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Matt joined the Guardians in May 2008 as general manager, private markets. He became chief investment officer in 2014 and was appointed chief executive officer of the Guardians in July 2018.



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Anne-Maree joined the Guardians in 2007. Her main role is the development and oversight of the Guardians' responsible investment framework, which includes integrating ESG considerations across the fund's investments.

CLIMATE CHANGE INVESTMENT STRATEGY

How We Invest

Matt Whineray and Anne-Maree O'Connor

Preface

The New Zealand Superannuation Fund was established to help reduce the future tax burden of universal pensions for New Zealanders.

We began considering the implications of climate change more than 10 years ago. Over time our analysis, supported by independent research, determined that climate change is an investment risk and, as a prudent investor, that we needed to address that risk. We therefore developed a climate change investment strategy. This paper sets out our strategy, how we have implemented it and some of the frameworks we have used.

- Matt Whineray, chief executive officer

Introduction

Why we started to think about climate change

Climate change represents one of the largest economic and political challenges of the 21st century. Nations, individually and collectively, are developing policy responses to mitigate or manage the risks posed to society.

The context has moved on from debate about the science of cli-

mate change to action. As international policy commitments have strengthened, discussions about the implications of climate change for investors and asset owners have deepened.

The combination of policy commitments, technological advances, and societal preferences mean that global energy systems will change over coming decades. The world will become less reliant on fossil fuels. When and how these changes occur is uncertain.

At the Guardians, we began to consider our responsibilities in relation to climate change more than 10 years ago when we joined the international Carbon Disclosure Project, which encourages business to measure and understand their environmental impact. In following years our focus was on considering how climate-related risks might affect the fund and future returns. We considered climate change from a thematic perspective, which led to a strategy to invest in alternative energies. We also worked from first principles, considering our obligations under our investment mandate and what an analytical approach to the impact of climate change on global investment would reveal.

Along with a group of other investors, the Guardians commissioned global investment consultants Mercer to provide an analysis of climate change scenarios on portfolio risks and returns. The model looked at the impact on returns over a horizon of 35 years, to 2050, based on different scenarios.

**The quote**

Climate change presents a risk for which we believe we will not be rewarded. It is good practice to remove uncompensated portfolio risks.

Based on this and other academic and industry research, we concluded that the market currently underprices carbon risks—a shorthand for the various risks posed by the impact of climate change—over the long time horizon that matters for the Guardians’ investment purposes. As a prudent investor that avoids undue risk, we need to address these climate-related risks.

In 2016, we announced a strategy with a goal to make the portfolio more resilient to these risks. One element of the strategy meant we reduced our holdings in some segments of the market through which we were most exposed to climate change risk. Specific targets were set to reduce the carbon emissions intensity of the fund and potential emissions from reserves by 2020. The result is that the fund’s carbon foot-print is measured each year so that we can track progress against our targets to reduce its exposure to emissions and carbon reserves.

The context**Investment mandate, endowments and investment beliefs**

The New Zealand Superannuation and Retirement Income Act 2001 requires the Guardians to invest the fund on a prudent, commercial basis and, in doing so, to manage and administer the fund in a manner consistent with:

- a) Best-practice portfolio management; and
- b) Maximising return without undue risk to the fund as a whole; and
- c) Avoiding prejudice to New Zealand’s reputation as a responsible member of the world community.

We have a set of endowments and investment beliefs that guide our investment process. Our endowments are the strengths or advantages that have been given to us by virtue of the fund’s mandate and the way it was established. These include advantages such as our long horizon, known liquidity, clear mandate and operational independence.

Our investment beliefs are the foundations of our investment approach. For example, we believe clear governance and decision-making structures that promote decisiveness, efficiency and accountability are effective and add value to the fund. We believe investors with a long horizon can outperform more short-term focused investors over the long run. We also believe that responsible investors must have concern for environmental, social and governance (ESG) factors because they are material to long-term returns. These beliefs, and others, inform all of our investment decisions. The fund has a well-established and integrated Responsible Investment Framework.

The fund is managed using a ‘reference portfolio’ approach. The structure of the reference portfolio is determined by the board and is designed to achieve all three legs of our investment mandate. It serves as our default portfolio and the benchmark against which we can measure how much value is added through active investment strategies. Because of the fund’s long horizon, the board

has determined that the reference portfolio should 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 by the Guardians within strict risk parameters set by the board.

Global and domestic context

International debate about climate change has followed a tortuous path since the issue was first flagged, but the momentum for change has increased. Over the past three years debate has moved on to more meaningful action.

Bank of England Governor Mark Carney said, in a 2015 speech to Lloyd’s of London, that climate change will lead to financial crises and falling living standards unless countries and companies take action on greenhouse gas emissions. He said insurers were heavily exposed to climate change risks and that time was running out to deal with global warming. Insurers feel the effects both on the liability side (increased claims) and the asset side (impact on returns).

“Climate change is the tragedy of the horizon. We don’t need an army of actuaries to tell us that the catastrophic impacts of climate change will be felt beyond the traditional horizons of most actors – imposing a cost on future generations that the current generation has no direct incentive to fix,” he said.

The Paris Agreement in December 2015 brought most of the world’s nations together to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries. The central aim of the Paris Agreement is to keep a global temperature rise this century to below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C.

The Paris Agreement has been ratified by 184 countries, including the European Union. Although the United States has served notice that it will withdraw as soon as it can legally do so (November 2020), the agreement has international momentum. Rules for implementation were agreed at a meeting in Poland in 2018, including a requirement for countries to be transparent about their emissions and progress towards emissions reduction targets.

In 2015, the Financial Stability Board set up a Task Force on Climate-related Financial Disclosures. A prestigious group, chaired by Michael Bloomberg, it has developed voluntary, consistent climate-related financial disclosure guidelines for use by companies in providing information to investors, lenders and insurers.

In New Zealand, the Government signed and ratified the Paris Agreement in 2016. The current coalition Government has committed to reducing the country’s greenhouse gas emissions 11% below 1990 levels by 2030, and has declared its intention to play a leadership role in the global endeavour to limit global warming to 2°C by the end of this century. It has also conducted extensive public

consultation on a proposal to reduce New Zealand emissions to net zero by 2050. The Zero Carbon Bill, which will go before Parliament in 2019, would set a greenhouse gas emissions target into law for the first time and establish an independent climate change commission. An interim climate change committee was established in April 2018.

Investment context

The Guardians has followed domestic and international developments closely, particularly developments related to the investment context for a long-term investor.

The transition to a low-carbon energy system has only just begun. In a recent report, Carbon Tracker argued that renewables have been through a phase of innovation since 1980, and predicted that the use of fossil fuels will peak in the 2020s before a period of rapid change from 2030, with renewables overtaking fossil fuels as the world's primary energy source in 2050.

Carbon Tracker predicts that renewables will be cheaper than fossil fuels in every major region of the world by 2020. The driver of change is emerging markets, which will have the highest growth in energy demand over the next 25 years. In 2015, developing markets overtook developed countries in terms of capital expenditure on renewables. In 2017, they spent US\$177 billion on renewable technologies, 1.7 times the spending of developed markets.

The energy transformation is likely to disrupt not only the energy sector, but all industries to different degrees. Examples include the trend towards hybrid and electric vehicles and the growth in wind and solar energy. For investors, this creates substantial risks as well as opportunities. Some assets, such as fossil fuel reserves, may become 'stranded', rendered uneconomic by proper pricing of the carbon pollution externality, made obsolete by new technologies or face a dwindling consumer market.

Investors also need to consider the potential unpredictability of policy initiatives. A coherent, global policy response is unlikely despite the growing momentum that has developed since the Paris Agreement. Instead, industries may be at risk from a patchwork of unpredictable and potentially heavy-handed regulatory interventions. Policies may not be well coordinated across countries, further raising the cost of doing business. It would be as unwise for investors to assume an efficient and well-thought-out response as it would be to ignore climate change risks altogether.

The impact of climate change on asset classes and investment returns is uncertain in both magnitude and timing. There are, for example, downside risks that come from a structural shift to a lower-carbon economy for unprepared investors. There are tangible risks of higher physical damages to real assets (e.g. agriculture, timber, infrastructure and real estate). Equally, it is likely that there will be rapid changes in relative prices, technology and mispriced assets that create investment opportunities for the prepared and long-horizon investor.

In 2016, we interviewed a range of energy market analysts and experts to understand how they valued listed energy companies. At that time, we found:

- Oil and gas valuations were based on projected cash flows from proven reserves which were expected to be monetised within 10 to 15 years. In assuming this, markets are betting that there will be no significant policy action for some time.
- Analysts priced fossil fuel assets as if a 2oC scenario would not apply;

- Consideration of global or national carbon budgets did not feature;
- Carbon regulatory risk was not explicitly factored into company valuations unless there were tangible measures in place in relevant markets;
- Carbon risk was judged immaterial in the timeframe of proven oil and gas reserves;
- Analysts believed host country governments had a vested interest in the profitability of oil and gas companies;
- The timeframe for carbon risk to impact oil was perceived to be longer than for coal because there was no established alternative transport fuels;
- Gas was viewed by many to be an important bridge fuel in the low-carbon economy transition;
- Other market fundamentals were considered to be more important than climate change in terms of valuations.

We still hold the view that impacts related to climate change are not efficiently priced at present.

Until recently, much of the discussion about managing climate change, stranded assets in particular, has focused on divesting from companies in the fossil fuel sectors. Divestment reduces an investor's exposure to the potential carbon risk, but also simply shifts that risk to another investor. Our view is that divestment is just one means of influencing the change in company behaviour necessary in the energy sector and is insufficient to impact global warming on its own. Divestment also means forgoing the rights of an owner to demand change. We are seeing an increasing number of shareholder resolutions targeting fossil fuel companies. These resolutions generally ask companies to assess and disclose the financial risks that climate change poses for their business plans and to outline their strategy for resilience under a carbon-constrained future.

There are also a growing number of investor-led collaborative initiatives on climate change, including the Montreal Carbon Pledge, the Transition Pathways Initiative and the Investor Group on Climate Change, as well as the Task Force for Climate-related Financial Disclosures.

Mercer research

Mercer produced its first work on climate for institutional investors in 2011, looking at what types of risk climate change represents to investors, how these risks could be measured and assessed and how they might be managed.

The Guardians joined other global institutional investors to commission a further report into the investment implications of climate change in 2014. One of the objectives was to help investors identify ways to hedge against climate risks during the transition to a lower carbon economy.

The study, *Investing in a Time of Climate Change* (2015), was framed by four climate scenarios with distinctive economic and market impacts, modelled out 35 years to 2050. The study related these scenarios to the risk and return characteristics of key asset classes, regions and sectors.

The four scenarios are based on climate modelling and scientific literature and provide a view of the different ways the following 35 years might play out. These are a transformation scenario (strong climate-mitigation action, global warming limited to 2oC above pre-industrial levels this century), co-ordination (policies and actions aligned, global warming limited to 3oC) and fragmentation scenar-

ios (limited climate-mitigation action, 4oC warming) with lower or higher economic damages.

The report found that key downside risks come either from structural change during the transition to a low-carbon economy, where investors are unprepared for change, or from higher physical damages.

The modelling demonstrated:

1. Climate change, under the scenarios modelled, will inevitably have an impact on investor returns, and so should be viewed as a new return variable.
2. Industry sector impacts will be the most meaningful. For example, depending on the scenario that plays out, annual returns from coal could fall between 18% and 74% over the next 35 years. Conversely, renewables could increase by between 6% and 54%.
3. Asset class return impacts could be material. Growth assets are more sensitive to climate risks than defensive assets. The analysis indicated that global equity returns were negatively affected in all four scenarios.
4. A 2oC scenario does not have negative return implications for long-term diversified investors at a total portfolio level by 2050 and is expected to better protect long-term returns beyond this timeframe.

The report said that investors could be in the best position to be resilient to climate change impacts by embedding climate change considerations in the investment process. The next step is portfolio-oriented activity, including risk and opportunity assessments, new investment selection/weights and enhanced investment management and monitoring.

“Investors have two key levers in their portfolio decisions – investment and engagement. From an investments perspective, resilience begins with an understanding that climate change risk can have an impact at the level of asset classes, of industry sectors and of sub-sectors. Climate-sensitive industry sectors should be the primary focus, as they will be significantly affected in certain scenarios.”

Investors also have numerous engagement options, with companies in their portfolios and with external managers, as well as with policymakers.

NZ Super Fund's climate change strategy

Taking into account the Mercer research, along with the investment and international context, the Guardians arrived at the following views:

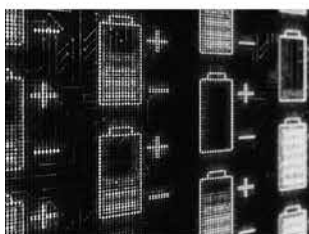
- Climate change is a market and policy failure. Markets are producing too many emissions and are over-invested in fossil fuels, given the international context.
- We believe carbon risk is underpriced partly because the time horizon over which the effects will manifest is too long for most market analysts—but it is relevant for the time horizon that matters for the fund. There is also significant uncertainty around which path the world will follow and different risks have different impacts, depending on the path taken.
- Risk arises from:
 - The supply and demand changes from substitution, higher cost structures, consumer preference and regulation;
 - Physical damage or disruption to industries and economies,
 - Inability to adapt at reasonable cost over a reasonable period.
- Climate change presents a risk for which we believe we will not be rewarded. It is good practice to remove uncompensated portfolio risks.
- Climate change is different from other investment themes, such as demographics. It has multiple drivers across technological change, resource and physical impacts, and policy actions. It encompasses both listed and alternative assets, but it impacts them in different ways. It requires a shift in energy which affects all sectors. It is an inter-generational and cross-boundary issue, one which requires (and is seeing) significant co-ordination across countries.
- Climate change offers opportunities for investment as well as risk, with the development of more energy-efficient and alternative technologies for example.

Analysis of our portfolio showed that the fund's largest climate change exposure was through our passive listed global equity holdings. These holdings have a very wide geographic spread, and included investments in high carbon-emitting sectors. We concluded that reducing exposure to climate risk offers a low-cost insurance policy. If we are right that markets underprice carbon risks, then reducing our exposure to the most at-risk assets is likely to improve the portfolio's long-term risk adjusted returns.

On the other hand, if it turns out that markets have been efficiently pricing these risks all along, then we would have sold some fairly-priced assets and swapped them for other fairly-priced assets. The impact on returns will be minimal over the long term, with the main cost being a minor reduction in portfolio diversification.

Accordingly, we concluded that ignoring climate change in our

Figure 1. Four scenarios



Transformation



Coordination



Fragmentation
(low damages)



Fragmentation
(high damages)

investment decisions would constitute taking 'undue risk' and that climate change must be factored into the Guardians' decision making on an ongoing basis. This entails managing and monitoring the carbon-intensity of the fund, including passive investments in the reference portfolio, managing climate risk in the actively-managed portfolio, and looking to take advantage of the long- horizon investment opportunities that arise from climate change.

The Guardians' strategy in responding to climate risk has four legs: reduce, analyse, engage and search (see Figure 2). It seeks to achieve two targets by 2020:

- Reduce the carbon emissions intensity of the fund by 20%, relative to the original reference portfolio; and
- Reduce the carbon reserves of the fund by 40%, relative to the original reference portfolio.



Carbon emissions intensity is defined as measured tonnes of CO₂e/\$m sales = tonnes of carbon emissions divided \$m of company sales. This measures the portfolio in terms of carbon emissions per unit of output and provides a measure of the overall efficiency of the portfolio by comparing emissions with the economic activity that produces them. This metric is robust to movements in market valuations.

Fossil fuel reserves are defined as potential future emissions: measures tonnes of CO₂e/\$m invested = tonnes of carbon emissions divided by \$m invested. This measures the carbon equivalent emissions stored in fossil fuel reserves that would be released if those reserves were used in the future, relative to the dollars invested. MSCI ESG research uses the Potsdam Institute methodology to calculate the potential emissions, expressed as tonnes of CO₂e, which would be emitted if all stated reserves (both proved and probable) were produced and used.

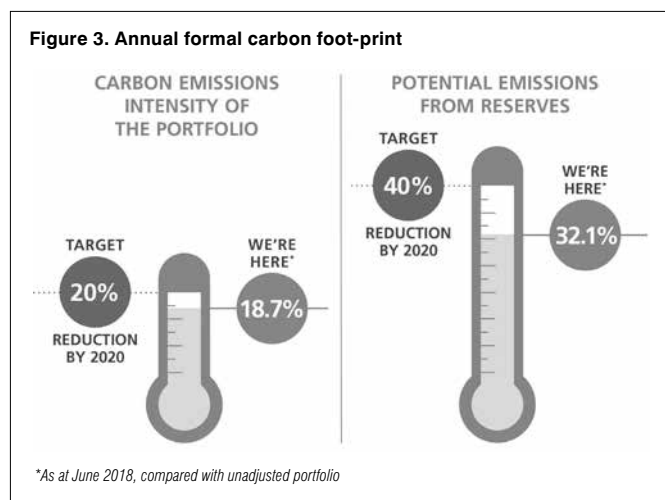
Reduce exposure

This strategy is to reduce the fund's exposure to companies that are most at risk from climate change policy through their emissions or fossil fuel reserves.

Our first priority was to reduce the carbon intensity of our passive global equity portfolio; this was achieved by June 2017 through the application of a bespoke methodology that resulted in holdings in selected companies being sold and funds being reallocated across the rest of the portfolio.

We then turned to the fund's actively managed equity holdings, including our equity factor mandates, with further carbon reductions made by June 2018. We continue to focus on reducing carbon exposures in this part of the portfolio, in our synthetic exposures as well as in Fund's unlisted assets.

A formal carbon foot-print is completed annually, allowing us to measure ourselves against our baseline targets. At our financial year end in June 2018, the carbon emissions intensity of the fund was 18.7% lower, and potential emissions from reserves were 32.1% lower, relative to an unadjusted reference portfolio (see Figure 3).



Analyse

The analyse stream means that we incorporate climate change into our analysis and decision making toolkit. We completed a framework for investment professionals to incorporate climate change considerations into asset valuations. The objective is to ensure climate change risk for new and existing investments is assessed in a consistent and systematic manner. The framework was approved by the investment committee and will be refined on an ongoing basis. We are working on scenario modelling to add to our valuation tool-kit.

The climate valuation framework uses six lenses to assess how assets might be affected by the climate transition:

- **Technology** – Disruption driven by the development of technology to support a low-carbon economy;
- **Resource availability** – Slow onset shifts in everyday environmental factors;
- **Physical damages** – The impact of acute, extreme weather events;
- **Policy** – Increased costs and complexity from policies and regulations designed to limit the long-term effects of climate change and to encourage sustainability;

- **Demand and supply** – Changes in economic and social factors affecting demand and supply;
- **Liability** – Parties who have suffered loss or damage from the effects of climate change seek compensation from those held responsible.

Engage

The engagement work stream means that we engage with companies, managers and policymakers. By being an active shareholder we can seek better climate risk management, adaptation and disclosure in investee companies.

Our Responsible Investment and External Investments and Partnerships teams have together reviewed the climate engagement work conducted by our listed equity investment managers. In addition, all managers were asked about their climate change activities through the ESG due diligence questions sent out in April 2018. We established voting guidelines on climate change and now vote all of our shares globally in a consistent way. We will disclose voting decisions on our web site, consistent with our commitment to best-practice governance and transparency.

We have made a number of submissions on climate change. Copies of submissions made are available on our website. The Guardians is a member of the Investor Group on Climate Change; Climate Action 100 initiative; and One Planet Sovereign Working Group.

Search

The reduce, analyse and engage work streams are mostly about managing the risk of climate change in our portfolio. The search work stream is about taking advantage of opportunities presented by the transition to a low-carbon energy system. In the search work stream, the fund has reviewed opportunities including green buildings, protein replacement and agricultural technology. We continue to search for investments within our alternative energy opportunity set. We have invested in developing wind and solar generation in the U.S., in energy efficiency opportunities through electrochromic glass

producer View Glass, and in alternative energy producers such as Lanzatech, which produces alternative fuels from waste gases. More broadly, we have invested in Rubicon Global, a United States waste management and technology platform, with a vision to divert waste from landfill to recycling. Environmental benefits include a reduction in landfill methane emissions.

We also seek and assess opportunities in energy efficiency, transformational infrastructure, transport, resource and land management. In assessing new opportunities we continue to maintain our investment discipline as we would with any potential investment.

Summary

We believe that financial markets currently underprice carbon risk over the horizon that matters for the Guardians' investment purposes. Our own research and experience as investors makes us confident that, because the time horizon involved is so long, climate risk has been under-appreciated, if not largely ignored, by many investors and analysts. Changes to policy and technology are likely to pan out over multiple decades. These risks – from policy, technology and society – can be and must be managed.

In the current context, reducing exposure in the reference portfolio whilst maintaining diversification is a low-cost insurance policy for the fund. Reducing the fund's exposure to these risks is good for the portfolio, and is consistent with our mandate. The fund could suffer opportunity cost by being on the wrong side of dramatic policy and technology shifts, therefore we are building our capability and maintaining an agile approach as the market evolves. We are also active in seeking investment opportunities created by the transition to a low-carbon energy system.

We have taken an investment-based approach to the risks that arise from climate change. Looking ahead, Government policies, the societal context, and the physical and investment risks will evolve. Our strategy will also continue to evolve.

We report on our progress in implementing our climate strategy each year in our annual report. **FS**