Ceres

IMPAX Asset Management

PORTFOLIO CLIMATE RISK MANAGEMENT

Case Studies on Evolving Best Practices

In collaboration with Asia Investor Group on Climate Change, Investor Group on Climate Change, IIGCC The Institutional Investors Group on Climate Change

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INTRODUCTION

As the climate crisis, its physical impacts and the transition to a net-zero emissions economy all accelerate, global investors increasingly recognize the material and financial risks to their portfolios. Large institutional investors know they must assess and manage climate-related risks if they are to meet their fiduciary duties to clients and beneficiaries.

Recognizing the economic materiality of climate change as investment risks, some leading global asset owners have become early movers in taking comprehensive action to identify, evaluate and manage climate-related risks in their portfolios. In steps that align with The Investor Agenda, an initiative to accelerate and scale up the actions that are critical to keeping global warming to no more than 1.5 degrees Celsius, some have developed climate action plans involving low-carbon investment strategies, corporate engagement, disclosure and policy advocacy. The case studies presented here show a range of evolving best practices used by some of the largest global asset owners and financial institutions. Ceres developed these case studies in collaboration with our partner global investor networks - Asia Investor Group on Climate Change (AIGCC), Investor Group on Climate Change (IGCC), and Institutional Investors Group on Climate Change (IIGCC) - and with funding from Ceres Investor Network member, Impax Asset Management.

Ten asset owners are profiled in these case studies—AP2, the Second Swedish National Pension Fund; the Brunel Pension Partnership; Cathay Financial Holding Co. Ltd.; Caisse des Depots et Placement du Québec; New Zealand Superannuation Fund; OPTrust; the Ontario Teachers' Pension Plan; PFA Pension of Denmark; PGGM Investment Management, and Wespath Investments and Benefits. These ten institutions, which collectively manage hundreds of billions of dollars, were kind enough to share information on their methodologies and answer questions about their climate risk-management and investment strategies.

Each has developed a range of approaches to assess and manage two fundamental risks from climate change: physical risk (e.g., the impacts of heat waves, droughts, wildfires, sea level rise, floods and stronger storms) and transition risk (e.g., the impacts of government climate policies like carbon pricing and the technology transition to renewable energy, electric vehicles, and energy and resource-efficient technologies). They are also collaborating in global initiatives, including Climate Action 100+, and in climate policy advocacy as encouraged by The Investor Agenda, to mitigate the systemic economic and social impacts of climate change.

The investors profiled use both qualitative and quantitative strategies to assess and manage climate-related risks. Their approaches range from carbon footprinting of different asset classes to developing scenario analyses of how their portfolios may fare under various climate policy and transition scenarios. Employing such methods allows these investors to assess and disclose their climate-related risks. Some funds work with service providers to develop quantitative models to estimate the impacts of transition risk, physical risk, or both. Most funds also use corporate engagement as a risk management tool, and some have reduced holdings in high greenhouse gas emitting companies that have not developed robust transition strategies. All of the funds in these case studies are pursuing low-carbon investment strategies, seeking to invest in "climate solutions" opportunities across various asset classes.

A common strategy for most of the investors profiled in these case studies is to "decarbonize" their portfolios by reducing the carbon intensity of entire portfolios or of particular asset classes. Another common strategy is to align their portfolios with the "well-below 2 degrees Celsius" Paris Agreement goal. Some have set time-bound targets for emission reductions with a few aiming for net zero emissions by 2050. Others have set quantitative goals to scale up their low carbon, climate positive investments, and many are reporting their strategies and progress in line with the Task Force for Climate-Related Financial Disclosure (TCFD) framework.

These case studies offer a snapshot of how the profiled funds and institutions currently address climate risk. The approaches these funds and their peers employ are rapidly evolving as investors learn from both individual and collective experience. We encourage investors at earlier stages of their climate risk-management journeys to review these case studies and consider which of these approaches could help guide their responses to climate risk. As practices around managing climate risks continue to evolve, Ceres will support investors in tackling these risks through The Investor Agenda and the Ceres Accelerator for Sustainable Capital Markets: Achieving Paris-Aligned Portfolio initiative.

Ceres is grateful to Impax Asset Management for its support and funding of this project.

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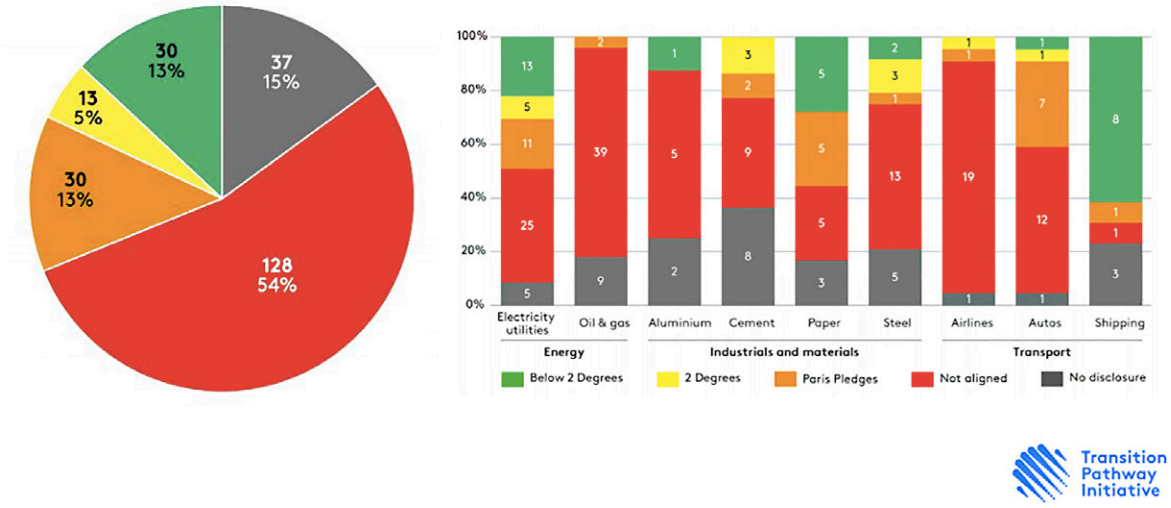
Alignment with the Paris Agreement Benchmarks

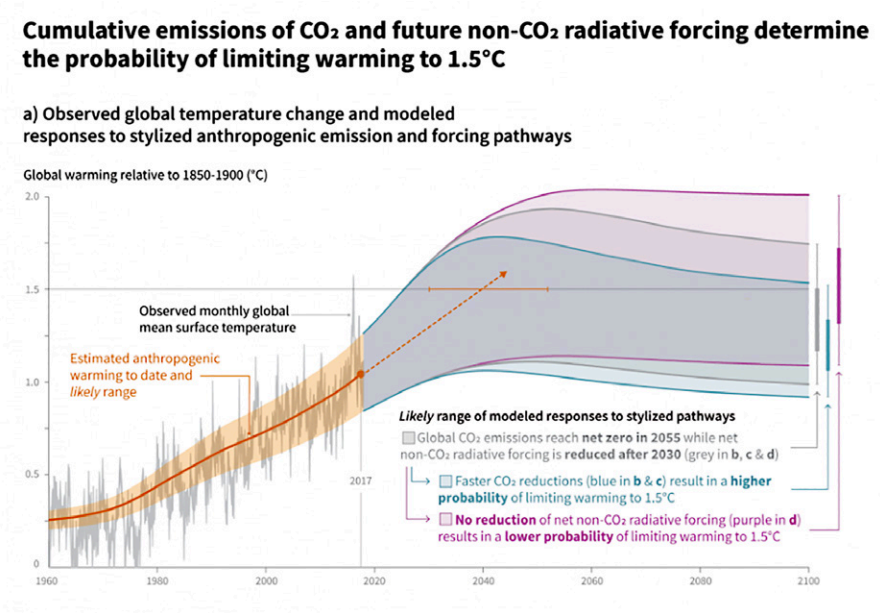


Graphic/Source: Transition Pathway Initiative

Key Takeaways

Common elements in the 10 investors' approaches to portfolio climate risk management:

- Many of the funds have set portfolio decarbonization goals to cut their portfolios' carbon intensity by a specific percentage and date.
- Most aim to align their funds' investments with the goals of the Paris Agreement, although few have defined how to achieve it.
- Most developed their climate strategies in an iterative process over the last decade and are continually implementing more sophisticated, effective data-driven strategies.
- Almost all funds have measured and begun reducing the carbon footprints of their portfolios.
- Some have selectively divested holdings in high carbon companies, particularly those in the coal, oil & gas, electric power and high-carbon materials sectors.
- All are actively investing in opportunities in climate solutions such as renewable energy, green real estate, energy efficiency technologies and green bonds.
- Most have done scenario analyses on how their portfolios would fare under different global warming policy outcomes.
- All the funds have engaged with portfolio companies around climate risk and greenhouse gas emissions reductions through the Climate Action 100+ initiative.
- Most have engaged in policy advocacy at the regional, national, and international levels on such policies as carbon pricing and emissions reductions.
- Most have disclosed their climate risk assessment and management practices and metrics in accordance with the TCFD reporting framework.
- All of the funds have ambitions to further advance their climate action.



Graphic/Source: UN IPCC Report Summary for Policymakers - From Global Warming at 1.5 degree C, Cumulative Emissions

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Portfolio Climate Risk Management Case Study
AP2 / The Second Swedish National Pension Fund

1. OVERVIEW

- AP2 has been a leader in addressing climate risk in its investment process, and has adopted investment beliefs, policies and processes aimed at aligning its portfolio with the goals of the Paris Agreement.
- AP2 has integrated climate analysis into its investment analysis and processes. In 2019, the Fund included climate risk in the Fund's overall ALM-analysis and return assumptions, which are the basis upon which it selects the strategic portfolio. The Fund also increased its allocation to green bonds in the strategic portfolio from 1.0 to 3.0 percent in 2019. In addition, it has decided to make an allocation to sustainable infrastructure, i.e., assets that contribute to sustainable development in line with the Paris Climate Agreement.
- To date, AP2 has reduced the carbon footprint of its equities portfolio by more than 50% since 2015
- Based on its carbon risk analysis, AP2 engages with companies in high emissions sectors, and has divested 80 energy and utility companies found to present excessive climate-related financial risks.
- AP2 seeks to contribute to a low carbon economy and invests in "climate solutions" including green bonds, renewable energy infrastructure and forestry.
- During 2019, AP2 investigated how different climate scenarios can be included in the choice of overall strategic asset allocation.

2. ASSET OWNER PORTFOLIO AND ORGANIZATION DESCRIPTION

The Second Swedish National Pension Fund, or AP2, is one of the buffer funds within the Swedish income-based pension system. The beneficiaries include all salaried workers who have lived and worked in Sweden. To respond to the challenge of demographic vulnerability, the Swedish government introduced a new pension system in 2001, re-organizing AP1-AP4 to each have the same mission, investment rules and starting capital, although each fund operates independently. The system is financed on a pay-as-you-go basis, where the AP funds act as a buffer fund from which the Swedish Pension Agency can draw if there is a deficit in retirement payments. Likewise, any surplus is added to the capital of the AP funds.

AP2, along with the other buffer funds, is tasked with the overarching goal of maintaining high pension levels over the long-term. Since 2019, the law has required that the AP fund must manage the capital in an exemplary manner through responsible investments and ownership. The AP funds are also obligated to promote sustainable development, without compromising on their overarching risk/return goals. AP2 does this, among other things, by maintaining a focus on sustainable investment strategies.

AP2 currently manages SEK 381B (USD $40B), comprised of approximately 40% equities, 30% fixed income and 30% alternative investments. The majority is managed internally by the 35 members of the investment staff, with 70 total fund staff. AP2's investment strategy focuses firstly on strategic asset allocation, secondly on index selection and thirdly on active management, with a focus on integrating sustainability into all asset management decision making and analysis processes.

In 2019, AP2 developed a new sustainability strategy based on six sustainability principles. The first principle is that AP2 integrates sustainability in all investment processes. The form of the integration depends on the conditions that exist for each individual asset class and decision process. The way that sustainability is integrated may differ, for instance, between fundamental management, quantitative management and index selection. It may also vary across strategies for direct asset management, management of listed assets, non-listed assets and internal vs. external management.

3. OVERALL CLIMATE CHANGE STRATEGY

AP2 sees climate change as both an important risk and an important opportunity, and describes climate as one of its main focus areas. As such, the fund adopted in 2019 a climate Investment Belief – "Climate change is a systemic risk." Accordingly, AP2 aims to manage its portfolios in line with the Paris Climate Agreement to keep global temperature rise well below 2 degrees Celsius. AP2 plans to achieve this goal by: 1) investments in sustainable strategies; 2) dialogue with investee companies, and, 3) dialogues with decision-makers. AP2 has published this approach to the transition to a low-carbon economy in 2016. AP2 also describes its overall climate change strategy in its TCFD report.

The Fund's Board of Directors, appointed by the Swedish Government, determines guidelines and policies for the Fund, its strategic asset allocation, and decisions related to index changes. The strategic asset allocation is decided on annually, based on the fund's internally developed ALM-model. During 2019 AP2 integrated assumptions related to climate change in its forward looking macro-economic and return assumptions and thus the choice of strategic asset allocation. The strategic asset allocation also includes investments directly aimed at contributing to a sustainable development, such as green bonds and sustainable unlisted infrastructure equity. AP2 sees the index choice as an important part of the strategic portfolio. The Fund has largely replaced traditional capital-weighted indices with specialized indices, which are expected to have better properties in terms of risk and return. These indices are constructed from factors related to ESG alongside more traditional risk factors.

ESG analyses and climate reports are provided at Board meetings. In 2018, the Board was provided a dedicated training on ESG, which included a focus on climate. The Board has authorized the CEO to manage sustainability as part of the fund's day-to-day operations. The Fund's Executive Management, together with the Head of the strategy department and the Senior sustainability analysts, are responsible for the strategic sustainability work and for implementation and follow-up. This includes the strategic work and decisions regarding climate change. The day-to-day work is handled by the Fund's various departments.

The Fund also has an internal working group on fossil energy and financial climate risk to perform market and company analyses of coal and energy companies that the Fund has assessed to have significant financial climate risk. The fossil energy working group includes two people from management, the Chief Investment Officer and Head of Communications and Corporate Governance, as well as the sustainability and equity analysts and the Head of the strategy department. Based on their analysis, the working group recommends to the Executive Management divestment of equities and corporate bonds for specific companies.

AP2 reports its financial results every six months, and publishes a Sustainability Report at the same time as the Annual Report. AP2 also reports in line with the TCFD Framework in its annual Sustainability Report, first issued in 2018.

4. APPROACH TO ASSESSMENT AND MANAGEMENT OF CLIMATE RISK

Key Elements

Climate change is a long-term risk that could have far-reaching impact on global financial markets and the Fund's returns and goal attainment, and is therefore a particularly important strategic issue within sustainability. AP2's ambition is to develop the portfolio in line with the Paris Agreement. Therefore, climate change was a key focus in the review of the Fund's investment beliefs in 2019.

Climate change can be seen both from the perspective of opportunity and risk. The risk that climate change constitutes for economic growth and financial markets is significant. AP2 has therefore in 2019 included climate risk in the Fund's overall return assumptions in its ALM analysis, which is the basis for the selection of the strategic portfolio. The Fund also sees investment opportunities in the climate area and makes investments that directly contribute to the low carbon transition that is required without compromising its risk-adjusted return.

The Fund has an internal working group on fossil energy and financial climate risks. Since 2013, work has been ongoing on analyzing financial climate risks for fossil energy companies and coal-based electric power companies. An important part of this work is to assess whether the climate risks facing the companies are priced by the market. AP2's work with on analyzing financial climate risks focuses on regulatory risks for companies within the fossil energy and the electric power sectors. The Fund's work also includes analyses of technologies and markets for fossil energy. To date, AP2 has divested from 80 companies due to their financial climate risks, including 23 coal, 20 oil and gas, and 37 utility companies.

An element of AP2's strategy of integrating climate analysis into its investment process towards a goal of achieving Paris alignment, is the analysis of their listed equity portfolio's carbon footprint. AP2 began performing carbon footprint analyses in 2009, and has been doing so as part of the Swedish National Pension (AP) Funds coordination efforts since 2014. The AP Funds have provided a fact sheet to all managers outlining both the benefits and limitations of carbon footprinting of Scope 1 and Scope 2 emissions, as well as standardized measurement and reporting guidelines. At this time, roughly 50% of AP2's fund capital is measured according to an emissions indicator.

AP2 has not set a target for emissions reduction, but does report percent reductions year over year in the annual Sustainability Report. The reason why AP2 does not have an emission reduction target connected to the carbon footprint measures is that this measure alone is not sufficient to steer investment decisions with regard to climate risks. A company with a relative high carbon footprint can have less climate risks than a company with a low carbon footprint, if its investments result in accelerating the transition to a low carbon economy.

In 2019, AP2 decided to compare its portfolio against the most conservative of IPCC's 1.5°C scenarios when reporting on its alignment to the Paris Agreement. In this scenario, greenhouse gas emissions are reduced 50 per cent by 2030 compared with 2010, and 82 per cent by 2050. In 2020, AP2 will further develop its internal indices via a sustainability profile, with the ambition of complying with the criteria of the EU Paris Aligned Benchmark, which implies low targets regarding greenhouse gas emissions intensity across its portfolios.

From 2015 to 2019, the fund reduced the Scope 1 and 2 emissions of its equity portfolio by 50% from 3.4 to 1.6 million tons CO2 equivalent. AP2 includes the carbon footprint information in the decision-making basis for index changes and it can also be used to assess the sensitivity of different portfolios to carbon pricing. This information is also used in engaging with companies. Through performing carbon footprint analyses, as well as through the work of the fossil energy and climate risk working group, AP2 works diligently to integrate climate risk analysis into its investment process.

Because the global scale of climate-related risks requires collective action, AP2 collaborates with organizations including Institutional Investors Group on Climate Change (IIGCC), including in IGCC's Paris Aligned Portfolios and Scenario Analysis projects. It is a participant in the Climate Action 100+ initiative to engage the highest emitters of greenhouse gas emissions, and also a member of the Global Real Estate Sustainability Benchmark (GRESB).

AP2 also manages climate risk by investing in sustainable strategies, notably including green bonds, forestry assets and infrastructure projects, including renewable energy infrastructure. AP2 has increased its allocation to green bonds in the strategic portfolio from 1.0 to 3.0 per cent in 2019. The Fund also decided to make an allocation to sustainable infrastructure, i.e., assets that contribute to sustainable development in line with the Paris Agreement. AP2 also has 1.3 per cent of its total assets invested in timberland.

Tools, Metrics, Data Sources, Service Providers

AP2 uses MSCI emissions data, and one of its real estate companies has used Maplecroft's Climate Change Vulnerability Index to evaluate the impact of physical climate risk on its real estate portfolio.

Evaluation of Gaps

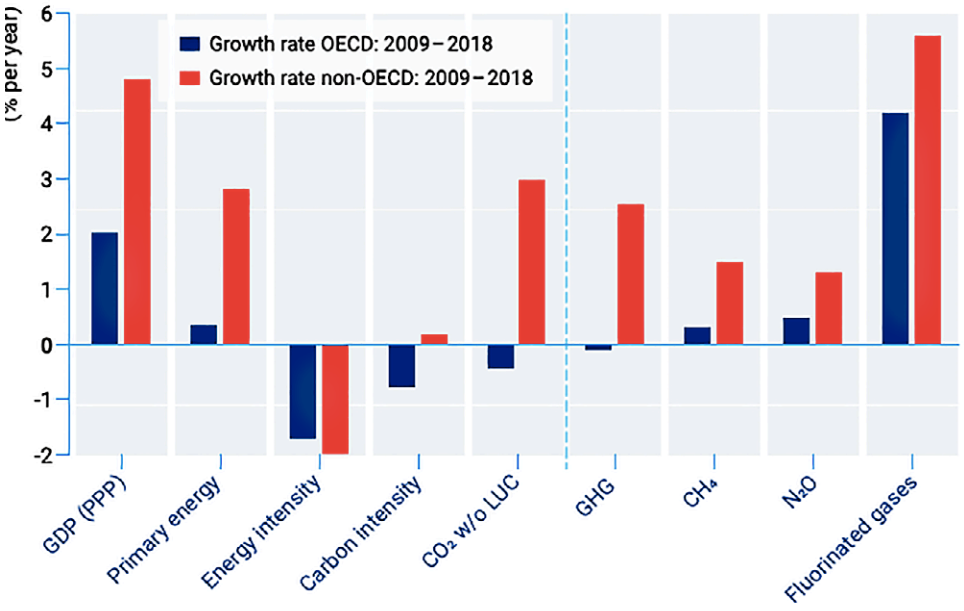
AP2 notes that carbon footprinting has limitations in that it is retrospective, relies on incomplete data, and fails to fully assess climate risks or trends, such as companies' transition readiness and strategies. One of the limitations with carbon footprinting is that no information is given about actual emission changes in the portfolio companies. To increase transparency in this regard, the AP Funds agreed in 2019 to increase the reporting by specifying how large a part of the change in its carbon footprint is due to changes in the Fund's equity holdings versus changes in underlying company emissions. More information is available in this Factsheet on AP2's website.

Next Steps

AP2 feels that its sustainability journey has only begun, and plans several further initiatives to address climate change. Notably it plans to incorporate scenario analysis into its risk analysis, and to develop an analysis of how resilient to physical and transition climate risks the Fund's strategic portfolio and underlying investment strategies are. The Fund also intends to further develop views on what the significant climate risks and opportunities beyond carbon footprinting are for more asset classes, sectors, geographies and their specific time horizons.

In 2020. focus will be on implementing AP2's new sustainability strategy with a strong focus on climate. Among other things, the Fund is further developing its internal indices via a sustainability profile, with the ambition of complying with the criteria of EU Paris Aligned Benchmark. Asset management works actively, and in different ways, to include climate risks and opportunities in its analyses and to find investment opportunities for different asset classes. The process of integrating climate analysis into the overall ALM analysis will continue to be developed.

Emissions Gap Report 2019



Graphic/Source: U.N. Environment Programme, Emissions Gap Report 2019

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Portfolio Climate Risk Management Case Study
Brunel Pension Partnership

1. OVERVIEW

- Brunel has a unique structure as a dedicated manager for a pool of UK pension funds, each of which has its own governance and asset allocation.
- Brunel has adopted an overarching policy to help integrate climate risk and opportunity into all of the investments it makes on behalf of clients, including transition, physical adaptation risks and opportunities relating to a low carbon economy.
- Brunel expects its external asset managers to identify and manage climate related risks and to integrate climate considerations into their investment practices.
- Brunel supports engagement and participates in collaborative engagements including the Climate Action 100+ and Transition Pathway Initiative.
- In early 2020, Brunel launched a comprehensive Climate Change Policy focused on working to change the financial market system to enable it and other investors to better mitigate climate risks and invest in climate solution opportunities, with initiatives in five areas:
  - **Policy**—engaging policymakers on climate policy, trade frameworks, mandatory corporate disclosure, and industry skill development.
  - **Products**—expanding the availability of climate positive products.
  - **Portfolios**—challenging investment managers to demonstrate reduced exposure to climate risk and encouraging engagement to put companies on a trajectory to align with a 2°C future.
  - **Positive Impact**—supporting the low carbon transition.
  - **Persuasion**—engaging with material holdings to persuade them to improve climate disclosure and performance.

2. ASSET OWNER PORTFOLIO AND ORGANIZATION DESCRIPTION

Brunel Pension Partnership (Brunel) was formed in July 2017 as one of eight United Kingdom Local Government Pension Scheme (LGPS) Pools. It was established to manage the retirement assets of over 700,000 beneficiaries from the local UK authorities of Avon, Buckinghamshire, Cornwall, Devon, Dorset, Gloucestershire, Oxfordshire, Somerset, Wiltshire and the UK Environment Agency. Each of these local authorities has its own board, investment policy and asset allocation. Brunel manages approximately 30B GBP ($40B USD), offering its clients 24 portfolios, which is each managed externally with between one and five managers per portfolio. They are authorized and regulated by the Financial Conduct Authority (FCA), the UK's financial services regulator.

Environmental and social risk considerations, along with good governance and stewardship, are integrated into the decision-making processes for each asset class. However, the member organizations retain responsibility for their asset allocation and investment strategy, and ultimately their exposure to climate risk. Thus, Brunel has less direct control over its overall climate impact and mitigation strategies than many internally managed pension funds.

3. OVERALL CLIMATE CHANGE STRATEGY

The Brunel Board is ultimately accountable for Brunel's Climate Change Strategy and Policy (discussed below). Operational accountability for its day to day implementation is held by Brunel's Chief Responsible Investment Officer. Brunel climate change strategies and policies have been developed in conjunction with key stakeholders, including the Brunel Oversight Board, Brunel Client Group, and the Client Responsible Investment Working Group, membership of which includes representatives from the local pension authorities it serves and Brunel staff. They have chosen to integrate climate risk into the roles and responsibilities of the Board, executives and other key personnel within Brunel. As a result of its efforts to address climate to date, 100% of Brunel's portfolios, across all asset classes, are carbon and climate aware – and thus climate considerations are integrated into the investment process. Brunel looks to its external asset managers to

identify and manage climate-related financial risks, and all external managers are required to sign an Asset Management Accord. Brunel's framework for assessing the impacts of climate change on their portfolios encompasses adaptation and physical risks, as well as transition risks and opportunities related to a low carbon economy.

However, while Brunel does not instruct managers to exclude certain stocks, they do expect managers to have portfolios with materially reduced climate exposures and to be able to justify any climate-controversial holding. If investment managers are not able to robustly and credibly explain their investment strategies and how they have integrated climate risk, Brunel will look to replace them with investment managers that do.

Brunel also examines investment managers' engagement with companies, and if found ineffective (i.e. these efforts do not deliver real change in corporate strategies on climate change so that these companies are on a trajectory to be aligned with the transition to a 2°C or below economy), will consider whether to remove certain investment managers and/or introduce specific exclusion criteria to be applied to companies.

Brunel believes its ability to do more to manage climate risk is constrained by the current financial markets and regulatory system, and therefore in January 2020, announced a comprehensive Climate Change Policy to help build a financial system which is fit for a low carbon economy (see below).

4. APPROACH TO ASSESSMENT AND MANAGEMENT OF CLIMATE RISK

Key elements

Brunel's new climate policy builds on strong foundations. It already conducts carbon footprints of all its listed equity portfolios and, for example, allocates 35% of its first infrastructure portfolio to renewable energy.

What's new about the policy is that it commits Brunel to using its influence to harness the collective power of the asset manager industry to challenge and reduce climate risk.

Brunel feels that "the nature of the investment system, and financial markets more generally contributes to the challenge of addressing climate change rather than supporting change". Therefore, to build a financial system which is fit for a low carbon economy, Brunel frames its recently announced Climate Change Policy, as follows:

"If we do not have a financial system that is fit for purpose, we will not be able to respond effectively to climate change. We can take some specific actions, mitigating risk at the margin, but the impact will be limited without wider change. However, given our position, the opportunity for us is to shape and influence the investment system and that should be the focus of our Climate Policy. Our priority must be to catalyze change in the financial system at scale, not only through our own efforts but in partnership with others, and through enabling our clients to be agents of change in their own right."

The updated Climate Change Policy includes a five-point plan:

1. Policy Advocacy In order for policymakers to establish comprehensive and robust climate change policy frameworks, Brunel will play an active and leading role in encouraging policymakers to:

I. Establish comprehensive and robust climate change policy frameworks
II. Integrate climate change into multilateral and bilateral trading frameworks
III. Introduce mandatory climate change disclosure requirements for companies, with a focus on providing clear, decision useful information and encouraging a clear articulation of the risks that companies and their investors face.
IV. Support the development of skills, knowledge and professional standards of those intermediaries who are critical influencers in the action of investors and companies. These include, but are not limited to, investment consultants, actuaries, lawyers and auditors.

2. Product Governance In order to increase the number and range of products available to Brunel clients and the wider investment market that deliver substantial climate change benefits, Brunel will:

I. Ensure that climate risk is an integral part of its product governance and monitoring framework.
II. Report on the climate change performance – both mitigation and adaptation – of portfolios and explain how it manages the investment-related risks and opportunities associated with these issues.
III. Continue to ensure that climate change considerations are integrated into all mandates
IV. Identify and develop new product opportunities which help further address climate change risks in all asset classes.
V. Assess the degree to which its main listed equity portfolios, and possibly other portfolios, are, at a minimum, 2°C aligned.
VI. Explore the role that investment benchmarks play in driving investment decisions and in constraining ability to invest in areas that make a meaningful contribution to climate change mitigation and adaptation

3. Portfolio Management In order for Brunel's investment portfolios to be resilient under a range of climate change scenarios, Brunel will:

I. Challenge its investment managers on their analysis and assessment of change-related risks in their investment practices and processes.
II. Work with investment managers and others in the investment industry to develop methodologies for climate risk stress-testing and risk management of mandates, on both mitigation and adaptation
III. Assess how its portfolios and mandates align with the goals of the Paris Agreement

4. Positive Impact In order to enable investments in activities that directly support the low carbon transition and that enable effective adaptation to the unavoidable impacts of climate change, Brunel will:

I. Continue to make significant investments in a diverse set of opportunities that directly contribute to the energy transition
II. Evaluate its clients' contribution to the overall global investment needs for capital investment in the low carbon transition.
III. Report on the investments made, their contribution to climate mitigation and adaptation, their financial performance, and the wider social and environmental benefits of these investments
IV. Report on principal climate impacts of its investments and the steps taken to reduce these impacts as part of wider corporate disclosures.

5. Persuasion In order for companies and other entities in which we invest and contract with to support the transition to the low carbon economy, and to ensure that they are resilient to the unavoidable impacts of climate change, Brunel will:

I. Using the Transition Pathway Initiative (TPI), strengthen its focus on climate change outcomes and impacts in engagement with companies
II. Establish engagement objectives for all asset classes in which it is invested
III. Challenge companies on their approach to public policy lobbying, in particular lobbying that undermines the transition to the low carbon economy or that prevents effective adaptation to the unavoidable impacts of climate change.
IV. Amplify its efforts through working with others, through clearly communicating voting intentions and through encouraging others to support Brunel's work
V. Work with other investors to create an engagement framework for climate resilience that incentivizes the right behaviors and supports capacity to assess risks.
VI. The global scale of climate-related risks requires collective action. Brunel is collaborating with global organizations including Institutional Investors Group on Climate Change (IIGCC), Principles for Responsible Investment (PRI), Transition Pathway Initiative (TPI), and the Climate Action 100+ initiative to engage the highest emitters of greenhouse gas emissions. The Brunel published a TCFD report in its Annual Report on pages 16 to 18 and discussed the results of its climate-related investment and engagement in its Responsible Investment and Stewardship Outcomes report, at page 16.

Tools, metrics, data sources, service providers
Brunel does not directly select its member funds' assets but uses climate risk data, tools, metrics and services to support portfolio construction, monitoring and oversight. Brunel reports on its climate metrics and performance in its 2020 Carbon Metrics Report.

There are a number of data sources and tools that are utilized by both Brunel and their large pool of asset managers. Several data providers consistently used across asset managers are: S&P/TruCost, MSCI and Carbon Risk Ratings (ISS). Additionally, Brunel's real estate managers utilize the Global Real Estate Sustainability Benchmark (GRESB) to assist in monitoring real estate managers.

Brunel has set for itself and its managers the challenge of making an improvement of at least 7% year on year in reducing the carbon intensity of its listed equity portfolios. This will equate to over 20% lower carbon intensity than the benchmark (which we are also seeking to improve) by 2022.

The Brunel Chief Responsible Investment Officer co-chairs the Transition Pathway Initiative (TPI) on behalf of the Environment Agency Pension Fund, which assesses how listed companies in high carbon sectors are preparing for the transition to a low-carbon economy. This tool is used to evaluate risk of individual holdings and portfolios and to inform stewardship activities.

In its latest State of Transition report, in March 2020, the TPI found that only 18% of high-emitting energy, industrial and transport companies have emissions trajectories in line with limiting climate change to 2°C, suggesting much faster progress needs to be made on the low-carbon transition.

An example of a fund providing climate solutions to Brunel is the new closed-ended private markets fund, Greencoat Renewable Income fund. The fund has already allocated approximately £130m ($158m) of capital to investments including a Biomass Power Plant, and a share of two of the largest low carbon greenhouses in the UK solar fund which itself now has investor commitments of over £1bn.

Evaluation of gaps
Brunel recognizes that there are gaps relating to the consistency and availability of climate data, for example in the corporate disclosure of Scope 3 emissions. This applies to asset classes beyond public equities and fixed income where tools are still being developed or are not widely available. Brunel, like many others, is at the early stages of using climate scenario and stress tests.

Next steps
Brunel plans to focus on implementing its new Climate Change policy on an ongoing basis, and to report annually on progress against this Policy. Additionally, it aims to develop the capability to provide client-specific carbon footprints and fossil fuel exposure information, and is working toward carbon positive metrics (e.g. green revenues).

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Portfolio Climate Risk Management Case Study
Cathay Financial Holding Co., Ltd.

1. OVERVIEW

- Cathay Financial Holding Co. (Cathay FHC) is a large diversified financial institution that includes asset owner (insurance) and asset management subsidiaries as well as banking businesses.
- Cathay is a leader across Asia in integrating climate change risks, opportunities and other ESG factors into its investment and other business processes, and has implemented multiple climate-related initiatives through its Corporate Sustainability Committee and TCFD Task Force.
- It calculates the carbon footprint and carbon intensity of all companies whose equities and bonds it holds, and assesses physical risks to all of its real estate investment holdings.
- Cathay has conducted climate scenario analyses in accordance with TCFD guidance, and has also used other service providers to conduct quantitative climate risk analysis
- Cathay plans to expand its use of scenario analysis and quantitative climate risk analysis. Its climate risk management efforts have encountered obstacles including lack of emissions data from many local investee companies and the early stage of development of quantitative climate risk models and tools
- It invests in low carbon assets including renewable energy, low carbon industries, green real estate and green bonds. The amount was approximate USD $5B by the end of 2018.
- Cathay FHC, Cathay Life and Cathay SITE (asset management) engage with high emitting companies through the Climate Action 100+ initiative. They also participate in collaborative climate initiatives through organizations including AIGCC, CDP, TCFD.
- Cathay also engages with policy makers through the Investor Agenda as a signatory to the Global Investor Statement to Governments on Climate Change and has begun local policy engagement activities with the financial regulator, stock exchange, and low carbon tracker in the Taiwan market.

2. ASSET OWNER PORTFOLIO AND ORGANIZATION DESCRIPTION

Cathay Financial Holding Co., Ltd. is a diversified financial institution and the largest financial conglomerate in Taiwan with total assets of USD $302B. Major subsidiaries include Taiwan's largest life insurer, second largest property & casualty insurer, second largest private bank and the largest asset management firm. Cathay Life and Cathay United Bank (CUB) contribute to nearly 60% and 40%, respectively, to Cathay FHCs total assets of USD $302B. The allocation of Cathay Life's invested assets includes 67% in fixed-income, 11% in equity, 8% in real estate, and 8% in mortgages and secured loans as of end 2019.

3. OVERALL CLIMATE CHANGE STRATEGY

Cathay FHC believes proper ESG integration is critical to safeguard long-term value for all stakeholders. Cathay considers climate change to be one of the most important factors when reviewing their direct and indirect risks given frequent climate-change induced extreme weather events including typhoons, drought and heavy rains causing landslides in Taiwan. These climate events raise the future risks for operating, credit risks in loan and investments; they may also cause many indirect risks.

Cathay has two units that simultaneously manage climate-related issues:

(1) In 2011 Cathay FHC established the Corporate Sustainability Committee (CS Committee) which reports to Board of Directors and is under the leadership of the CEO of Cathay FHC. The CEOs of both Cathay FHC and subsidiaries are responsible for climate change issues, including strategy development and monitoring of progress. In 2014 the CS Committee added a responsible investment working group led by the chief investment officer and included 8 senior executives from the investment teams of the major subsidiaries. Their responsibility is to incorporate ESG, including climate change, into investments, establish group-wide responsible investment strategy/policy and arrange ESG training for staffs.

(2) In 2018 Cathay FHC established the TCFD task force led by the chief risk office; the task force comprehensively reviews assets and liabilities related to climate risks and opportunities. It produces monthly internal reporting to update group progress on climate risk management studies, business planning and challenges encountered. The task force periodically reports the progress to Cathay's Board of Directors and each member of the TCFD task force also report to his or her supervisor in the particular business unit.

The TCFD task force includes four teams: real estate investment and mortgage team, securities team, corporate lending team and insurance products team.

- The real estate investment and mortgage team identifies and assesses physical risks from the location and building condition of real estate, including own-use property, invested real estate and mortgage loans in Taiwan.
- Cathay Life has calculated the carbon footprint of its equity and credit portfolio to manage the exposure of assets under climate-related risk. It has estimated the weighted average carbon intensity based on the methodology suggested by the TCFD. Cathay life has invested in low carbon assets and started to divest coal power plants which do not actively change their energy source to renewable energy.
- The corporate lending team identifies and assesses the climate risks of borrowers from project finance loans and from high-carbon emission industries defined by the government.
- The insurance products team assesses and identifies climate risks of life and property insurance policies.

Cathay FHC also consistently reviews existing policies in order to make progress, with a common goal to be in compliance with international standards.

4. APPROACH TO ASSESSMENT AND MANAGEMENT OF CLIMATE RISK

Key Elements

Cathay FHC sets goals for low-carbon transformation to implement business strategies. They have set green operations, green financial services, and responsible investment strategies:

1. **Green operations** Cathay FHC's main strategies are to increase the energy efficiency and renewable energy use of its facilities and set carbon reduction goals with a Science-Based Target method. Using 2016 as the baseline year, Cathay FHC's goal is to reduce GHG emissions by 5-10% by 2021. In order to achieve this goal, it uses the ISO 14001 and 50001 Energy Management Standards to align its GHG emission reduction goals and manage energy systems. Apart from that, it has considered committing to the Science Based Target initiative.. Furthermore, it has installed solar panels with a capacity of 3,400 kW in 2018 to increase their renewable energy use.
2. **Green financial services** Cathay FHC utilizes itsfinancial core competencies to monitor environmental protection trends and have established four pillars of operations to take advantage of climate-related and other green business opportunities, including 1) renewable energy industry financing, 2) promotion of green transportation and agricultural insurance products, 3) promotion of green bonds and sustainability private equity fund bonds, and 4) guidance for green enterprise IPOs.
3. **Responsible investment strategies** include increasing low-carbon investments, ESG integration, and engagement activities such as the Climate Action 100+ and the CDP Non-disclosure Campaign. Cathay FHC actively participates in low-carbon investments and lending in the following sectors: renewable energy, architecture, waste recycling, transport, energy-efficient industry, and green finance.

Cathay FHC also actively participates in global climate initiatives by collaboration with organizations including the Asia Investor Group on Climate Change (AIGCC), CDP, TCFD, the Global Investor Coalition on Climate Change (GIC), and the Investor Agenda. It is also a participant in the Climate Action 100+ initiative to engage the largest greenhouse gas emitters.

Tools, Metrics, Data Sources, Service Providers

The Cathay TCFD task force has used the climate-related scenario analysis modules recommended by the TCFD; it uses various sources of GHG emission data to calculate climate risk. More detailed description of tools that TCFD task force has used are as follows:

1. **Real Estate Investment & Mortgage** Cathay FHC used the NATCAT module built from the consulting company to estimate the effects on assets based on scenarios simulated through Taiwan's historical typhoon records. The module refers to the historical hour-by-hour typhoon records from hundreds of meteorological observation stations around Taiwan. The module will be enhanced to projection after sourcing more simulation tools in the near future.
2. **Securities** Cathay Life has applied "Weighted Average Carbon Intensity," the carbon footprint and exposure metric suggested by TCFD, to calculate the carbon footprint of its listed equity assets, corporate bonds, and financial bonds as a management and evaluation tool of its investment portfolio in relation to climate change. The data resources are collected mainly from international ESG databases and companies' CS report. Cathay FHC also uses heat map data to show the relative exposure of 84 sectors globally to material environmental risks including climate change.
3. **Corporate Lending** Cathay United Bank (CUB) evaluates the climate risk of its loan book through scenario analysis based on Taiwan's Intended Nationally Determined Contributions (INDC) under the Paris Agreement.

Cathay FHC has disclosed climate-related information on page 60-64 of its 2018 Sustainability Report.

Evaluation of Gaps

While Cathay FHC is evaluating climate-related risk with quantitative methods, and trying to integrate the quantitative and qualitative results into its assessment and management procedures, it still confronts several obstacles, including:

1. Due to its diversified portfolio, Cathay finds it difficult to maintain data consistency. For example, most of the CUB lending costumers which are SME companies lack GHG emission data.
2. As many climate risk evaluation tools are still in the developing stage, Cathay cannot fully make use of scenario tools to evaluate the impact ofspecific climate scenarios, such as operating under a well-below-2 degree C limit to global average temperature rise..
3. Cathay FHC struggles to evaluate the climate performance and risk of its investee companies and customers due to a lack of climate regulation and reporting in Taiwan, notably the lack of a price on carbon and GHG emissions regulation,
4. Though Cathay FHC obtains emissions data from third-party databases,it still lack carbon emission data from many investee and lending targets, especially from small and medium sized companies in Taiwan that do not report their emissions.

Next Steps

Cathay FHC has been actively promoting awareness of climate change in Taiwan as it believes that climate change will bring risks and opportunities to broad areas of business, such as products, investments, customer services and operations. The group plans to put emphasis on comprehensive quantitative analysis and scenario analysis of climate risks, and to incorporate the results of these analyses to improve management processes. In addition, they plan to aggressively develop low carbon products to facilitate its value chain's transition to a low-carbon economy. Cathay FHC is planning to expand its scenario analysis to other asset classes in the coming years. It also plans to benchmark global practices to improve the scenario analysis process.

For insurance products specifically, where it aims to better understand the impact of climate change to life insurance claims, Cathay FHC is developing a quantification methodology to estimate potential insurance claims under different climate scenarios. These scenarios will take into account the direct and indirect effects of climate change on human health, as well as on future weather patterns.

4

Portfolio Climate Risk Management Case Study
Caisse des Depots et Placement du Quebec (CDPQ)

1. OVERVIEW

- CDPQ has a comprehensive Climate Action Plan encompassing integrating climate risks and opportunities into all investment decisions, reducing the portfolio's carbon intensity, increasing low carbon investments, engaging companies, and participating in industry leadership initiatives
- CDPQ aims to reduce the carbon intensity of its portfolio by 25% by 2025 via carbon budgets for each asset class
- CDPQ plans to increase its low carbon investments across asset classes by 80% to USD $32 billion by the end of 2020. CDPQ follows the taxonomy of the Climate Bonds Initiative to define what is low carbon. Consequently, sectors are restricted, and investments, in effect, are in renewables and green buildings as well as in public transport and selected industries.
- CDPQ makes achievement of its carbon reduction targets a significant factor in determining investment staff compensation
- CDPQ engages companies on reducing their carbon footprints and meeting Paris Climate Agreement goals via participation in the Climate Action 100+, the Net Zero Asset Owners Alliance and other investor leadership initiatives
- CDPQ currently prefers qualitative analysis of climate risks and metrics such as a company's relative carbon intensity over quantitative modeling and scenario analysis, given the major assumptions and uncertainties inherent in the latter

2. ASSET OWNER PORTFOLIO AND ORGANIZATION DESCRIPTION

CDPQ manages assets for Quebec government employees, retirees and other Quebec institutions, encompassing 41 pension plans, insurers and other public and quasi-public organizations. CDPQ manages more than USD $250 billion and is Canada's second largest and North America's third largest public pension fund. CDPQ invests globally and manages its assets almost entirely internally, with an absolute return focus. Its asset allocation is approximately 50% equities (public and private), 30% fixed income, and 20% real assets (real estate and infrastructure). CDPQ is headquartered in Montreal, has offices in 10 countries, and is a leading global real estate, private equity and infrastructure investor.

3. OVERALL CLIMATE CHANGE STRATEGY

In October 2017, CDPQ adopted a comprehensive Climate Action Plan. The Plan has 4 pillars:

- Integrating climate change risks and opportunities into each investment decision
- Increasing low carbon investments by 80% by 2020 from $18 billion to $32 billion, including renewables (wind, solar), sustainable transportation systems (electric light train), and eco-efficient buildings. (The original target of 50% was reviewed at the end of 2018 and increased to 80%.)
- Reducing the carbon intensity of the portfolio by 25% by 2025 (based on Scope 1 and 2 emissions data), through setting carbon budgets for each asset class
- Exercising stronger leadership in the investment industry, through partnerships and through engaging portfolio companies on climate change.

The Plan is based on four principles: (1) achievable targets, (2) measurable performance, (3) transparent disclosure of process and results, and (4) collaboration. Implementation of the Plan is ahead of schedule, with CDPQ having added $16 billion in low carbon assets for a total of $34 billion by year-end 2019 and reduced portfolio carbon intensity by 21% also by year-endIn late 2019, CDPQ was a founding member of the Net Zero Asset Owners Alliance, a coalition of global asset owners convened by PRI and the UN Environment Programme Finance Initiative (UNEP FI), with a commitment to transition their investment portfolios to net zero GHG emissions by 2050, across all asset classes, consistent with limiting global average temperature rise to 1.5 degrees C in accordance with the Paris Agreement.

This is to be achieved through a holistic environment, social and governance (ESG) approach incorporating climate change and emphasizing GHG emission reductions in the real economy through joint corporate engagement and public policy advocacy. This initiative aims to accelerate the low carbon transition and builds on other investor climate change initiatives including the Investor Agenda, Climate Action 100+, and the TCFD disclosure framework.

4. APPROACH TO ASSESSMENT AND MANAGEMENT OF CLIMATE RISK

Key elements

Addressing climate change as an investment risk and opportunity is a priority focus area for CDPQ. Each asset class and business unit has a dedicated risk manager to assure all risks, including both physical and transition climate risks, are assessed in the same way other financial risks are evaluated and integrated into all investment decisions.

At this juncture, CDPQ uses mostly qualitative analysis to approach climate risk at the individual investment level, having already identified vulnerable sectors or activities within a sector and then complemented with a review of corporate strategy and the use of simple metrics (e.g., measuring carbon emissions and intensity compared to a company's industry peers).

Climate risks identified by investment staff are evaluated for every proposed investment by the Investment Committee, based on an assessment of materiality of the risk to each company or asset. The determination of materiality may include but is not limited to emissions intensity, the existence of substitute product (e.g., black electrons vs. green electrons), potential product obsolescence and exposure to regulation. If a climate-related risk is deemed material to a particular investment, such as for example in renewable energy, where long-term weather patterns are critical, or sectors with high transition risks, CDPQ performs a rigorous qualitative analysis of the risk and its impact, employing specialized consultants as necessary.

For CDPQ, asset-specific scenarios used in investment decisions tend to be sector specific, such as real estate—for example: how real estate occupancy (and investment value) in a particular city may be affected if climate-related factors cause a downturn in the financial health of companies occupying buildings there. Another good example might be how a toll road dependent on tourist traffic could be impacted by a catastrophic hurricane. The road might be passable but the resorts it serves damaged, reducing traffic and revenue levels. .

To evaluate how quantitative analysis can contribute to actionable outcomes, CDPQ participated in a 2018-19 UNEP FI investor task force on scenario analysis consistent with the recommendations of the TCFD. It will form a basis for CDPQ's future work in this rapidly evolving field.

In addition, and importantly, CDPQ mitigates the fund's climate risks by reducing the portfolio's carbon intensity, setting declining annual carbon budgets for each asset class and measuring annual results against these targets.

CDPQ also manages climate risks by engaging with its portfolio companies, participates in the Climate Action 100+ engagement initiative for large emitters and the Net Zero Asset Owners Alliance, and supports a global price on carbon. The fund prefers engagement to exclusion, but will reduce its exposure where engagement does not produce satisfactory results. Further detail can be found in CDPQ's 2019 Stewardship Investment Report, published March 2020.

CDPQ has been able to successfully implement its climate strategy across the organization through a combination of leadership from the top and the fact the most of its assets are managed internally. Implementing

this strategy required an intensive internal consultation, education and culture change process. Achievement of its climate and carbon reduction targets is a significant factor in CDPQ's formula for determining the variable compensation of all staff.

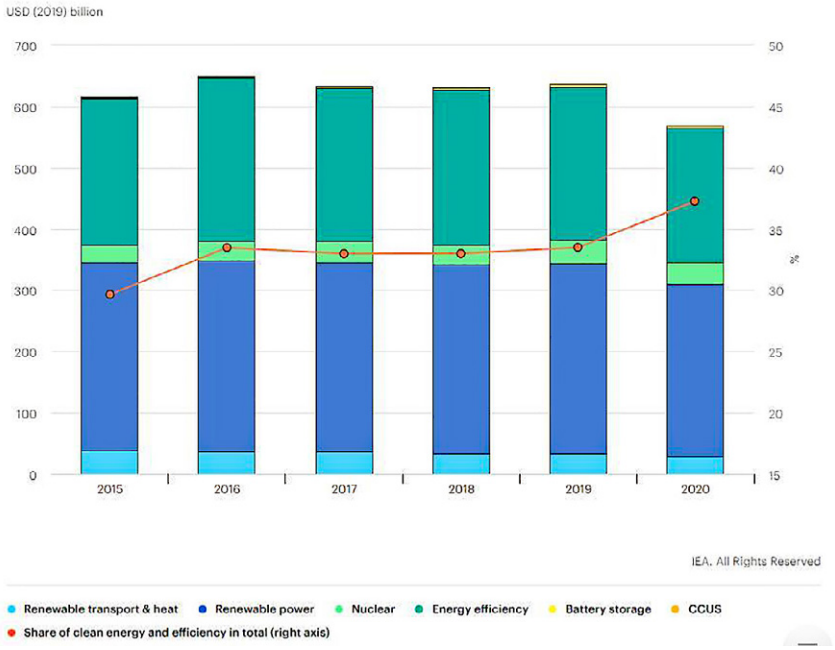
Tools, metrics, data sources, service providers

CDPQ uses data from S&P'sTruCost for its carbon emissions data (Scope 1 and 2). The fund worked with Carbon Delta as part of the UNEP FI Climate risk modeling project and uses a number of specialized consultants to evaluate climate risks at the asset level.

Next steps

CDPQ will continue to implement its Climate Action Plan to reduce portfolio emissions intensity, increase low carbon investments, engage with portfolio companies and collaborate with members of the Net-Zero Asset Owner Alliance, the Investor Leadership Network and other investors on climate change. CDPQ will also continue to evaluate evolving tools and models to quantify climate risks to its portfolio.

Global investment in clean energy and efficiency and share in total investment, 2015-2020



Graphic/Source: International Energy Agency

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Portfolio Climate Risk Management Case Study
OPTrust

1. OVERVIEW

- OPTrust published in 2018 an eight-step Climate Action Plan to enhance the Fund's resilience to climate change
- It is establishing baseline exposures to physical and transition risks
- OPTrust collaborated with its asset-liability consultant, Ortec Finance, on a top-down pilot analysis of Fund sensitivity to three climate scenarios
- It actively engages their external managers on ESG and climate expectations
- The Fund collaborates on global climate initiatives, including Climate Action 100+ and the Investor Leadership Network

2. ASSET OWNER PORTFOLIO AND ORGANIZATION DESCRIPTION

With net assets of almost $22 billion, OPTrust invests and manages the defined benefit pension plan for members of Ontario's Public Service Employees Union (OPSEU). As of Dec. 31, 2019, the plan was fully funded. OPTrust's assets are broadly diversified and managed to maintain funding status: approximately 60% allocated to publicly traded equity and fixed income and 40% to the private markets including real estate, private equity, and infrastructure. The Fund's integration of ESG and climate risk and opportunities is stewarded internally by two groups that work together. The Sustainable Innovation and Investing team, comprising four people and expanding to six, strengthens the integration of responsible investing across the entire investment division and manages an incubation portfolio that allocates capital against longer term risks, such as climate change. The second group, the Responsible Investing Committee, includes representatives from each asset class plus the Legal and Communications departments. This committee of approximately ten people ensures that OPTrust's commitment to sustainable and climate-aware investing is embedded throughout the organization, from investment due diligence to corporate culture.

3. OVERALL CLIMATE CHANGE STRATEGY

OPTrust undertook several studies as part of its climate change analysis. The first, in 2017, was with Mercer Consulting who conducted a climate change scenario analysis of the total fund to evaluate the likely resiliency of OPTrust's portfolio to a 2degree Celsius world, the goal of the Paris Climate Agreement. The second, in partnership with Ortec Finance, was an asset liability management/strategic asset allocation project that integrated physical and transition risks and opportunities associated with climate change into several multi-horizon time scenarios. A third, currently underway, is a bottom-up study to establish a baseline assessment of climate-related risks to the total fund, including carbon footprint, stranded assets and energy transition analyses. More information on the latter two studies is detailed below.

These studies build on OPTrust's 2018 Climate Change Action Plan, which identified eight actions required to define a long-term climate resilience strategy:

- **Deliver on disclosure** of information that investors need to price carbon risk consistent with the disclosure framework of the TCFD
- **Collaborate** with like-minded partners to share knowledge, amplify OPTrust's voice, and identify best practices in climate risk assessment and management – all to achieve meaningful change
- **Continue to build awareness** among investment professionals internally and among investee companies
- **Define a clear baseline** from both top-down and bottom-up perspectives to better evaluate OPTrust's exposure over time to climate change impacts
- **Integrate in portfolio construction** an approach that considers climate risk impact on the total fund by assessing the effects of climate change on three macroeconomic variables related to strategic asset allocation decisions: GDP, interest rates, and inflation

- **Support innovation in process and metrics**, recognizing that the industry is still at an early stage in developing tools for measuring climate risk
- **Drive for improved performance**, encompassing ongoing attention to proxy voting guidelines; active engagement with portfolio companies on climate issues, including reduction of emissions and adoption of the TCFD recommendations; and advocacy for a just transition related to climate change
- **Lead with transparency** by reporting OPTrust's progress against the TCFD framework and expecting similar disclosure from companies in the OPTrust portfolio

4. APPROACH TO ASSESSMENT AND MANAGEMENT OF CLIMATE RISK

Key Elements

In 2018, to build internal awareness around climate risk – one pillar of their Climate Change Action Plan – OPTrust hosted a climate change symposium involving climatologists, service providers and other asset owners. As noted above, one of those service providers, Ortec Finance, advised OPTrust on its overall asset/liability management and contributed its analysis of climate impact under atmospheric warming scenarios of 1.5, 3, and 4 degrees Celsius. This top-down assessment, which was undertaken as a pilot project for OPTrust, integrates physical and transition risks and opportunities associated with climate change into traditional multi-horizon scenario sets that drive strategic investment decision-making. The pilot assessment was not meant to produce a definitive and actionable set of recommendations but rather to test how this approach can contribute to an improved understanding of climate risks. OPTrust found the pilot to be a useful learning experience, particularly the sensitivity of portfolios to different climate scenarios, and will be continuing and expanding its work with Ortec Finance, which itself is incorporating new capabilities into its climate risk assessment platform for both transition and physical risks.

The Private Markets group within OPTrust recently revised its investment due diligence process to explicitly incorporate climate risk and other ESG factors into the documents and investment recommendations submitted to the investment committee.

The fund conducted a survey to identify their external managers' considerations of ESG and climate in their investment processes. Subsequently, the OPTrust team responsible for monitoring and engaging with the fund's external managers created for use in its manager meetings a clear set of expectations for integrating ESG and climate factors into the investment process.

Engagement vs divestment OPTrust's preference is to engage with its portfolio companies to determine how they will transition to a low carbon economy. If no progress has been made after a reasonable period of time, the Fund's exposure to that asset may be reduced or eliminated due to the financial vulnerability of its business plan.

Because the global scale of climate-related risks requires collective action, OPTrust is collaborating with organizations including Ceres' Investor Network, CDP, and the Investor Leadership Network, and is a participant in the Climate Action 100+ initiative to engage the highest emitters of greenhouse gas emissions.

OPTrust is deliberately seeking to incorporate sustainability into its investment choices by investing in "climate solutions," consistent with its Climate Action Plan. For example, a majority of OPTrust's direct investments in Canadian real estate is LEED or BOMA certified. OPTrust has purchased more than $350 million in green bonds, including those issued by Ontario and Quebec. In addition, renewable energy assets, most of which are direct investments, account for nearly 8% of the Fund's total assets under management and 30% of its infrastructure allocation.

In its 2019 Responsible Investing Report on pages 17-23, OPTrust reported on its climate metrics, strategy, risk management, and targets in accordance with the TCFD framework.

Tools, Metrics, Data Sources, Service Providers

As an early phase of their 5-year climate action plan, OPTrust employed the *MSCI ESG Industry Risk Intensity Scores* and the *HSBC Climate Vulnerability by Country* methodologies to establish a high order baseline for climate-related risks by industry and geography. The Fund has subsequently engaged in discussions with Trucost (now a part of S&P) to establish a more detailed baseline of carbon risk and with Four Twenty Seven research firm (now part of Moody's Investor Services) concerning its direct real estate investments that are vulnerable to the physical risks of climate change. The scope of the OPTrust project with Trucost is four-fold and encompasses establishing a baseline for both physical risk and transition risk. It includes conducting: 1) a carbon footprint analysis; 2) a fossil fuel risk and energy transition analysis to assess exposure to extraction, reserves, and renewable energy; 3) a carbon value at risk analysis, and 4) a two-degree scenario alignment of its investments in public equities, corporate fixed income and sovereign fixed income. As data concerning private equity, real estate and infrastructure portfolios becomes more available and reliable, similar assessments will be undertaken. With more defined baselines established, the Fund can better evaluate how climate change risks have an impact on assets going forward.

Evaluation of Gaps

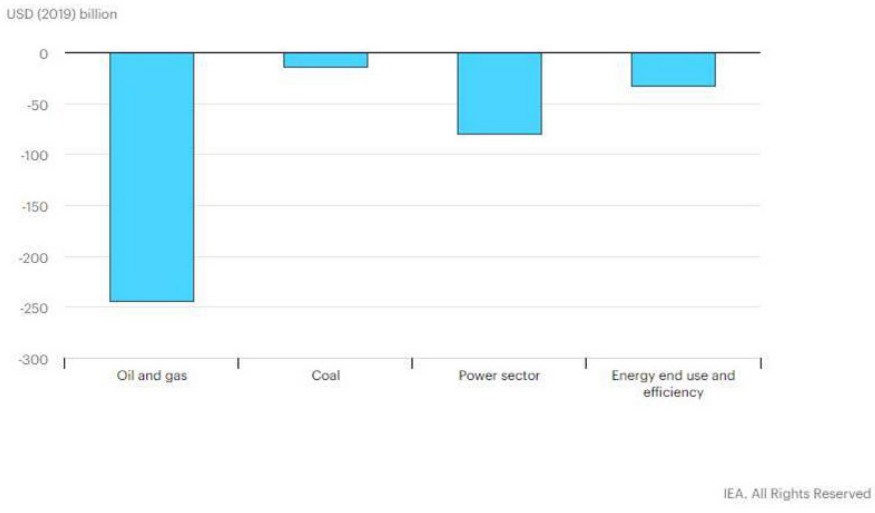
Credible, trustworthy corporate GHG emissions data are not available for many companies, and some companies do not report their emissions. OPTrust believes that carbon footprinting can be an instructive place to start internally and as a catalyst for conversations with portfolio companies, but particularly given its retrospective focus, it doesn't provide the necessary metrics to meaningfully inform investment decisions.

Next Steps

In 2020, OPTrust is moving into its next phase of collaboration with Ortec Finance beyond the pilot study, to better understand how the Plan's investments are aligned with optimal, sub-optimal and catastrophic climate scenarios, and what can be done to adjust the Fund as a whole and its different portfolios in response to those scenarios. Explicit attention will be paid to geographical risk factors.

The fund is currently in discussion with data providers to help devise bottom-up climate change risk metrics for physical risk and transition risk for all asset classes. It also continues to look for risk models that provide actionable information on such key issues as carbon value at risk that will allow the portfolio managers to confidently and fully integrate climate change into portfolio construction and the investment process.

Change in estimated investment by sector, 2020 compared to 2018



Graphic/Source: International Energy Agency

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Portfolio Climate Risk Management Case Study
Ontario Teachers' Pension Plan (Ontario Teachers')

1. OVERVIEW

- Climate risk and opportunity is fully integrated in the organization's investment processes and its 300+ investment professionals
- The Plan's overall approach is to integrate climate change consideration in its investments, engage with companies, industry, regulators and policymakers to effect positive change, and to seek the investment opportunities that arise.
- Ontario Teachers' 2017 Low Carbon Economy Transition (LCE) Framework informs the Fund's climate change approach as conveyed in Ontario Teachers' TCFD-aligned 2018 Climate Change Report
- The LCE Framework identified and monitors twelve signposts that are indicators of the direction and pace of change of the economy towards a low carbon future, which helps the organization to assess the long-term merits and resiliency of investments.
- Ontario Teachers' actively engages with portfolio companies, as well as, external managers on ESG and climate expectations
- Actively participates in global climate-related initiatives, including Climate Action 100+ and the Investor Leadership Network. Ontario Teachers' is also a member of SASB's Investor Advisory Group and on the board and infrastructure advisory committee of the GRESB Real Asset Assessment.

2. ASSET OWNER PORTFOLIO AND ORGANIZATION DESCRIPTION

Ontario Teachers' manages more than C$200 billion in globally diversified assets for more than 325,000 active and retired members of Ontario's teaching profession. The Plan, which is fully funded, is allocated approximately 20% to public equities, 40% to fixed income, and 40% to private markets and real assets, which includes real estate, infrastructure and natural resources. Ontario Teachers' manages about 80% of its assets in-house.

3. OVERALL CLIMATE CHANGE STRATEGY

Ontario Teachers' systematically integrates the risks and opportunities associated with climate change across asset classes and throughout all levels of the organization. The Fund is also active externally with companies, industry, and others to manage risks and invest in opportunities.

Ontario Teachers' starting premise is that we are transitioning to a low carbon economy; however, how smooth or disruptive that path is uncertain. To better understand how the organization could be impacted under different transition scenarios – and the critical outcome drivers – Ontario Teachers' developed a Low Carbon Economy Transition Framework in 2017, which is described in Ontario Teachers' 2018 Climate Change Report. The framework identifies three different scenarios or pathways that require the organization's ongoing attention: 1) an orderly transition to a low carbon economy; 2) a transition consistent with current policies and practices; and 3) a period of sustained dependence on fossil fuels that ultimately leads to drastic and disruptive actions to curb further warming. Ontario Teachers' does not assign any probabilities to these possible scenarios, but rather believes the organization needs to pay attention to five key contributors to the direction and pace of change: policy, technology, consumer preference, capital, and physical impacts. The LCE Framework provides guidance on how the future may unfold to inform the full range of investment activity, from identifying opportunities, to due diligence, to managing assets.

Responsibility for climate-related risks and opportunities is enterprise-wide and starts from the top. At the Board level, its Investment Committee "receives regular updates regarding Ontario Teachers' responsible investing activities including updates regarding the transition to the low-carbon economy;" the CEO chairs the Enterprise Risk Management Committee where climate change is one of the identified risks; the Chief Investment Officer has ownership responsibility for climate change risk and for overseeing our climate change

processes and implementing risk mitigation strategies;" the Chief Risk Officer has responsibility for "effective risk monitoring and assessment capabilities," and the portfolio managers "are responsible for the identification, assessment and management of material ESG risks and opportunities, including climate change, in their investments." The organization is further supported by Ontario Teachers' Responsible Investing Team of eight professionals providing subject matter expertise concerning assessment, management and reporting of material climate-related issues.

To promote climate awareness as a factor in Ontario Teachers' investment practice, and to stay current with climate research and industry trends, the organization conducts educational sessions that include speakers as diverse as Paul Polman, former CEO of Unilever; Dianne Saxe, former Environmental Commissioner of Ontario; sector specialists from ARC Financial and Bloomberg New Energy Finance; and fiduciary duty experts to prompt discussion about Board accountability to understand climate related risks and climate change as a fiduciary imperative.

An important element of Ontario Teachers' climate strategy is to exercise its influence as a major pension fund investor and to collaborate with peer organizations. In addition to representation on boards of companies in the portfolio, Ontario Teachers' is a signatory to and participant in Climate Action 100+, the global investor initiative to engage companies having high carbon emissions; a founding member of the Investor Leadership Network, comprising fourteen global asset owners (six of them Canadian pension funds) advocating for stronger climate change disclosure; and a member of SASB's Investor Advisory Group. Ontario Teachers' also sits on the board of the Global Real Estate Sustainability Benchmark (GRESB), and helped found GRESB's Infrastructure Assessment. As part of the Canadian financial ecosystem Ontario Teachers' is a member of the Canadian Coalition for Good Governance and the Accounting for Sustainability CFO Leadership Network.

4. APPROACH TO ASSESSMENT AND MANAGEMENT OF CLIMATE RISK

Key Elements

Ontario Teachers' monitors twelve "signposts" that help indicate the pace of progression toward one of the three pathways previously mentioned. More specifically the signposts help Ontario Teachers' understand how the catalysts for each scenario are changing and the direction in which the overall trend is moving. The twelve signposts, in alphabetical order are:

- Batteries for electric mobility
- Building energy efficiency
- Carbon capture and storage
- Carbon price level and coverage
- Climate policy commitments
- Deforestation
- Distributed electricity systems
- Fossil fuel subsidies
- Interconnectivity of electricity networks
- Levelized cost of electricity
- Meat consumption
- Smart city technologies

Ontario Teachers' has developed expected milestone values for each signpost consistent with the three pathways and is able to assess both direction and pace of change. For example, five of the signposts might point toward progress toward a low carbon world, four toward an extension of existing commitments to reduce carbon emissions, and three toward a high carbon scenario. It is important to note t hat the signposts are not all equal in influence, but help to guide our decisions.

Each pathway and each time horizon present their own risks and opportunities. In Ontario Teachers' 2018 Climate Change Report, which will be updated in 2020, a matrix of climate risks and impacts, plus potential areas of investment opportunity, offers additional clarity concerning how the Fund considers each over the short-term, medium-term and longer-term.

In the near term (one to three years) Ontario Teachers' is predominantly focused on risks deriving from new policies for reducing carbon emissions, legal action against companies failing to manage and disclose climate risk, the physical consequences of extreme weather, and consumer action that can range from social media campaigns to boycotts to undermining a company's social license to operate.

Over the medium-term (3-10 years) and longer-term (10+ years) time horizons, climate-related risks are path-dependent and will vary in prominence depending on which scenario that is being looked at.

The following three examples from the 2018 report illustrate this connection between risk and impact under two different pathways – to a low-carbon world and to a high-carbon world:

Medium- and Long-term Risks and Impacts in a Low-Carbon World

Source of Risk: Capital

Implication for companies

- Capital flows away from high-carbon opportunities in favour of low-carbon opportunities. Increase in the issuance of green and climate bonds
- Borrowing by companies in high-carbon industries, and those that have not addressed material climate change risks, will be costlier or unavailable

Implications for Ontario Teachers'

- Capital flows into climate-smart investments may create challenges in finding attractively priced investments
- Companies in our portfolio that have not addressed climate change risks may be unable to expand or grow as a result of the increased cost of funding

Medium- and Long-term Risks and Impacts in a High-Carbon World

Source of Risk: Physical risks

Implication for companies

- Physical climate impacts become more extreme. In the longer term there are increasing crop failures, frequent and extensive periods of drought, extreme heat and flooding. Sea levels rise. Infectious disease epidemics, species extinction and the spread of pests increase.
- Demand for natural resources may hit scarcity constraints
- These risks may cause total loss of some assets

Implications for Ontario Teachers'

- Our real assets, particularly to coastal areas, may see higher maintenance and capital expenditures to enhance resiliency. Some portfolio companies may have difficulty in getting insurance. Agricultural investment in drought prone locations such as California and Australia may see lower returns, while sustainable agriculture may see benefits due to expected food shortages globally. Portfolio companies with vulnerable supply chains may see disruptions in their businesses.

Investment opportunities are also considered through the lens of both a low-carbon trajectory and a high- carbon one. The pathway to a low carbon future tends towards opportunities that address mitigation, such as clean energy, technological innovation, carbon capture, energy efficiency, electrification and sustainable agriculture.

Should the signposts suggest a sustained pathway to a high-carbon economy the investment opportunities will tilt toward adaptation and the inescapable recognition that fossil-fuel related investment warrants attention while demand for oil and gas continues to grow. Examples of investment opportunities that support adaptation in a higher carbon world are energy efficiency, industrial technologies, infrastructure, healthcare (particularly related to heat and resilience to disease) and water (encompassing availability, access and quality).

Ontario Teachers' has not formally catalogued all its investments that support the transition to a low carbon economy, but its $30 billion real estate portfolio meets either LEED or BOMA BEST standards and our airports are all carbon neutral or working toward carbon neutral. The Fund also has direct investments in: renewables, climate-related technologies, sustainable agriculture and forestry, and water-related infrastructure. Any future categorization elsewhere in the Fund will likely draw upon the taxonomy developed by the European Union (HLEG Taxonomy) and the Climate Bonds Initiative, among others.

By monitoring the signposts and the signals they provide, Ontario Teachers' is positioned to evolve its investment strategy with the ongoing circumstances of climate change and how carbon informs economic behavior, including the elasticity of demand, and financial outcomes.

Tools, Metrics, Data Sources, Service Providers

In addition to its own proprietary frameworks, Ontario Teachers' uses SASB and GRESB and has considered how data providers and modelers, including 427 (now part of Moody's Investor Services), Trucost (now part of S&P), Vivid Economics, and FTSE Russell's Green Revenue classification, can help contribute to a better understanding of the climate risk and opportunity to their portfolio of over 10,000 investments. Going forward, Ontario Teachers' will be working with the Woods Hole Research Institute and Wellington Management on a customized approach to asset level physical risks and how they inform transition risks. In particular, the data-driven research of Woods Hole can help quantify the impact of physical risk on particular assets and enable portfolio managers make better investment decisions, and develop plans to increase resiliency.

Ontario Teachers' is developing a sector specific ESG Maturity Framework that draws upon SASB's standard setting work for 77 industries and uses data from Bloomberg and MSCI along with our proprietary assessment of the companies' governance, policies and practices around the material sustainability factors. The framework enables to categorize companies' ESG management as baseline, advanced or exceptional, and track company progress concerning such things as risk management practices, intensity of carbon emissions, and disclosure of climate risk consistent with the TCFD recommendations.

Next Steps

In addition to Ontario Teachers' collaboration with Woods Hole and Wellington Management, the organization will continue to cultivate internal climate awareness and work to further integrate climate risk and opportunity into every investment decision. The signposts, which provide insight to the catalysts affecting the direction and pace of change toward or away from a low carbon economy, will be regularly monitored, and improved data and risk models will be evaluated for inclusion in Ontario Teachers' scenario analysis over different time horizons, carbon impacts and investment environments.

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Portfolio Climate Risk Management Case Study
PFA Pension of Denmark

1. OVERVIEW

- PFA employs a number of processes and steps to align its investments with the goals of the Paris Climate Agreement
- The fund uses an internal screening model to assess and compare the carbon intensity of companies in its public equities and fixed income portfolios
- It uses a quantitative climate screening tool to evaluate companies' emission reduction targets, renewable energy use, investment in fossil fuels, green products, etc. to identify companies that require further analysis of their climate risks
- PFA engages the worst performing companies identified by its screening process to encourage more sustainable business strategies, and will divest companies that fail to make adequate progress and reallocate to other better performing companies in the same sector
- The fund maps and manages the energy and resource consumption of properties in its real estate portfolio, with the goal to achieve net zero emissions by 2050
- PFA invests in climate solutions including large wind farms in its private equity and infrastructure portfolios
- The fund participates in several climate-related corporate engagement collaborations including the Climate Action 100+ and reports consistent with the TCFD framework

2. ASSET OWNER PORTFOLIO AND ORGANIZATION DESCRIPTION

PFA Pension was founded in 1917 to "ensure that people in Denmark have the freedom to live the life that they want." PFA is the largest customer-owned pension funds in Denmark, and ranks among the largest pension funds in Europe, supporting 1.3 million members. The fund currently manages DKK 668B ($100B USD), comprised of 55% fixed income, 20% listed equities, 11% property investments, 10% alternative investments and 4% other asserts. The fund's holdings are managed almost entirely internally, with a total of 115 staff members, 5 of whom are focused on ESG risks and opportunities. While its team dedicated to ESG is small, climate considerations are an integral part of PFAs investment process. The team works systematically to reduce the carbon footprint of the equity and property portfolios, while actively investing in green solutions and renewable energy, such as wind and solar.

3. OVERALL CLIMATE CHANGE STRATEGY

Since 2009, PFA has based the fund's overall corporate responsibility policy on international principles and conventions, including: the UN Global Compact's 10 principles for responsible corporate behavior focusing on human rights, labor rights, the environment and anti-corruption; the six UN-supported Principles for Responsible Investment; and the Paris Climate Change Agreement. PFA is overseen by a Responsible Investment Board, whose role is to set goals and priorities for PFA's investment strategies, as well as to monitor progress towards those goals and priorities. PFA aims to develop and maintain their portfolios in line with the Paris Climate Change Agreement to keep global temperature rise well below 2 degrees Celsius. They also focus on their real estate investments in Danish properties, working to systematically map the energy and resource consumption of the properties to reduce their carbon footprint. Additionally, PFA invests in climate solutions such as solar and wind farms, loans to greener transportation and Sustainable Development Goals themed investments in emerging and frontier markets. PFA makes best efforts to report on its climate risks and strategy in accordance with the TCFD framework, as part of its annual Corporate Responsibility Report

4. APPROACH TO ASSESSMENT AND MANAGEMENT OF CLIMATE RISK

Key Elements

PFA takes a bottom up approach to analyzing climate risk, by identifying the companies whose businesses are inconsistent with the goals of the Paris Climate Change Agreement. It also uses a top down approach,

using climate scenarios created by the International Energy Agency (particularly the Sustainable Development Scenario) for a macro review of its portfolio, and focusing on expected energy mixes under different scenarios to help determine which companies face significant climate risks.

To comply with the objectives of the Paris Agreement in its investment process, PFA has developed its own climate screening model, which consists of:

- Mapping the carbon emissions for all listed equities and bonds held by the fund to identify the companies which either emit higher amounts of carbon compared to the sector, or are reliant on energy intensive sectors.
- Once these companies are identified, PFA applies its quantitative climate screening tool which considers reduction targets, renewable energy used, green products, investment in fossil fuels etc., which provides enough data for the investment manager to understand if a further in-depth analysis of the company is required.
- Based on these results, PFA will engage in strategic dialogues with the companies that have not taken steps to reduce their energy consumption or set an emissions reduction target to further understand the company's business model and encourage sustainable business strategies.

In 2019, PFA divested eight companies, primarily in the energy sector, due to their higher carbon emissions levels and overall ESG concerns. PFA will also implement this initial screening process when considering new investments.

PFA outlines its Paris Agreement alignment method here, as well as guidelines for integrating it here.
As a result of PFA's efforts, in 2018, the companies in PFA's equity portfolio had 21 tons less CO2 emission per million US dollars invested than the MSCI World Index.

Because the global scale of climate-related risks requires collective action, PFA is collaborating with the following corporate engagement initiatives: the Principles for Responsible Investment (PRI), the Climate Disclosure Project (CDP), the Institutional Investors Group on Climate Change (IIGCC), the Taskforce on Climate-related Financial Disclosure (TCFD), the Nordic Engagement Cooperation and the Green Building Council Denmark. It is also a participant in the Climate Action 100+ initiative to engage the world's largest emitters of greenhouse gases.

PFA also manages climate risk and opportunity by investing in "climate solutions" in its private equity and infrastructure portfolios, including owning a 25% share of Europe's largest wind farm via a direct private equity investment, and a private debt investment in another wind farm in its infrastructure portfolio.
In addition, PFA invests in "green" buildings in its real estate portfolio.

Tools, Metrics, Data Sources, Service Providers

PFA uses CDP carbon emissions data for companies that self-report, and MSCI estimated data for non-reporting companies. It also uses Sustainalytics, Bloomberg and MSCI ESG data. The primary climate metric used by the fund is a company's emissions intensity (emissions/revenues). PFA also uses the 2 Degrees Investing Initiative (2Dii) PACTA model to assess a company's alignment with Paris Agreement goals. PFA has given priority to focusing on its listed shares and bonds since more and more complete types of carbon data have been available in these asset classes. Since many companies do not publish their objectives to reduce carbon emissions, PFA has collected different data sets to make a comprehensive assessment of the companies' plans and progress in reducing their emissions.

PFA has not yet used any quantitative models to systematically assess physical climate risks, however, this is a part of its standard due diligence phase for non-listed assets where there is a heightened risk of flooding etc.

Evaluation of gaps

PFA has not used any outsourced quantitative models to help address and integrate climate change risk into its investment processes, as at this time fund managers feel the data and assumptions utilized within the quantitative models are not fully developed. As a result, they are not comfortable using these tools to inform their investment strategy.

Next Steps

PFA plans to integrate the Paris target into its investment process through development of an internal method for screening its equity portfolios from a climate perspective. This will allow it to identify companies and sectors in which PFA's climate impact, in terms of its ability to move the companies toward energy transition readiness and carbon neutrality, is most significant. Based on this analysis, PFA will prioritize dialogues with those companies and sectors that violate its investment beliefs, and divest if no progress is made. PFA also aims to expand its renewable energy investments, as well as investing in companies that produce products which contribute to more environmentally friendly solutions.

PFA has announced the introduction of a new climate-focused pension product, "PFA Climate Plus", which will become accessible to its members in the summer of 2020. PFA Climate Plus assets will emit 60% less CO2 than the MSCI World Index and be completely carbon neutral by 2025 at the latest, with the ambition for it to be a carbon negative portfolio by 2030. The portfolio will exclude investments in oil, gas, and coal, and will include venture capital investments in tech companies focused on the transition to a green economy.

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Portfolio Climate Risk Management Case Study
PGGM Investment Management

1. OVERVIEW

- Although PGGM has not yet structured climate issues in a comprehensive climate strategy, it has long aimed to be a leader in addressing climate risks and opportunities and has undertaken numerous climate-related strategies and initiatives.
- PGGM has analyzed four climate change scenarios encompassing both transition and physical risks to understand which sectors it invests in are likely to be most impacted under different future scenarios.
- One of PGGM's primary climate risk management strategies is aimed at reducing the carbon intensity of its global equities portfolio by 50% by 2020 from a 2014 baseline by engaging companies in the energy and other carbon intensive sectors.
- It has also set a goal to significantly increase its "climate solutions" investments, which comprised 3.3% of its AUM at year-end2019, by the end of 2020 as part of a broader goal to quadruple its overall "solutions" investments (in SDG themes around climate, water, food, health) from 2015 to 2020.
- PGGM did an in-depth analysis of the impact of physical climate risks on its global real estate portfolio in partnership with a major reinsurer.
- It has examined several currently quantitative models of climate risks, but not yet found them sufficiently useful in informing investment decisions due to the uncertainty of and sensitivity to the necessary underlying assumptions, particularly around policy change and technology.
- PGGM plans an ambitious set of further actions on climate change in 2020 and beyond, including working with external experts to further analyze physical and transition risks to its portfolio.

2. ASSET OWNER PORTFOLIO AND ORGANIZATION DESCRIPTION

PGGM is a large pension fund service provider that manages assets for several Dutch pension funds, primarily PFZW, serving over 4.4 million pension participants. PGGM currently manages more than EUR 250 billion (USD $270 billion) in assets, which are allocated approximately 30% to public equities, 30% to government bonds, and about 40% to other assets (including credits, real estate, infrastructure and private equities). Asset allocation is adjusted annually based on economic projections, risk tolerance and regulatory constraints. PGGM uses a combination of internal and external asset management. For example, about 60% of its public equities are managed externally, while all of its fixed income (bond) investments are managed internally. Its real estate portfolio is managed both internally and externally with about 60 external managers globally. It has an investment team of about 350 members, and a responsible investment team of about 12.

3. OVERALL CLIMATE CHANGE STRATEGY

Although PGGM has not yet structured climate issues in a comprehensive climate action strategy, climate change has long been considered a material investment risk and a key investment theme by PGGM and its largest client (PFZW). PGGM has taken a wide range of actions to address climate risks and opportunities. This includes setting goals to reduce the carbon footprint of its portfolio and increase its investments in climate solutions. A first comprehensive research on climate change was completed in 2017; among other things, it developed a "climate monitor" to provide insight into the pace of the clean energy transition. PGGM has also undertaken scenario analyses of physical and transition climate risks, and participates in a number of climate-related collaborative initiatives including the Task Force on Climate-related Financial Disclosures (TCFD), Climate Action 100+, IIGCC and the Investor Leadership Network. PGGM issued its first TCFD report on its strategies for assessing and managing climate risks in 2019.

4. APPROACH TO ASSESSMENT AND MANAGEMENT OF CLIMATE RISK

Key elements

PGGM addresses climate and other investment risks through its Risk and Compliance Department, as well as through its Responsible Investment team. Strategies employed to assess and manage climate risks include

participation in climate impact studies, completing scenario analyses, setting targets to reduce the carbon intensity of its public equities portfolio and to increase its investments in climate solutions, and engaging companies through the Climate Action 100+ and other initiatives.

In 2018-2019, PGGM conducted scenario analyses on four scenarios (including ones resulting in 2, 3 and 4 degree Celsius average global temperature rise), addressing both physical and transition risks, and identified the highest risk sectors impacted under each of these scenarios. These analyses, discussed in PGGM's TCFD report, were found useful but difficult to translate into investment decisions due to large uncertainties, in particular in climate policies.

PGGM, at the direction of PFZW, set a goal to reduce by 50% the carbon footprint of its public equities portfolio (as defined by the weighted average of CO2 intensity of companies in its portfolio [Scopes 1, 2 and first tier upstream scope 3 emissions per million dollars in company revenue] by 2020, from its 2014 baseline of 339 tons CO2 per $1M turnover. This figure had been reduced to 229 tons/$1M turnover by the end of 2018 and further (to 203 tons/$1M turnover) in 2019. This reduction is being accomplished by reallocating investments in companies in the most energy-intensive sectors (energy, utilities and materials) to more carbon efficient companies. This has resulted in divestment of approximately 200 companies in these sectors. However, the investment manager is keeping its sector allocations unchanged, based on the belief that all sectors will play a significant role in the transition to a low carbon economy, although in the electric utility sector some of the reallocation has been to utilities that emphasize renewable energy generation.

PGGM is also making significant investments in climate solutions, as part of a mandate from PFZW to increase the fund's overall investments in solutions to major global challenges (including climate, health, food and water) from EUR 5 billion in 2015 to EUR 20 billion in 2020. At the end of 2018 it had EUR 7.7 billion (3.7% of AUM) invested in climate solutions, and this amount increased to EUR 8.4 billion by the end of 2019. These climate solutions investments included about one-third in public equities and a quarter in green bonds.

PGGM has a strong focus on physical climate risk. In 2019 it completed a study in partnership with Munich Re on assessing and managing physical impact risks (extreme weather and sea level rise) in its global real estate portfolio. The study used Munich Re's NATHAN framework model, which assesses 12 risk categories (9 climate-related), and produces hazard and risk scores (from 1 to 5) for each real estate asset, for example from flooding and storms. The study found the highest risks to PGGM's real estate assets in Japan. The fund also uses the Global Real Estate Sustainability Benchmark (GRESB) sustainability framework to assess the sustainability of its private real estate portfolio.

Other initiatives to assess and manage climate risks include membership in and support for TCFD reporting (including producing the fund's own TCFD report in 2019), membership of the Sustainability Accounting Standards Board (SASB) investor advisory group, engagement of energy companies on emissions reduction, climate governance and TCFD disclosure through the Climate Action 100+ initiative, participation in various IIGCC working groups, and the Investor Leadership Network.

Tools, metrics, data sources, service providers

Two metrics that PGGM uses to address climate risks and opportunities are the carbon intensity of its public equities portfolio, and the allocation, as a share of total AUM, of its "climate solutions" investments. Moreover, ESG risk scores (covering, among things, climate-related risks) are assigned to private market investments and investment proposals.

Service providers used by the fund for climate-related data and analyses include S&P TruCost (carbon emissions data), MSCI and Sustainalytics (ESG data), Vigeo EIRIS (SDG-related investment data), and the SDI asset owner platform (use of AI to assess companies' ESG impacts, founded by APG and PGGM).

Evaluation of gaps

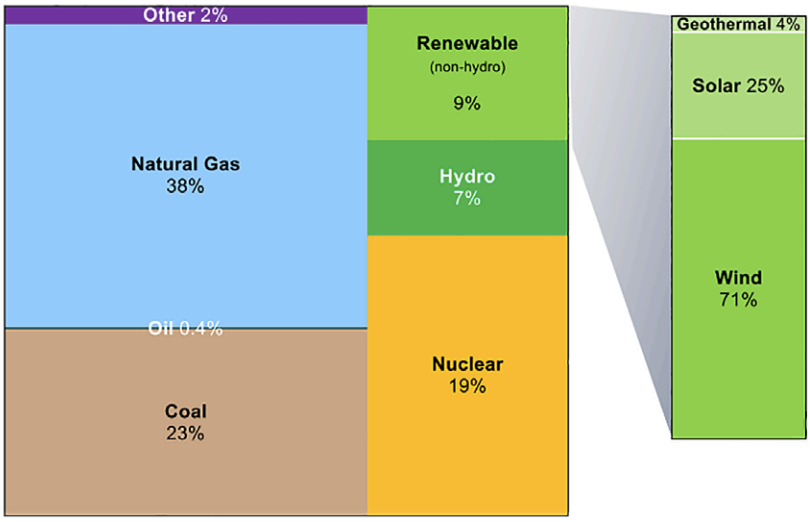
Gaps in PGGM's ability to assess and manage climate risks include uncertainty about the extent to which financial markets currently price climate-related risks (such as valuation of sea level rise and storm damage risks to coastal real estate). In addition, it is not clear that current models of the financial impacts of climate risks produce credible, decision useful outputs, due to the significant uncertainties around climate policy action.

Next Steps

Additional climate-related initiatives and activities planned by PGGM beginning in 2020 include:

- Retaining external experts to further study climate risks, particularly transition risks
- Expanding physical climate impact studies into other asset classes
- Potentially creating a portfolio-wide expert group to conduct long-term trend analysis, and assist investment teams

U.S. Electricity Generation by Fuel Type (2019)



U.S. Energy Information Administration. Electric Power Monthly

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Portfolio Climate Risk Management Case Study
Wespath Benefits and Investments

1. OVERVIEW

- Wespath assesses and manages climate-related risks through a comprehensive Climate Action Plan, based on its "Invest-Engage-Avoid" framework.
- It invests primarily through external investment managers expected to assess and manage climate-related risks. Wespath evaluates and engages its external managers on their assessment of climate risks and opportunities.
- Approximately 8% of the Wespath funds are invested in low-carbon "climate solutions," representing nearly $2.0 billion across five low-carbon strategies and three innovative low-carbon enhanced-passive equities strategies (as of December 31, 2019).
- It also addresses climate risks through active participation in several collaborative corporate engagement initiatives, including the Climate Action 100+ and Ceres' Shareholder Initiative on Climate and Sustainability.
- It excludes companies that are significantly involved in thermal coal extraction and electric power generation fueled primarily by coal.
- It is conducting quantitative climate scenario analyses consistent with the Task Force on Climate-Related Financial Disclosures (TCFD) guidelines with several of its external managers and plans to expand these scenario analyses across its entire public equities and fixed income portfolios over time.

2. ASSET OWNER PORTFOLIO AND ORGANIZATION DESCRIPTION

Wespath Benefits and Investments (Wespath) administers benefit plans and invests on behalf of participants and institutions related to The United Methodist Church (UMC). With nearly $25 billion in assets under management as of December 31, 2019, Wespath maintains the largest reporting faith-based pension fund in the world. Wespath manages assets almost entirely through approximately 35 external investment managers. The overall asset allocation of the Wespath funds is approximately 50% public equities, 40% fixed income, and 5% alternatives, with the remainder allocated to cash as well as its Positive Social Purpose (PSP) Lending Program that invests in market-rate affordable housing, community development and microfinance loans.

3. OVERALL CLIMATE CHANGE STRATEGY

Wespath's 10 Investment Beliefs help define its investment philosophy. In accordance with these beliefs, in 2017-18 Wespath established and implemented its Climate Action Plan to help identify, assess, and systematically address climate-related risks and opportunities. The Plan, built around Wespath's Invest-Engage -Avoid framework, was guided by its "Low-Carbon Transition" Investment Belief, which states:

"A global transition to a low-carbon economy is underway driven by the world's assessment of environmental risks. We believe public policies, emerging technologies and physical impacts associated with concerns about climate change are creating winners and losers across companies, industries and countries, impacting investment returns. As prudent fiduciaries, we must assess these global risks and opportunities in the management of our funds."

As part of its general risk assessment process, an internal team comprised of individuals across the investment team identifies long-term global "megatrends" – such as population growth, technology adoption, and most notably climate change – and strategically implements sustainable investment strategies to respond to and benefit from associated risks and opportunities. Wespath developed its Climate Action Plan and its Low-Carbon Transition Investment Belief as a direct result of this risk assessment strategy.

4. APPROACH TO ASSESSMENT AND MANAGEMENT OF CLIMATE RISK

Key elements

Wespath manages climate risk and associated opportunities largely by investing in low-carbon "climate solution" strategies, working closely with its external managers, engaging corporations and public policy makers, and avoiding thermal coal investments. Wespath's approach to climate change is described in its Sustainability Report.

Wespath believes active fund management adds value over the long-term and expects its external asset managers to integrate the consideration of risks and opportunities associated with the transition to a low-carbon economy (as well as broader ESG factors) into their investment analysis and decisions. Wespath believes this gives its external managers additional insight into company management and enhances investment performance over the long-term.

Wespath expects its external asset managers to conduct the necessary research to assess and manage climate risks across their portfolios' holdings, including implementation of climate-related scenario analysis. Wespath incorporated several questions related to the management of climate change-related risks and opportunities into its annual manager ESG evaluation to ensure climate analysis is integrated into their investment processes. These annual ESG Appraisals help ensure adequate climate competencies for all new and existing investment strategies, and contribute to Wespath's overall manager assessment, including decisions regarding allocation and retention. Results and feedback, along with future expectations, are routinely discussed with the managers.

To assist in identifying and managing ESG-related risks, Wespath adopted a "Management of Excessive Sustainability Risk" (MESR) policy. Under this policy, Wespath implemented a climate change exclusion guideline that avoids investments in high-risk companies involved in the thermal coal industry. The policy excludes companies that derive over 50% of their revenues from the extraction and/or mining of thermal coal, and electric utility companies that derive 75% or more of their overall fuel mix from coal. As of December 31, 2019, Wespath excluded 62 companies under the climate change guideline.

Wespath has also identified climate-related opportunities at the investment strategy/asset class level. It invests in real assets, such as sustainable forestry, as well as thematic investments in its U.S. and international equity funds. These represent nearly $2.0 billion in assets and include five dedicated "low-carbon solutions" strategies and Wespath's innovative enhanced-passive "Transition Ready" (TR) equity strategies.
TR, launched in partnership with BlackRock in 2018, is a sector-neutral strategy based on proprietary research that seeks to improve investment performance by overweighting companies with greater "Transition Readiness" characteristics, such as those consuming natural resources more efficiently or those investing in carbon-efficient technologies. The TR strategy underweights companies that are less prepared for the transition to the low-carbon economy. Wespath's investments in this framework total over $1 billion, including strategies indexed to the Russell Top 200 Index, Russell 1000 Value Index, and MSCI Word ex US Index.

In addition to investing in climate solutions, Wespath engages with companies directly and collaborates with other investors through advocacy and industry organizations. These include Climate Action 100+ (CA100+), the Ceres Shareholder Initiative on Climate and Sustainability (SICS), the Principles for Responsible Investment (PRI), the Interfaith Center on Corporate Responsibility (ICCR), the Sustainability Accounting Standards Board's (SASB) Investor Advisory Group (IAG) and the Transition Pathway Initiative (TPI).

Wespath urges companies to adopt stronger corporate governance, set carbon reduction goals consistent with the Paris Agreement, and strengthen climate-related financial disclosures in accordance with TCFD framework. Through the CA100+, Wespath in 2019 led engagements with four companies and served as a

supporting investor for eight additional companies. Through collaborative engagements organized by Ceres, PRI and ICCR since 2017, Wespath has engaged 15 oil and gas companies, four electric utilities, two auto manufacturers and seven companies in other industries on low-carbon initiatives. Wespath has seen particular success with two oil and gas majors: Chevron and Occidental Petroleum. After multi-year engagements, the companies both released climate risk reports and joined the Oil and Gas Climate Initiative (OGCI). Wespath continues to engage with these companies and monitor their progress.

Tools, metrics, data sources

While Wespath does not purchase climate data or ratings, other than thermal coal research from ESG research provider Sustainalytics, it recently conducted quantitative climate scenario analyses consistent with the TCFD guidelines in partnership with several of its external managers. Wespath considers scenario analysis to be an important risk assessment tool that strengthens its understanding of potential physical impacts, public policy, and technology risks associated with a changing climate. It expects to use the resulting analysis as a starting point for more detailed discussions with its managers.

In addition, Wespath joined the TPI so that it can better understand how individual companies are positioning themselves for the transition to the low-carbon economy. TPI offers a public, transparent, online tool that supports the requirements of the TCFD, comparing future projected emissions to the 2-degree Celsius target and other public policy criteria.

Service providers

Wespath's implements its thematic low-carbon investment mandates through strategies managed by Conservation Forestry, Developing World Markets, Hancock Timberland, Impax Asset Management, and Wellington Management Company—as well as its TR low-carbon enhanced-passive strategy with BlackRock. Wespath works with Sustainalytics to identify and assess the companies it avoids under its thermal coal investment exclusion. Wespath expects all of its external managers to procure and use the necessary data to assess climate risks.

Evaluation of gaps

Inadequate and inconsistent corporate disclosure of climate and ESG related data challenges the ability of Wespath and its external managers to assess and manage climate-related risks and opportunities. Broad reporting consistent with the TCFD and SASB frameworks would facilitate improved decision-useful climate risk assessments and scenario analyses. In addition, sufficient public policy responses and broad global commitments, such as the NetZero initiative, incentivize companies to aggressively reduce their carbon emissions.

Next steps

Wespath plans to engage its managers on the results of the scenario analyses it recently began conducting. Further, it is exploring the extent to which it can incorporate these types of analytical risk assessments into its asset allocation models and decisions. It will also continue to engage corporations directly, as well as in collaboration with global initiatives, on adopting ESG and climate disclosure standards and managing risks associated with the transition to a low-carbon economy. Finally, Wespath is in the process of building a unique framework to better align its investments with its vision for a sustainable economy by identifying material key performance indicators (KPIs) and conducting a data-driven analysis to identify portfolio contributions to these KPIs. Upon completing the analysis, it will determine an appropriate response plan, which may result in a reallocation of capital to further mitigate risks and capture opportunities associated with the development of a sustainable global economy.

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Portfolio Climate Risk Management Case Study
New Zealand Superannuation Fund (NZSF)

1. OVERVIEW

- NZSF regards climate change as a material source of investment risk and opportunity.
- NZSF has substantially reduced the carbon intensity of its portfolio through its Climate Change I nvestment Strategy.
- As of June 2019, the fund had reduced its emissions intensity of its portfolio by 43% and its fossil fuel reserves by 52%, exceeding its 2020 targets. It is now revising the targets .
- NZSF uses a "targeted divestment" strategy to reduce the carbon intensity of its portfolio, and has divested at least 467 companies.
- The fund actively seeks climate positive investment opportunities, and has invested in solar, wind, energy efficiency and carbon recycling companies, as well as sustainable forestry strategies.
- NZSF continues to work on all four streams of its climate strategy: reduce, analyze, engage and opportunity search.

2. ASSET OWNER PORTFOLIO AND ORGANIZATION DESCRIPTION

The New Zealand Superannuation Fund (NZSF) is a sovereign wealth fund dedicated to help fund future pensions for all New Zealanders over age 65, who are entitled by law to government superannuation. The fund manages about NZD $43 billion (USD $26 billion) and has about 140 employees. The fund uses a Reference Portfolio (RP) approach. The Reference Portfolio serves as the default portfolio and the benchmark to measure how much value is added through active investments. The fund has a long horizon and its Board has determined that the Reference Portfolio can be oriented towards growth assets, with a mix of 80% global equities and 20% fixed income. At any point in time, the actual portfolio consists of the Reference Portfolio plus the active strategies managed within risk parameters set by the Board. In the financial year ending June 2019, assets included 71% public equities (NZ, global and emerging markets), 18% unlisted/private markets (timber, private equity, infrastructure), 9% fixed income and 2% other investments. The fund's passive portfolio is managed externally.

3. OVERALL CLIMATE CHANGE STRATEGY

NZSF regards climate change as a material source of investment risk and expects it will also lead to investment opportunities. One of its investment beliefs states: "Environmental, social and governance considerations, including climate change, are fundamental to risk and return." The fund believes that climate change reflects a market and policy failure, that carbon risks are underpriced by the financial markets over the timeframes relevant for NZSF, that climate risks result from physical effects, supply and demand changes and other transitional forces, and that climate change offers investment opportunities as well as risks. The fund signed the Paris Pledge for Action and participated in the initial Mercer climate scenario modeling study in 2015, adopted its initial Climate Change Investment Strategy in 2016 and implemented its initial carbon reduction targets in 2017. The strategy is the evolution of 10 years of consideration of climate change. The fund is also actively involved in global initiatives such as the One Planet Sovereign Wealth Fund working group on climate change.

Its Climate Change Investment Strategy (CCIS) has four elements:

- **Reduce** Reduce exposure to fossil fuel reserves and carbon emissions;
- **Analyze** Incorporate climate change into its analysis and decision making;
- **Engage** Manage climate risks by being an active owner through voting and engagement;
- **Search** Actively seek new investment opportunities, for example in renewable energy.

To achieve its goal of a portfolio more resilient to climate risks, the fund has adopted three principles:

1. Manage climate change risks and opportunities across the whole portfolio;
2. Be consistent across all investment classes (listed/unlisted, active/passive); and
3. Use the full range of available tools, as there is no single solution.

Its climate strategy includes actions under each of the four pillars of the Investor Agenda: investment, engagement, disclosure and policy advocacy.

4. APPROACH TO ASSESSMENT AND MANAGEMENT OF CLIMATE RISK

Key elements

In 2017, the fund set carbon reduction targets: to reduce the emission intensity of its portfolio by at least 20 percent and its exposure to fossil fuel reserves by 40 percent by 2020, measured relative to the original Reference Portfolio. The fund began its emission reduction efforts with its passive equities portfolio, followed by its active equities holdings, and most recently it is addressing its unlisted assets. To date, as of June 2019, the fund had reduced its emissions intensity by 43%, and reduced its fossil fuel reserves emissions exposure by 52%, exceeding its 2020 targets. The reduction targets are now being reviewed.

NZSF uses a "targeted divestment" strategy to reduce the carbon intensity of its portfolio. It created a bespoke methodology for assessing carbon exposure based on independent third-party data on carbon emissions and reserves provided by MSCI ESG Research. The focus was on stocks with high carbon footprints without regard to sector. The methodology identifies stocks that exceed thresholds for carbon intensity or carbon reserves, along with those which manage carbon risks well. Stocks that were not in the top quartile were eliminated from the portfolio one-by-one until the specific reduction targets were met.

When the CCIS was implemented in July 2017, the NZ$14 billion passive equity portfolio (Reference Portfolio benchmark) became low carbon. This represented 40% of the fund. Nearly 300 companies were removed, which was NZ $950 million or 3% of the portfolio's net asset value. Since 2017 the strategy has been applied to active equities and a larger proportion of the fund via derivatives. As at June 2019, the exclusion methodology resulted in 467 stocks being removed, which was NZ$3 billion (nearly 8%) of the total portfolio. Decarbonising the portfolio has led to a slight improvement in returns and has had little impact on diversification.

The following climate change considerations are incorporated into the risk assessment process for each investment opportunity:

- Whether the opportunity increases portfolio exposure to emissions and reserves, and if it is exposed in a negative way to climate-related regulation, disruption and/or supply/demand impacts;
- The comfort level around how the opportunity may impact the portfolio's exposure to emissions and reserves (i.e., is it more or less carbon intensive than its proxy?);
- Whether associated carbon risks can be mitigated through design, practice or asset allocation;
- Whether the opportunity has a positive impact on climate change solutions or emission reductions.

In 2019, the fund's investment staff developed an investment decision-making framework to account for climate-related investment risk in valuation models. It provides a structured approach to identifying climate change considerations that could affect an investment. It guides investment staff to identify the climate change considerations that have enough significance to be modeled in valuations and provides a common framework to promote greater consistency in climate analysis across investment teams. The framework looks at the impact of climate change risks (or opportunities) on potential investments through the six lenses of technology changes, resource availability, physical damage, policy changes, demand and supply changes, and litigation. Investment analysts then assess, filter and integrate this information into their decisions, as well as plan for active ownership.

- **Assess** Think about how climate change may impact on the value of their active assets;
- **Filter** Determine which impacts should be evaluated more closely for incorporation into the valuation (e.g. materiality, likelihood);
- **Integrate** Consider the options around integrating these assumptions into valuation models (such as adjusting cash flows or terminal values); and then
- **Own Actively** Think about how to engage with investee companies on climate change issues and monitor performance over time.

NZSF is also involved with a peer group initiative to develop a climate change valuation framework for institutional investors.

The fund developed global temperature rise scenarios based on greenhouse gas emissions budgets estimated by the scientific community (2°C, 3°C, 4°C scenarios), with associated carbon price assumptions and adoption rates of clean energy technologies.

NZSF engages with its external managers, companies and policymakers to help manage climate risks. Managers are asked about their climate change activities and evaluated on their ability and commitment to implement the CCIS. The fund engages high emitting companies through the Climate Action 100+ collaborative engagement initiative. It also engages national and international policymakers through its participation in the Investor Group on Climate Change (IGCC). It adopted climate-related proxy voting guidelines to ensure consistent voting on climate-related shareholder proposals.

The fund is collaborating with peers on developing a climate change valuation framework for institutional investors and supports the Transition Pathways initiative, with a staff member on its steering committee. The TPI is developing tools to help investors assess how companies are managing their climate risks.

NZSF reports on its climate-related strategy and activities in its annual reports and is working to be consistent with the TCFD reporting framework.

NZSF actively seeks investment opportunities that have positive impact while meeting return objectives and continues to evaluate climate-related opportunities through its New and Existing Opportunities Assessment Hub (NEO). Internationally, the Fund has solar and wind investments through Longroad Energy in the United States, Rubicon (a platform for waste management and recycling) and View Glass, which manufactures high-tech 'smart' windows that bring energy-efficiency and health benefits. It is a cornerstone investor in the New Zealand-founded carbon recycling company LanzaTech, which uses anaerobic bacteria to convert carbon-rich waste gases into high-value fuels like aviation fuel through gas fermentation.

In its New Zealand and Australian farming and forestry investments, the fund has promoted initiatives to improve sustainability practices. This includes investment in a debarking facility for the treatment of export logs, avoiding the need to use the ozone-depleting substance methyl bromide, as well as climate mitigation initiatives. NZSF is working with a Canadian co-investment partner to develop a proposal for light rail in Auckland, a major infrastructure investment that would boost low-carbon public transport in Auckland.

Additional information about the fund's climate strategy is on its website.

Tools, metrics, data sources, service providers

The primary climate metrics used by the fund are carbon intensity (Scopes 1 and 2 emissions of CO2e/$ of company sales) and fossil fuel reserves (potential emissions of CO2e from reserves/net asset value invested), and it has set targets for reducing both. Tools to assess and manage climate risk include its valuation analysis framework and scenario analysis. It utilizes carbon emissions and reserves data from MSCI. It engages BMO Global Asset Management to conduct its corporate engagements, and is advised by the proxy voting service ISS.

Evaluation of gaps

It can be challenging to quantify the impacts of climate on investments because of:

- A lack of the data that would support a quantitative rather that qualitative assessment;
- A lack of confidence around the projections (e.g. future carbon prices, impact on economic growth, severity and frequency of physical impacts). Scenarios are intended to help bridge this gap by providing a consistent set of parameters for sensitivity analysis.

Climate data is still in its infancy and there are many providers offering their own datasets, tools and models. Yet full integration of this analysis is still a long way off in the industry.

Effective engagement with investee companies is time-consuming and resource intensive, although company disclosure is improving.

There are more investment funds focused on climate change solutions, but these can face obstacles due to a lack of data on long-term returns and historical trends compared with more traditional investments.

Next Steps

NZSF continues to work on all streams of its CCIS, including enhancements to its climate valuation framework, further work on scenarios and revised carbon reduction targets.

Leading Practices for Managing Portfolio Climate Risk - and examples of funds using them

To help institutional investors everywhere to better address climate risks and opportunities in their investment decisions, this third chapter of our case studies report examines eight strategies in climate risk management and cites examples of large funds employing them:

1/ Risk Assessment and Analysis
2/ Scenario Analysis
3/ Portfolio Decarbonization and Target Setting
4/ Net Zero Emissions Commitments
5/ Investment in Low Carbon or Climate Solutions
6/ Active Ownership and Engagement
7/ Investor Disclosure through Task Force on Climate-related Financial Disclosures (TCFD) Reporting
8/ Policy Advocacy

We outline examples of how 16 leading institutional investment funds put these practices to use. The funds include the 10 organizations profiled earlier in the Portfolio Climate Risk Management case studies—AP2, Brunel Pension Partnership, Cathay Financial Holding Co. Ltd, Caisse des Dépôts et Placement du Québec, OPTrust, Ontario Teachers' Pension Plan, PFA Pension of Denmark, PGGM Investment Management, Wespath Benefits & Investments and New Zealand Superannuation Fund.

Six more funds that are exemplars of these practices are also included--California Public Employees Retirement Fund (CalPERS), the California State Teachers Retirement Fund (CalSTRS), Cbus Superannuation Fund, HESTA Super Fund, New York State Common Retirement Fund and the San Francisco Employees Retirement System (SFERS).

By describing the strategies used by these large funds in addressing climate risk and opportunity, we hope to showcase leading examples that, while still evolving, may help other investors in their climate risk mitigation journeys.

1. Climate Risk Assessment/Analysis

- **New York State Common Retirement Fund** Based on its 2019 Climate Action Plan, NY State Common develops asset class specific frameworks and minimum standards for investing in high impact sectors, identified by TCFD, that focus on companies' transition readiness for the low carbon economy. After assessing and engaging with coal companies, and conducting financial and fiduciary reviews, the fund divested from 22 coal mining companies that did not meet the minimum standards. It is working on standards for additional high-impact industries, such as oil sands. NY State Common also conducts annual carbon footprints of its public equity and corporate fixed income portfolios, and is working with consultants and managers to identify enhanced climate risk assessments.
- **Ontario Teachers' Pension Plan** Ontario Teachers' uses a Low Carbon Economy (LCE) transition framework to analyze the climate risks of current and prospective investments. The framework employs 12 climate-related signposts or indicators to assess climate resilience under three transition scenarios driven by five key factors (policy, technology, consumer preference, capital and physical impact) over different time frames to inform investment decisions. Ontario Teachers' conducts scenario analysis and stress testing at the investment level by testing investment theses against a range of signpost values. Ontario Teachers' has a strategic partnership with Wellington Management and Woodwell Climate Research Center to access advanced climate models and data to assess and price-in physical climate change risks in new and existing assets, understand how to integrate forward looking climate data into the portfolio construction process, and build internal knowledge and in-house expertise. It is also undertaking deep dive physical climate risk assessments in its directly owned private assets.

- **PFA Pension of Denmark** Uses both a bottom up asset level analysis and top down, macroeconomic view using International Energy Agency (IEA) scenarios to analyze climate risk. The fund uses CDP self-reported data and MSCI estimated Scope 1, 2 and 3 emissions data within a three-step process. Those are: 1) mapping carbon emissions for all listed equities and bonds to identify highest emitting companies in each sector, 2) applying a multi-factor quantitative screening model to assess companies' transition readiness, and 3) after company specific analysis and dialogue, deciding whether to divest a company based on excessive climate risk.
- **PGGM Investment Management** Conducted a 2019 study of physical climate risks to its global real estate portfolio in partnership with Munich Re, using a model that assesses 12 risk categories and produces a hazard/risk score for each asset (based on sea level rise, flooding, storms, etc.). PGGM also uses the GRESB framework to assess the sustainability of its real estate portfolio.
- **OP Trust** Completed a pilot, top down climate risk modeling study of its portfolio with Ortec Finance, using climate, macroeconomic and financial modeling incorporating both transition and physical risks across three climate scenarios representing 1.5 degree 3 degrees and 4 degrees Celsius warming. The study showed that its Canadian energy portfolio is vulnerable to transition risk but less vulnerable to physical risk. OP Trust is also working with S&P Global /Trucost to do a four-phased climate risk assessment project, including carbon footprinting, fossil fuel energy transition risk analysis, carbon value at risk analysis and a 2 degree Celsius alignment analysis of its public equities and fixed income portfolios.
- **New Zealand Superannuation Fund** NZ Super incorporates climate change considerations into all of its investment analysis, including valuation models, risk allocation and manager selection. NZ Super evaluates climate risks through six lenses to analyze how its assets are affected by the climate transition, including: technology shifts, resource availability, physical damages, policy driving increased costs, demand and supply and liability. It explicitly incorporates climate risk factors into its asset valuation modeling.
- **CalPERS** Published its first Climate Change Risk Assessment report, assessing transition and physical risks to CalPERS' public equity and fixed income portfolios, and outlining the steps it was taking to manage and reduce climate risks consistent with the Paris Agreement. The steps included corporate engagement through a leadership role in the Climate Action 100+ initiative, proxy voting, investing in low carbon/climate solutions assets and public policy advocacy.
- **CalSTRS** Released its 13th Green Initiative Task Force report that outlines CalSTRS' integration of climate-related risks into its investment management process and details its significant corporate and public policy engagement activities, and contains the results of a portfolio carbon emissions exposure analysis. The TCFD-aligned report highlights CalSTRS climate-related governance, strategy and risk management while featuring sustainability-focused investments, environmental risk factors and climate-related considerations for each asset class.

2. Scenario Analysis

- **OP Trust** Conducted a top-down, macroeconomic modeling analysis of the impact on its portfolio of three global warming scenarios, incorporating both transition and physical risks, over short (through 2030), medium (2030-2050) and long-term (2050-2100) time horizons. The analysis was a pilot project using data from Ortec Finance, and is intended in future iterations to help inform asset and liability management (ALM) and strategic asset allocation (SAA) processes and decisions for the fund. OP Trust monitors signpost progression on a regular basis to help it identify climate transition tipping points.
- **PGGM** Conducted climate risk scenario analysis in 2018 and 2019 addressing both transition and physical risks for four scenarios, including 2, 3 and 4 degrees Celsius temperature rise. The results of this analysis were described in the fund's TCFD report. The scenario analysis was found informative in understanding climate risk exposure but not yet useful in making investment decisions.
- **Ontario Teachers'** As part of its Low Carbon Economy Transition framework, Ontario Teachers' has analyzed three climate scenarios: an orderly transition to a low carbon economy, a transition consistent with current policies and one of sustained dependence on fossil fuels followed by drastic and disruptive mitigation policies. These scenarios are driven by five catalysts: policy, technology, consumer prefer-

ence, capital and physical impacts, and were analyzed over short (1-3 year), medium (3-10 year) and long-term (10+ year) time horizons, using 12 "signposts" or indicators to assess portfolio impacts under each scenario. The results of this analysis are presented in the fund's TCFD report.

- **Cathay Financial Holding Co. Ltd** Cathay Century Insurance identifies natural peril exposures as the most 'sensitive to climate change' impact compared with other exposures. Therefore it used a NATCAT model developed by a leading local consultant to apply scenario analysis to the potential loss from typhoons and floods, in a 100-year regression period, on its natural peril exposures to monitor possible loss. The model integrates rainfall and temperature increase simulation alongside four climate scenarios and three time horizons out to 2100 to allow Cathay Century Insurance to forecast the potential loss from natural peril exposures. The company monitors the simulations results on risk exposure accumulation and natural catastrophe loss every quarter while reviewing the adequacy of the treaty limit for catastrophe reinsurance annually.
- **NZ Super** In 2019, NZ Super began work on scenario analysis, and developed scenarios for 2, 3 and 4 degrees Celsius global temperature rise based on different carbon pricing and clean energy technology adoption levels. NZ Super continues to work on refining its scenario models, which will be used to supplement its valuation modeling.

3. Portfolio Decarbonization and Target Setting

- **Caisse des Dépôts et Placement du Québec (CDPQ)** Set a target to cut the carbon intensity (Scope 1 and 2 emissions) of its entire portfolio by 25% by 2025 from a 2017 baseline. It set declining carbon budgets for each asset class achieving decarbonization targets and factored them into investment staff compensation. By the end of 2019, CDPQ had reduced its carbon intensity by 21%.
- **PGGM** Set a goal to cut carbon intensity (Scope 1, 2 and first tier upstream Scope 3) of its global equities portfolio by 50% between 2014 to 2020 and has reduced carbon intensity by 41% through 2019. PGGM achieved these reductions by reallocating investments in most carbon intensive sectors to more carbon efficient companies, resulting in divestment of about 200 companies, and through improved carbon efficiency in portfolio companies, some of which was achieved through engagement. while keeping sector weightings unchanged. PGGM will be updating its decarbonization targets in late 2020.
- **AP2, the Second Swedish National Pension Fund** Although it has not set a quantitative target, AP2 has reduced the absolute scope 1 and 2 carbon footprint of its portfolio by 50% from 2015 to 2019, and has divested 80 energy intensive companies. Between 2019 to 2020, its portfolio carbon intensity fell by 15 percent.
- **Brunel Pension Partnership** Brunel Set a target of 7% annual reduction in carbon intensity in its public equities portfolio, the expected result of carbon intensity dippling 20% below benchmark by 2022. Brunel also requires all of its external managers to sign an agreement committing to identify, manage and report climate-related financial risks.
- **NZ Super** Set targets of reducing portfolio emissions intensity by 20% and fossil fuel reserve holdings by 40% from 2017 to 2020. As of June 2019, NZ Super had reduced its emission intensity by 43% and its fossil fuel reserve holdings by 52%, exceeding its 2020 targets, which it plans to update. It has divested at least 467 companies.
- **Cbus Super** Set a target for its property (real estate) and infrastructure portfolios of net zero emissions by 2030, requiring all eternal property managers to commit to this goal. They must complete a physical impact risk assessment on all of its infrastructure and real estate assets. Also, 100% of its property managers report on their performance using the GRESB framework. In August 2020, Cbus set new commitments targeting an ambitious 45% reduction in absolute portfolio emissions by 2030 and a commitment to Net Zero Greenhouse Gas Emission by 2050. The fund also released a new Climate Change Position Statement and a new Climate Change Roadmap: Beyond 2020. This next two-year roadmap will develop climate pathways across sectors and asset classes, and will develop a stranded assets framework. The roadmap builds on Cbus' Low Carbon Transition Strategy work in its quantitative strategies, enabling the fund to reduce exposure or remove high risk climate holdings from its portfolio.
- **HESTA** As part of its 2020 Climate Change Transition Plan, HESTA committed to reduce absolute

carbon emissions (Scope 1 and 2) from its portfolio by 33% by 2030, and to achieve net zero emissions by 2050.

- **San Francisco Employees Retirement System (SFERS)**: The fund's Climate Action Plan includes an ambition to be a net zero emissions asset owner by 2050. SFERS said it would accomplish this through company engagement, investment, divestment, and policy advocacy. Currently, SFERS' weighted average carbon intensity is 36% less than its policy benchmark. SFERS divested from thermal coal companies and began a selective, phased divestment of high risk oil and gas companies, based on assessment and engagement in accordance with its Climate Transition Risk Framework. To date SFERS has divested 11 oil and gas companies and 46 thermal coal companies. It maintains a Watch List of 24 oil and gas companies.

4. Net Zero Emissions Commitments

- A growing number of global asset owners are making commitments to achieve net zero emissions by 2050 to be consistent with the Paris Agreement's goal of limiting average global warming to 1.5 degrees Celsius. These funds CalPERS, Cbus, CDPQ, Church of England, HESTA, PFA and Wespath have made net zero by 2050 commitments by joining the UN-affiliated Net Zero Asset Owners Alliance, which also calls on its members to set five-year interim targets for emission reductions. CDPQ was a founder of this Alliance. In addition, efforts are underway to encourage investors to set science-based targets for their portfolio emissions, likewise aligned with the Paris Agreement's goals and supported by the Science Based Targets initiative (SBTI).
- **New York State Common Retirement Fund** In December 2020, New York State Common became the first pension fund in the United States to commit to achieve net zero emissions across its portfolio by 2040, ten years ahead of net zero commitments made by other funds. In setting this new goal, it established interim targets it intends to reach between 2020 and 2040.
- Two others funds made net zero by 2050 commitments separately from the Alliance: Harvard Management Company and San Francisco Employee Retirement System (SFERS).

5. Investment in Low Carbon and Climate Solutions

- **Wespath Benefits & Investments** Has invested about 8% or $2 billion of its portfolio in three enhanced, passive low carbon strategies and five active climate solutions strategies. Wespath's passive low carbon investments are run through the innovative Transition Ready Strategy, initially launched in partnership with BlackRock in 2018 with $750 million and has since expanded to over $1.2 billion. The sector-neutral transition strategy indexes to three major domestic and global indexes and seeks enhanced performance by overweighting companies with higher "transition readiness" characteristics, and underweighting companies less prepared for the transition to a low carbon economy. Investment management firms employed to implement Wespath's active climate solutions strategies include Impax Asset Management, Wellington Management, Hancock Timberland, Conservation Forestry LLC and Developing World Markets.
- **CDPQ** Set a goal to increase its low carbon/clean energy investments by 80% from $18 billion in 2017 to $32 billion in 2020 such that it is now about 9% of the total portfolio, including investments in renewable energy, sustainable public transportation and efficient buildings. CDPQ is on target to meet this goal.
- **OP Trust** Has invested about 8% of its portfolio in renewable energy assets, comprising 30% of its infrastructure allocation, along with $350 million in green bonds. It is also actively seeking additional climate solutions investments.
- **NYS Common** Has set a goal to increase its "sustainable investments" (including "climate solutions") from $10 billion to $20 billion over 10 years, and to actively seek such investments across all asset classes. NYS Common's current investments include green bonds, green buildings, renewable energy and $4 billion in a low carbon emissions (Scope 1 and 2) passive strategy developed in partnership with Goldman Sachs Asset Management.
- **CalSTRS** Has invested over $2.6 billion in a low carbon passive index strategy based on the MSCI Target Low Carbon index, which aims to reduce carbon emissions by 80% and fossil fuel reserves by over 90%

compared to the parent MSCI ACWI index. CaLSTRS also has approximately $2.25 billion in a "sustainable investment" public equity program with approved managers including: Impax Asset Management, Hermes Investment Management, AGF Investments, Generation Asset Management and Schroders. CalSTRS has also invested approximately $300 million in green bonds and has made over $500 million in investments in renewable energy projects.

- **CalPERS** The fund has invested more than $12 billion or 18% of its private assets (comprised of real assets and private equity) in "climate solutions," renewable energy and sustainably certified buildings.
- **Cbus Super** In December 2018, Cbus announced an allocation of 1% (approximately A$500 million) to climate related opportunities that sit within the Alternative Growth asset class. The objective of this 1% allocation is to increase investment in climate related opportunities that do not fit within existing investment strategies. This work resulted in a seed investment of A$80 million in Capital Dynamics to fund renewable energy through a leading clean energy manager in Europe and the US, with an additional A$40 million to be invested over time. Investment allocation to climate solutions will continue.
- **SFERS** The fund has invested $1 billion, or over 10% of its public equity portfolio, in low carbon strategies. Half of this amount is in a passive public equities strategy managed by Goldman Sachs Asset Management (GSAM) that has at least 50% lower emissions as its benchmark. The other half is in the Global Equity Strategy fund managed by Generation Investment Management which is 70-to-80% less carbon intensive than its benchmark. Additionally, SFERS has over $150 million invested in a passive strategy that tracks the MSCI USA Large Cap ex Fossil Fuels index. Across asset classes, SFERS has over $150 million in investments in renewable energy, clean tech, and related technologies-focused companies or projects across at least 28 private equity, private credit and real assets funds (though not all funds are entirely dedicated to renewables or low carbon technologies).

6. Active Ownership/Engagement

All 16 of the institutional investment funds actively engage with portfolio companies on climate risk and opportunity, as a key climate risk management strategy. All are members of the Climate Action 100+ global collaborative engagement initiative, engaging the world's largest corporate greenhouse gas emitters on climate governance, emission reduction and TCFD reporting. Most also engage companies independently, either directly and individually, or collectively through their regional or global investor networks, including ACSI, AIGCC, Ceres, IGCC, IIGCC and PRI. Some funds also use private engagement specialist firms to conduct engagements. In addition, essentially all of these funds use their proxy voting on climate-related shareholder proposals as a key aspect of their climate stewardship strategies. Moreover, they all actively engage with their external managers on their strategy and performance in addressing climate risks and opportunities.

7. Investor Disclosure/TCFD Reporting

Many of the funds have released reports on their portfolio climate risk management actions in line with the Task Force on Climate-related Financial Disclosures (TCFD) framework or made TCFD aligned disclosures part of their annual responsible investment reports , including Brunel , CalPERS, CalSTRS, Cathay, CDPQ , NZ Super , OPTrust , Ontario Teachers' PGGM, and Wespath. These reports address funds' climate risk governance, strategy, risk management and metrics and targets. In a few cases, they reported on scenario analysis.

8. Policy Advocacy

Almost all of the 16 funds actively engage in public policy advocacy, calling for responsible climate and clean energy policy at a global, regional, national, or sub-national (state or provincial) level. Advocacy is generally done through regional or global investor networks including AIGCC, Ceres, IGCC, IIGCC and the PRI. Most of these and many other investors have signed annual or periodic Global Investor Statements on Climate Change calling on national governments to implement policies consistent with achieving the goals of the Paris Agreement, setting long-term emission reduction goals and phasing out the use of thermal coal, among other calls for action.

As the physical and transitional risks posed by climate change become clearer and the investment opportunities presented by the transition to a net zero carbon economy expand, more asset owners are developing comprehensive climate risk management programs as well as initiatives to invest in low-carbon, zero net carbon and "climate solutions" strategies. These investment practices, and the data sets, tools and models that support them, are rapidly evolving. We hope the case studies and examples outlined in this report provide useful guideposts to other investors as they progress on their climate journeys, and help inform the development of comprehensive climate action plans consistent with the Paris Agreement's goals.