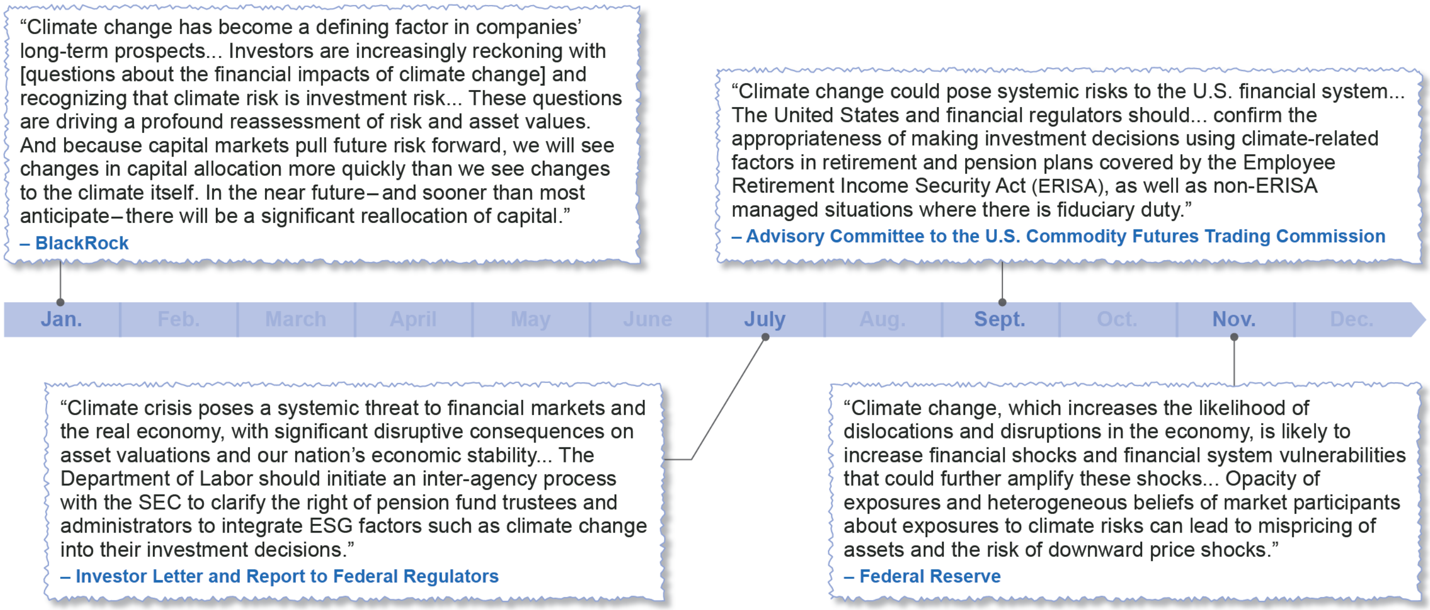
fund window would include options that consider climate change risks specifically, or otherwise address ESG factors, they told us they anticipate it will offer a wide variety of funds outside of TSP's current core funds that will appeal to a wide variety of participant interests. They added that mutual fund platforms are typically not static—that is, they add and subtract funds in response to market conditions and investor interests.

FRTIB Could Enhance its Risk Management by Assessing TSP's Potential Investment Risks from Climate Change

While the efficient market investment theory mentioned by FRTIB officials suggests that asset prices reflect known risks, concerns have been raised by several notable stakeholders that investment risks from climate change are not adequately reflected and, thus, merit evaluation by regulators and participants in the financial sector, which includes passive investors. In 2020, the Board of Governors of the Federal Reserve System (Federal Reserve) and an advisory panel to another federal financial regulator, among others, noted that climate change risks may not be adequately reflected in current asset prices. Those prices could experience rapid and severe declines as climate change's effects become more evident, they noted.[61] These stakeholders found that the federal government and other actors in the financial sector—including retirement plans—should address their exposures to such climate change-related risks (see fig. 4).

[61]The Federal Reserve constitutes the central bank of the United States. To promote the effective operation of the U.S. economy, the Federal Reserve, among other things, conducts the nation's monetary policy and monitors and engages in the United States and abroad to promote the stability of the financial system and minimize and contain systemic risks.

Figure 4: Examples of Published Stakeholder Views on Addressing Climate Change-Related Risks to the Financial Sector, 2020



Source: GAO analysis of stakeholder documents. | GAO-21-327

Specifically, the stakeholders have taken a variety of steps to convey concern about and encourage actions to address investment risks from climate change. These include:

- **BlackRock Letter to Chief Executives on Long-term Investment Risks from Climate Change.** According to a January 2020 open letter to chief executive officers from BlackRock, investment risks from climate change will lead to a significant reallocation of capital and cause profound changes in the pricing of risk and assets globally.[62] BlackRock stated previously that the risks or opportunities from climate change, which may not necessarily materialize in the short term but could instead be significant over longer time periods, tend to be underestimated or underpriced. BlackRock officials told us that encouraging publicly traded companies to disclose their exposure to risks from climate change—so that asset owners who own stocks or bonds issued by the companies can better assess their own exposure

[62]BlackRock is the primary asset manager for TSP's stock and bond funds and one of the largest asset management firms in the world. See BlackRock, 2020 (https://www.blackrock.com/corporate/investor-relations/blackrock-client-letter).

to climate change risks—has become a major focus of their engagement and proxy voting policies.[63] BlackRock stated that it plans to improve access to investment options that address climate change-related risks for all its clients, including passive index investors.

- **Investor Letter and Report Urges Federal Financial Regulators to Recognize Risks from Climate Change.** Federal financial regulatory agencies should "implement a broader range of actions to explicitly integrate climate change across [their] mandates," according to a July 2020 letter from a stakeholder group to the leaders of multiple federal financial agencies and state insurance regulators. The stakeholder group was comprised of 72 investors, retirement plans, businesses, former regulators, politicians, nonprofit organizations, and others, including institutional investors with nearly $1 trillion in assets under management.[64] The group also endorsed a report that included a recommendation for the Department of Labor to clarify the right of retirement plan trustees and administrators to integrate information on climate change-related risks into their investment decisions.[65] The group stated that climate change poses a systemic threat to financial markets and the real economy and will have significant disruptive consequences on asset valuations and on the United States' economic stability.
- **CFTC Advisory Committee Finds Addressing Risks from Climate Change is Consistent with Fiduciary Duty.** A September 2020 report from a federal advisory committee to the U.S. Commodity Futures Trading Commission (CFTC) expressed the view that considering risks from climate change is consistent with fiduciary duty

[63]BlackRock officials told us that through their engagement policy they are encouraging companies to make climate change-related disclosures that are consistent with the recommendations of the Task Force on Climate-related Financial Disclosures.

[64]The stakeholder group directed their recommendations to leaders of the Federal Reserve, the Office of the Comptroller of the Currency, the Federal Deposit Insurance Corporation, the Securities and Exchange Commission, the Commodity Futures Trading Commission, state insurance regulators, the Federal Insurance Office, the Federal Housing Finance Agency, and the Financial Stability Oversight Council. See Ceres, July 21, 2020 (https://www.ceres.org/news-center/press-releases/40-investors-nearly-1-trillion-join-other-leaders-urge-us-financial).

[65]The report recommended the Department of Labor initiate an inter-agency process with the U.S. Securities and Exchange Commission to make this clarification. See Ceres, Addressing Climate Risk as a Systemic Risk: A Call to Action for U.S. Financial Regulators (June 2020).

for those managing retirement plan investments.[66] The committee's report stated that climate change poses complex risks to the stability of the U.S. financial system, including disorderly price adjustments in various asset classes, with possible spillovers into different parts of the financial system and potential disruption of the proper functioning of financial markets. The report found that financial markets are unable to channel resources efficiently to activities that reduce greenhouse gas emissions in the absence of an economy-wide price on carbon at a level that reflects the true social cost of those emissions. Markets are in equilibrium when asset prices to investors reflect expected outcomes as well as premiums for risks, the report stated. In the case of climate risk, according to the report, neither the expected impacts nor the potential for extremely bad outcomes are being priced appropriately. The committee said the United States should clarify that it is appropriate for retirement plans covered by the Employee Retirement Income Security Act of 1974, as well as non-ERISA plans where there is fiduciary duty, to consider risks from climate change when making investment decisions. The report mentioned that analysis of climate change-related risks can be used when creating passive investment products, which can provide a low-cost way for asset managers to meet client investment objectives.

- **Federal Reserve Identifies Climate Change as a Risk to the Stability of the Financial System.** Climate change is a source of economic uncertainty and risk that could threaten the stability of the financial system, as reported in November 2020 by the Federal Reserve.[67] Climate change increases the likelihood of dislocations and disruptions in the economy and is likely to increase financial shocks and financial system vulnerabilities that could further amplify these shocks, according to the report. Furthermore, the report found that uncertainty about the exposure of assets to climate change-related risks can lead to mispricing of assets and the risk of downward

[66]The U.S. Commodity Futures Trading Commission (CFTC) is an independent federal agency that regulates U.S. derivatives markets. The CFTC's Market Risk Advisory Committee convened a subcommittee to examine climate-related market risks, which issued a report in September 2020 that concluded climate change is a major risk to the stability of the U.S. financial system and thereby the American economy. The report made several recommendations to federal financial regulators, including to move urgently and decisively to measure, understand, and address risks from climate change. CFTC, *Managing Climate Risk in the U.S. Financial System, Report of the Climate-Related Market Risk Subcommittee, Market Risk Advisory Committee of the U.S. Commodity Futures Trading Commission* (Washington, D.C.: September 9, 2020).

[67]Board of Governors of the Federal Reserve System, *Financial Stability Report* (Washington, D.C.: November 2020).

price shocks. Within the financial system, increased transparency through improved assessment and disclosure could improve the pricing of climate change risks, the report stated, and thereby reduce the probability of sudden changes in asset prices.

Given the financial concerns raised by these various stakeholders, assessing TSP's exposure to investment risks from climate change could provide FRTIB information to better understand and manage risks to TSP's investment portfolio as part of its ongoing oversight activities. Such an assessment would also be consistent with principles of risk management discussed in our prior work. GAO has recognized the importance of risk management as a means of enhancing the resilience of the federal government to risks posed by climate change.[68] A key principle of GAO's framework for facilitating and promoting resilience to the effects of natural disasters, including impacts from climate change, is that decision makers need authoritative and understandable information to help them evaluate current and future risks.[69]

FRTIB has periodically sought information on the appropriateness of TSP's investment offerings in light of the statutory requirements for its core investment funds, and used this information to address investment risks it identified. Stakeholders we spoke with, including TCFD and PRI, have recognized that it is important for actors in the financial sector to assess their exposure to risks from climate change as part of their overall risk management. Furthermore, according to USGCRP's *Fourth National Climate Assessment,* enhancing climate resilience entails a continuing risk management process through which individuals and organizations become aware of and assess risks and vulnerabilities from climate and other drivers of change, take actions to reduce those risks, and learn over time.[70] FRTIB, as a key decision maker for the TSP program, has not assessed the potential investment risks that climate change poses to TSP's investments, thereby missing an opportunity to enhance its risk

[68]GAO has designated limiting the federal government's fiscal exposure by better managing climate change risks as one of the 35 high-risk areas in the federal government that are vulnerable to waste, fraud, abuse, and mismanagement, or that need broad reform. See GAO, *High-Risk Series: Substantial Efforts Needed to Achieve Greater Progress on High-Risk Areas*, GAO-19-157SP (Washington, D.C.: March 6, 2019).

[69]To facilitate and promote resilience to climate change, among other forms of natural disasters, GAO issued the Disaster Resilience Framework in October 2019 to serve as a guide for analyzing federal actions. See GAO, *Disaster Resilience Framework: Principles for Analyzing Federal Efforts to Facilitate and Promote Resilience to Natural Disasters*, GAO-20-100SP (Washington, D.C.: October 23, 2019).

[70]USGCRP, *Fourth National Climate Assessment.*

management activities to help protect the retirement savings of its 6 million participants.

Conclusions

Investment risks associated with climate change are expected to impact the global economy and cause unprecedented disruption to the financial markets, and investors, including retirement plans, are considering how their portfolios may be exposed to these risks. Passive investment strategies, like those used by TSP, are generally seen as providing the important benefits of broad diversification and low costs, leading to greater risk-adjusted returns when compared to active investment strategies. However, even passive investment strategies are exposed to financial risks from climate change as the impacts are expected to be widespread across all economic sectors. Climate and financial experts urge passive investors and others to consider the unique and systemic risks posed by climate change. As noted by the Market Risk Advisory Committee of the U.S. Commodity Futures Trading Commission, these risks may not be adequately reflected in current market values, which increases the likelihood of systemic shocks. Similarly, the Federal Reserve has reported that this mispricing of assets poses a risk of downward price shocks and could thereby make climate change a risk to stability of the financial system. In addition, the Market Risk Advisory Committee of the U.S. Commodity Futures Trading Commission reported that climate change over time will likely touch virtually every sector and region of the country. Moreover, selected retirement plans in other countries are assessing the impacts of climate change on their portfolios and have leveraged their knowledge to develop strategies for addressing these risks as part of their passive investment approach.

In managing the TSP, the FRTIB has not explicitly assessed the potential financial impact of climate change on the $700 billion in assets it manages for 6 million active and retired federal workers. FRTIB is subject to requirements different than those for the plans we reviewed in other countries, which affect what actions it may take. However, FRTIB has a process to understand risks and has previously undertaken efforts to address risks. Including consideration of climate change as part of this process would provide FRTIB more complete information about potential risks relevant to its passive investment approach. Taking action to understand the financial risks that climate change poses to the TSP is a useful first step that would help FRTIB be better positioned to consider, as part of its ongoing oversight activities, if any changes are needed to help ensure that the retirement savings of federal workers are protected.

Recommendation for Executive Action

The Executive Director of the Federal Retirement Thrift Investment Board, to better inform the Board's ongoing oversight activities, should evaluate TSP's investment offerings in light of risks related to climate change.

Agency Comments and Our Evaluation

We provided a draft of this report to FRTIB for review and comment. In written comments, reproduced in appendix II, FRTIB did not indicate whether it agreed or disagreed with our recommendation. FRTIB noted that it subscribes to a strict indexing discipline and that the efficient market theory concludes that the market is pricing all risks into its valuation on an on-going basis. FRTIB stated that its next investment consultant review is planned for fiscal year 2022 and that it would review any recommended changes to its fund offerings at that time. FRTIB further stated that it would examine any recommendations made by the U.S. Securities Exchange Commission and the Federal Stability Oversight Commission on climate change-related risks and determine whether and how to apply those lessons to the TSP. FRTIB also stated that it disagreed with a statement in our draft report that it did not currently have any knowledge of the potential financial impact of climate change on TSP assets. We removed this characterization from the report.

GAO recognizes that FRTIB has an established process for evaluating TSP's investment options and utilizes an investment consultant to conduct a review. While the most recent investment consultant review in 2017 did not include any consideration of climate-related risks, its next review in 2022 is an opportunity for FRTIB to conduct a focused evaluation of these risks and clarify what additional steps, if any, are needed. Given the systemic and unprecedented risk that climate change is expected to have on global financial markets, GAO continues to believe that it is important for FRTIB to evaluate TSP's investment offerings for these risks. While FTRIB stated that its upcoming mutual fund window would provide TSP participants with an opportunity to invest beyond the five core funds, the mutual fund window does not address the potential climate change-related risks to TSP's core investment funds. Examining climate change-related risks facing TSP's $700 billion in assets under management would provide FRTIB with a greater understanding of its potential exposure to these risks and enable it to decide if any further actions are necessary to protect the retirement savings of over 6 million federal workers.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days form the report date. At that time, we will send copies to the appropriate congressional committees, the Executive Director of the Federal Retirement Thrift Investment Board, the Secretary of Labor, the Chair of the Securities and Exchange Commission, and other interested parties. In addition, the report will be available at no charge on the GAO website at https://www.gao.gov.

If you or your staff members have any questions about this report, please contact me at (202) 512-7215 or NguyenTT@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report are listed in appendix III.

Tranchau (Kris) T. Nguyen
Director, Education, Workforce, and Income Security Issues

Appendix I: Objectives, Scope, and Methodology

This report examines (1) what is known about retirement plans' exposure to investment risks associated with climate change; (2) what comparable retirement plans in other countries have done to address risks from climate change and how they communicate this information to the public; and (3) what steps the Federal Retirement Thrift Investment Board (FRTIB) has taken to address investment risks from climate change.

To determine what is known about retirement plans' exposure to investment risks associated with climate change, we interviewed representatives of retirement plans and other knowledgeable stakeholders and conducted a literature review. We interviewed officials from public retirement plans we identified as having taken steps to address risks from climate change facing their portfolios, including the New York State Common Retirement Fund and New York City Employees' Retirement System. We spoke to knowledgeable stakeholders, including officials from Mercer, Moody's Analytics (a stakeholder group that provides financial intelligence and analytical tools), Trucost, Ceres (a nonprofit focused on sustainability issues in the economy, including climate change), the Climate Service, and the Defined Contribution Institutional Investment Association. We spoke with TSP's asset manager, BlackRock, and the Task Force on Climate-related Financial Disclosures (TCFD) and the Principles for Responsible Investment (PRI). We reviewed literature since 2010 on climate change-related risks for investors, including defined benefit and defined contribution retirement plans.[1] As a part of the literature review, we reviewed reports and documentation provided by those we interviewed.

To examine how retirement plans in other countries address climate change-related risks, we reviewed available literature and consulted with knowledgeable stakeholders at PRI, the Council of Institutional Investors (CII), TCFD, and others mentioned above. Early in our research, we interviewed officials from the Church of England Pension Fund and Australia's Cbus Superannuation Fund for informational purposes and to gather their ideas on how retirement plans generally incorporate climate

[1]We conducted a literature review to help develop our understanding of what is known about how retirement plans could face exposure to investments risks from climate change. Our initial search encompassed the prior two years for news items and the prior 10 years for other types of literature found in a variety of academic and policy-related databases, including ProQuest, Scopus, DIALOG, and Ebsco. We used search terms such as climate change, global warming, asset management, retirement, and defined contribution and defined benefit. In the thousands of results from our initial search, we narrowed our review to those items we judged to be most relevant to our objectives and that were published in academic journals.

change-related risks into their portfolios. From these interviews, we learned there were examples of large passively managed retirement plans that incorporated climate change into their investment strategies and selected plans in the United Kingdom, Japan, and Sweden to include in our research. We interviewed representatives from these plans as well as government officials and other stakeholders from these countries, and reviewed relevant documentation.

To select these plans, we conducted an initial review of retirement plans that are PRI signatories and in that role have committed to integrating climate risks into their investment decision-making. The selected plans included two defined contribution plans, the National Employment Savings Trust (NEST) in the United Kingdom and AP7 in Sweden. The selected plans also included one public pension reserve fund, the Government Pension Investment Fund (GPIF) in Japan. In selecting these three retirement plans, we focused on plans that have common characteristics with the TSP, which include being: (1) relatively large institutional investors with a long-term investment time frame; (2) investors in both domestic and global markets, and; (3) mostly passive investors with index funds in their portfolios. Each of the three plans also uses a unique strategy to address climate risks and provided information on their experiences with incorporating risks related to climate change. While all three plans are established by the government, they can cover public and private sector employees. (See table 2.)

We did not conduct an independent legal analysis to verify the information that plans and officials provided about the laws, regulations, or policies of their countries. Instead, we relied on appropriate secondary sources, interviews, and other information to support our work. We note also that the fact that a legal structure was successful in one or more of the countries we analyzed—which may have significantly different cultures, histories, and legal systems than the United States—does not necessarily indicate that it would be successful in the United States. We submitted key report excerpts to plan representatives in each country for their review and verification, and we incorporated their technical corrections where appropriate.

Table 2: Selected Characteristics of Thrift Savings Plan (TSP) and Retirement Plans in Selected Countries

	AP7 (Sweden) *(as of March 2021)*	**GPIF (Japan)** *(as of December 2020)*	**NEST (UK)** *(as of March 2021)*	**TSP (US)**
Assets under management	\$91.8 Billion (800 Billion SEK)	\$1.7 Trillion (177.7 JPY)	\$23.7 Billion (£17.2 billion)	\$700 Billion
Number of participants	4 Million	N/A	9.1 Million	6 Million
Public/Private	Public	Public	Public	Public
Defined Contribution (DC)/Defined Benefit (DB)	DC	N/A	DC	DC
Investment style	Passive	Mostly Passive	Passive/Active (depending on asset class)	Passive

Source: GAO review of plan documents. | GAO-21-327

Note: GPIF is Japan's reserve fund for its public pension system.

To examine what steps FRTIB has taken to address investment risks from climate change, we reviewed FRTIB's approach to managing TSP's investment risks in general and its risks from climate change specifically. We reviewed FRTIB and other documents containing information about TSP's funds, as well as federal law that authorizes and provides for the structure (i.e., asset type, investment approach) for each of TSP's five core funds.[2] We also reviewed documents on FRTIB's management of TSP's funds, including annual reports, minutes from Board meetings, and reports from investment consultants.

In addition, we interviewed officials from FRTIB, FRTIB's asset manager for TSP (BlackRock)[3], and an investment consultant previously hired by FRTIB to review TSP's investment offerings. We also reviewed documents and interviewed key stakeholders on how actors in the financial sector include climate change in their approaches to risk management. Specifically, we reviewed documents from federal financial regulators (CFTC, Federal Reserve) and other key stakeholders (Ceres,

[2]United States Code Section 5 §8438 establishes the TSP and specifies its five core funds—the G Fund (U.S. government securities), C Fund (U.S. common stock), S Fund (small-capitalization U.S. common stocks not found in the C fund), I Fund (international stocks not found in either the C or S funds), and F Fund (fixed income assets such as public and corporate bonds).

[3]BlackRock is a major global investment management company with \$7.3 trillion in assets under management as of second quarter 2020.

TCFD, PRI) on the risks that climate change may pose to financial actors and the financial system in general. We also interviewed key stakeholders on their views for managing financial risks from climate change. Furthermore, we also reviewed documents from key stakeholders and GAO (e.g., *High-Risk Series and Disaster Resilience Framework*) that describe the importance for organizations of incorporating climate risks into their risk management processes.[4]

We conducted this performance audit from October 2019 to May 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

[4]See GAO, *High-Risk Series: Substantial Efforts Needed to Achieve Greater Progress on High-Risk Areas*, GAO-19-157SP (Washington, D.C.: March 6, 2019); and, *Disaster Resilience Framework: Principles for Analyzing Federal Efforts to Facilitate and Promote Resilience to Natural Disasters*, GAO-20-100SP (Washington, D.C.: October 23, 2019).

Appendix II: Comments from the Federal Retirement Thrift Investment Board

FEDERAL RETIREMENT THRIFT INVESTMENT BOARD
77 K Street, NE Washington, DC 20002

THRIFT SAVINGS PLAN

April 29, 2021

Ms. Tranchau (Kris) T. Nguyen
Director
Education, Workforce,
and Income Security Issues
Government Accountability Office
441 G St., NW
Washington, DC 20548

Dear Ms. Nguyen:

Thank you for the opportunity to review and comment on GAO-21-327, Federal Workers' Portfolios Should be Evaluated for Possible Financial Risks Related to Climate Change.

The Federal Retirement Thrift Investment Board's (FRTIB) goal is to allow its participants to retire with dignity. Our 6.2 million participants benefit from a retirement savings and investment plan, with current assets of $735 billion, that Congress designed to put participants' financial interest ahead of all other considerations.

The FRTIB is very proud of the job that we have done in administering the Thrift Savings Plan (TSP) in accordance with the statutory requirements laid out by Congress. Congress requires the TSP to be passively invested in index funds chosen by the FRTIB in compliance with the statutory conditions for each Fund. The FRTIB is prohibited by law from voting the proxies for the shares owned by the TSP or investing or divesting in any specific stock.

The draft report states that the FRTIB "does not currently have any knowledge" of the risks of climate change. We disagree with that characterization. As we discussed several times with the GAO representatives and as is mentioned in the report, the FRTIB subscribes to a strict indexing discipline using the broadest possible market opportunity set. As such, individual companies are held in the TSP index funds at their market weights, in line with the theory that markets are generally efficient and that the market portfolio is the most efficient from a risk and return perspective. The theory has proven to hold true over decades of empirical studies. Indeed, we build our 10 Lifecycle Funds using that analysis. The efficient market theory concludes that the market is pricing all risks into its valuation in an on-going basis. It also posits that a broad index fund with all assets held at market weight provides the highest return to risk ratio.

With decades of empirical data supporting this theory, broad passive index investing, across financial investments, both from institutional and retail investors, has exploded. While indexing is an American invention, it is spreading globally and is now in use across the world. There is material disclosure of climate risk by individual firms currently, even if imperfect. The efficient market does recognize the downside risk of fossil fuel investment due to climate change. However, while some firms will lose value due to climate change, others will gain; climate change does not necessarily portend universal downward risk. As an example, and as reported by CNBC on April 22, 2021, "Exxon board member Jeffrey Ubben "is increasing his stake in the company based on the oil giant's work around carbon capture. 'I am building this new business...I really believe that the return dynamics for Exxon from here are spectacular,' he told CNBC on Thursday."[1] The draft report appears to dismiss this possibility out of hand.

As a basic illustration of the effect of the efficient market theory, the weighting of the energy sector in the S&P 500, the index tracked by the C Fund, has changed dramatically over time:

Year	S&P 500 Energy Sector's Share of the S&P 500
1990	13.38%
2000	6.57%
2010	12.03%
2020	2.28%

The FRTIB is well aware of the important national conversations that are occurring regarding climate change. We have been following the numerous ideas and proposals that are being advanced nationally and internationally. On April 21, 2021, Secretary of the Treasury Janet L. Yellen spoke to the Institute of International Finance. She said (excerpted):

> One of the financial sector's most essential functions is the distribution of risk—ensuring that it falls across investors and institutions well placed to manage it. Climate change introduces new and increasing types of risk…These risks are hard to measure for at least three main reasons. First, there are data gaps limiting the ability of investors, financial institutions, and regulators to make good assessments…Second, the long-term nature and unpredictability of climate change may call for new approaches to assessing risks…Third, climate change science is relatively new to financial institutions and regulators…Treasury is working with a host of U.S. agencies to overcome these issues and is coordinating our efforts globally…At last month's FSOC [Financial Stability Oversight Council] meeting, all participants expressed support for further steps to address climate-related financial risks. FSOC will prioritize analysis of climate-related financial risks this year, focusing on bringing together individual regulator's perspectives to accelerate overall progress and understand risks to financial stability.[2]

On April 20, 2021, Senator Pat Toomey and the Republican members of the Senate Banking Committee sent a letter to Special Presidential Envoy for Climate John Kerry stating (excerpted):

> Finally, we are troubled by the Biden administration's efforts to politicize oversight of financial disclosure, especially at the SEC…This statement is concerning because, under federal securities law, all public companies—including banks—are already required to disclose material information, including climate-related risks. This point bears repeating: if a climate-related risk is material, a public company must already disclose it. Inundating investors with such information would undermine the quality and reliability of the SEC's disclosure framework, which is intended to provide investors with information that is

[1] https://www.cnbc.com/2021/04/22/exxon-board-member-ubben-ups-stake-company-invests-in-carbon-capture.html

[2] https://home.treasury.gov/news/press-releases/jy0139

> objectively important for making an investment decision…The apparent objective of this effort is not to protect investors, but to punish lawful energy companies by deterring lending to, and investment in, such firms.[3]

On March 15, 2021, then-Acting Chair of the Securities and Exchange Commission (SEC) Allison Herren Lee issued a statement "Public Input Welcomed on Climate Change Disclosures" which began, "In light of demand for climate change information and questions about whether current disclosures adequately inform investors, public input is requested from investors, registrants, and other market participants on climate change disclosure." This input is requested by June 13, 2021.[4]

On April 12, 2021, SEC Commissioner Hester M. Peirce issued a statement, which included these remarks:

> Another question raised by the risk alert is do firms need a special set of policies and procedures for ESG? The answer to this question is no. Firms need not have a separate set of policies and procedures for any investment strategy. Rather, firms' policies and procedures should be designed around the investment strategies the firm employs, whatever those strategies are.[5]

The FRTIB will continue to follow the discussions and debates over climate change disclosure closely. We will examine the FSOC and SEC recommendations to determine whether and how to apply those lessons to the TSP. We will continue to monitor and analyze this risk, as we do many others. Any action by the FRTIB, however, must be within the statutory construct of the plan.

In GAO's draft report, you reference several plans which are characterized as passive investors and have addressed climate change is various ways: engagement with specific companies (page 16); "allocates assets, selects and monitors asset managers (page 20); and changing investment to account for climate risk (page 20). If these plans characterize themselves as using a passive investment strategy, it is a markedly different implementation than the FRTIB's. The FRTIB's statutory mandate is selecting an appropriate index and seeking to match that index. Additionally, the type of engagement outlined in the draft report is inconsistent with the Congressionally-mandated restrictions on the FRTIB's ability to engage with individual companies.

Further, on page 12, GAO outlines various processes and measurements to assess climate risk. These are all appropriate for an actively managed fund where there are risk parameters (e.g. credit quality, duration, interest rate, sector weights, etc.). As demanded by Congress, the C and S Funds give TSP participants exposure to the entire U.S. equity market. Through the I Fund, the TSP is exposed to large capitalization, developed market stocks representing roughly 55% of the international stock market. As a result, the TSP does not have risk limits in the same way an actively managed plan would.

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3 https://www.banking.senate.gov/imo/media/doc/toomey_gop_members_letter_to_kerry.pdf
4 https://www.sec.gov/news/public-statement/lee-climate-change-disclosures
5 https://www.sec.gov/news/public-statement/peirce-statement-staff-esg-risk-alert

As noted in the GAO's draft report, the FRTIB regularly engages an investment consultant to review the line-up of options offered within the TSP to determine whether the Fund offerings remain appropriate and to evaluate whether potential fund additions are warranted. The most recent review was in May 2017 and did not result in any recommended additions to the TSP Fund line-up. The investment consultant evaluated the current offering against their optimal TSP structure that would: offer sufficient range of choice with options that reasonably span the risk and return spectrum across major investable markets; allow participants to form well-diversified portfolios; is appropriately comparable with peers; and meet broad participant demand. The FRTIB is planning on the next review in FY2022. Should the investment consultant recommend changes to the Fund offerings, the FRTIB Board members and I would review them carefully and make legislative suggestions to Congress, if warranted. I would also note that an "appropriate portfolio" per Dr. William Sharpe, Nobel Prize winner and one of founders of Modern Portfolio Theory and indexing, should contain assets that are exhaustive and mutually exclusive. You mention in your report that the TSP asked Congress to add a small capitalization and an international equity fund. The TSP added the S and I Funds because the TSP funds were lacking U.S. small capitalization stocks and international stocks, thereby violating one of the key tenets of return maximization per unit of risk.

The FRTIB is aware that some of its participants want the ability to invest in other funds, beyond the five core TSP Funds. To address this, the FRTIB will be implementing a mutual fund window (MFW) in the summer of 2022. The MFW will allow TSP participants to take a portion of their TSP accounts "through the window" and invest in a universe of thousands of mutual funds on a platform offered by the TSP recordkeeper.

Again, I appreciate the opportunity to comment on the GAO's draft report. If you have any questions, please do not hesitate to contact me.

Sincerely,

Ravindra Deo

Ravindra Deo
Executive Director

Enclosure

Background on the FRTIB/TSP

The Federal Retirement Thrift Investment Board (FRTIB) is an independent establishment in the Executive Branch that administers the Thrift Savings Plan (TSP). The FRTIB is managed by a Presidentially-appointed five-member Board and an Executive Director chosen by the Board to manage the day to day operations of the Agency.

The FRTIB Board Members and Executive Director serve as fiduciaries obligated to act "solely in the interest of the [TSP] participants and beneficiaries" [5 U.S.C. 8472(h)] and for the "exclusive purpose of providing benefits to participants and their beneficiaries." [5 U.S.C. 8477(b)(1)]. The law requires the Board to develop investment policies which provide for "prudent investments suitable for accumulating funds for payment of retirement income" [5 U.S.C. 8475(1)]. The FRTIB receives no annual appropriations. As such, all Plan expenses are paid by participants. The fiduciaries are charged by law to administer the Plan at low cost [5 U.S.C 8475(2)].

The TSP is a retirement savings and investment plan for Federal employees and members of the uniformed services that is very similar to 401(k) plans offered to private sector employees. As of March 31, 2021, the TSP had more than 6.2 million participants and managed more than $735 billion in assets. By law, the assets in the TSP are held in trust for each individual participant.

Congress directly addressed the issues of non-financial investment considerations and political manipulation when it created the TSP. The legislative history of the TSP demonstrates that there was concern that neither the FRTIB, the Congress, nor the Administration be in a position to manipulate the assets of the Thrift Savings Fund for purposes other than furtherance of the financial interests of the participants and beneficiaries.

> Concerns over the specter of political involvement in the thrift plan management seem to focus on two distinct issues. One, the Board, composed of Presidential appointees, could be susceptible to pressure from an Administration. Two, the Congress might be tempted to use the large pool of thrift money for political purposes. Neither case would be likely to occur given present legal and constitutional restraints.
>
> The Board members and employees are subject to strict fiduciary rules. They must invest the money and manage funds solely for the benefit of the participants. A breach of these responsibilities would make the fiduciaries civilly and criminally liable.
>
> H.R. Conf. Rep. No. 99-606l at 136 (1986), reprinted in 1986 U.S.C.C.1508, 1519.

The hallmark of the TSP is its simple design. The statute outlines the five core funds: the G Fund (Government Securities Investment Fund), F Fund (Fixed Income Index Investment Fund), C Fund (Common Stock Index Investment Fund), S Fund (Small Capitalization Stock Index Investment Fund) and I Fund (International Stock Index Investment Fund). This creates a menu of investment options that is exhaustive and exclusive. This maximizes return and minimizes risk for participants when used appropriately.

The G Fund is invested in specially-issued Government securities. Each of the other Funds are passively managed and follow an index that is selected by the FRTIB. The investment goal for each Fund is to match the applicable index. Such an approach results in investment returns that are significantly above the average of investment returns generated through non-indexed investment.

In creating the TSP, Congress was so committed to the efficacy of passive index investing, the statute explicitly prohibits the Board from directing the Executive Director to invest or to cause to be invested any sums in the Thrift Savings Fund in a specific asset or to dispose of or cause to be disposed of any specific asset of such Fund. [5 U.S.C. 8472(g)(2)]

In addition, the statute specifically prohibits the Board, other Government agencies, the Executive Director, an employee, a Member, a former employee, and a former Member from exercising voting rights associated with the ownership of securities by the Thrift Savings Fund. [5 U.S.C. 8438(f)]. The fund managers for the C, S, F, and I Funds vote the proxies for the TSP in accordance with their publicly stated proxy voting policy. Each quarter, the fund manager provides an audit of its proxy voting for that quarter, which is shared at the public, monthly meeting of the Board.

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

Tranchau (Kris) T. Nguyen at (202) 512-7215 or NguyenTT@gao.gov

Staff Acknowledgments

In addition to the contact named above, Sharon Hermes (Assistant Director), Anjali Tekchandani (Analyst in Charge), Chad Clady, Mick Ray, and Seyda Wentworth made key contributions to this report. Also contributing to this report were Susan Aschoff, James Bennett, J. Alfredo Gómez, Charles A. Jeszeck, Kirsten Lauber, Joseph Dean Thompson, and Adam Wendel.

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