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INVESTING IN A TIME OF CLIMATE CHANGE

GUARDIANS OF NEW ZEALAND SUPERANNUATION FUND (NZ SUPER) PORTFOLIO CLIMATE RISK ASSESSMENT

October 2015

MARSH & McLENNAN COMPANIES

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Executive Summary

The Guardians of New Zealand Superannuation Fund (NZ Super) has recently partnered with Mercer and 17 other participants in a research study ("the Study") to gain further insights into the investment implications of climate change. The timing is no coincidence: 2015 is a critical year, with global governments meeting in Paris in December to negotiate a new global climate change agreement.

Climate change is an environmental, social and economic risk, expected to have its greatest impact in the long term. But to address it, and avoid dangerous temperature increases, change is needed now. The extent to which this change will occur is an open question.

To seek to quantify the risks and opportunities which arise in a time of climate change, and appropriate actions as a result of them, the Study has brought together a cross-section of the global investment industry including asset owners, investment managers, insurance companies and private banks. The Study also benefitted from the input of an advisory group comprised of renowned experts in the fields of investment and climate finance. Appendix C provides a list of participants.

The public report – *Investing in a Time of Climate Change* – provides a comprehensive review of the Study's research, methodology and findings. This report includes a short overview of the Study in Appendix D, but is focused on the key findings and implications for NZ Super.

NZ SUPER – ACTIONS AND MOTIVATIONS

NZ Super has already taken a number of steps in managing environmental, social and governance (ESG) risks and opportunities. NZ Super has:

- A long-standing commitment to Responsible Investment, as outlined in the publically available Framework, which aligns with the UN Principles for Responsible Investment (PRI). This is a framework for integration throughout the investment process, including investment manager monitoring.
- Established a number of ESG-related investment beliefs.
- Added climate specific expertise to the team and begun an extensive climate change project to review climate integration across its activities.

The motivations for joining the Study were to:

- Gain a broader understanding of climate risk and opportunity, and how these interact with the asset classes and sectors to which NZ Super has exposure.
- Determine portfolio specific climate positioning for NZ Super, identifying relevant risks and opportunities.
- Develop a series of specific steps which NZ Super can take to evolve its investment approach in the context of climate change, in order to optimise risk-adjusted returns for members over the long term.
- Work collaboratively with others to progress an approach to climate risk and opportunity – a topic too rich and complex to solve as a single organisation.

NZ Super also has legislated guidelines to avoid prejudice to New Zealand's reputation in the world community. Participation in this Study aligns with New Zealand's climate change commitments and ambitious INDC's ahead of the 21st Conference of the Parties in Paris in December.

KEY FINDINGS FOR NZ SUPER

This report provides the estimated return implications under the four climate scenarios and four climate risk factors, modelled between 2015 and 2050, with commentary on the implications for NZ Super. Portfolio impacts are considered across the total fund, at the asset class and industry sector levels.

The four climate change scenarios and the four risk factors are explained in detail in Appendix D but can be summarised as follows:

CLIMATE SCENARIOS:

1. *Transformation*: More ambitious climate-change mitigation action that puts us on a path to limiting global warming to 2°C.
2. *Coordination*: Policies and actions are aligned and cohesive, keeping warming to 3°C.
3. *Fragmentation (Lower Damages)*: Limited climate action and lack of coordination result in warming rising to 4°C.
4. *Fragmentation (Higher Damages)*: As above, coupled with assumed higher damages.

CLIMATE RISK FACTORS (TRIP FACTORS):

1. *Technology*: Broadly defined as the rate of progress and investment in the development of technology to support the low-carbon economy.
2. *Resource Availability*: Defined as the impact on investments of chronic weather patterns (e.g. long-term changes in temperature or precipitation).
3. *Impact of Physical Damages*: Defined as the physical impact on investments of acute weather incidence/severity (i.e. extreme or catastrophic events).
4. *Policy*: Broadly defined as all international, national, and sub-national targets; mandates; legislation; and regulations meant to reduce the risk of further man-made or “anthropogenic” climate change.

The key findings from the NZ Super portfolio analysis were as follows:

1. Total portfolio climate impacts on return for NZ Super range from -0.10%p.a. to -0.37%p.a. for the current asset allocation and from -0.09%p.a. to -0.55%p.a for the reference portfolio, for different scenarios over 10 and 35 years.

2. The current approximately 65% exposure to developed markets, emerging markets, and New Zealand equities could be better positioned under a Transformation (2°C) scenario, although the current portfolio is better positioned than the reference portfolio.

3. The actual return impact on the approximately 8% private equity allocation will depend on the underlying exposures, particularly in the case of a Transformation scenario.

4. The return impact on the combined 9% current exposure to timber and agriculture will also depend on the underlying location exposures, with differing impacts expected for each of the four climate risk factors over various time periods.

5. NZ Super’s regional equity exposure has a significant overweight Energy position, which is expected to be the most negatively impacted by climate change, and an overweight position to the Health sector, which is expected to be positively impacted by climate change.

RECOMMENDATIONS FOR NZ SUPER

The Study recommends integrating climate considerations to achieve sustainable growth within the investment process, following a Beliefs, Policies, Processes and Portfolio framework. The Recommendations section of this report, Table 3, captures which of the Study's action recommendations NZ Super has already addressed, and where, given the findings, NZ Super could focus its next actions alongside other portfolio considerations.

We understand that recent appointments, such as Justine Sefton who brings climate specific expertise to the NZ Super Climate Change Project (the CC Project), will continue to evolve NZ Super's progress in integrating climate considerations within the investment process.

Of the recommended actions, we expect the following should be given the greatest priority for NZ Super to consider, recognising that a number of these are already on the list as part of the CC Project:

- **Beliefs and Processes**: Recognising climate explicitly within: existing Investment Beliefs; the Responsible Investment Framework; voting and engagement; and stakeholder reporting. Also considering adding the Montreal Pledge to the current industry initiatives that NZ Super participates in.
- **Portfolio Risk Assessment:** NZ Super has already commissioned carbon analysis from MSCI for equities and is looking at other providers for other parts of the portfolio. We recommend that this includes an environmental and climate resilience assessment of timber and agriculture holdings (directly, or by requesting external managers to undertake this), as well as real estate and infrastructure investments.
- **Portfolio Risks and Opportunities:**
    - Passive Equities: Reallocate a portion of the significant passive equities exposure to a low-carbon alternative. See Appendix A.
    - Active equities: Ensure the overweight Energy industry sector is understood within the regional equity exposure. Consider introducing a thematic strategy focused on sustainability. Opportunities cover both mitigation and adaptation themes, including low-carbon investments, clean energy, water, agriculture, and broad sustainability themes. See Appendix B.
    - Review whether current exposures to emerging markets could be increased.
    - Niche exposures: A potential increase in the current allocation to insurance-linked securities and catastrophe bonds, bearing current valuations in mind.

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Analysis & Key Findings

Mercer has reviewed the climate risk exposures for NZ Super using our TRIP factor framework and considering the portfolio impacts under the four climate change scenarios. Results and commentary specific to each asset allocation are provided in the following pages, focusing on the following levels:

1. Total portfolio
2. Asset class
3. Industry sector

KEY FINDINGS

1. Total portfolio climate impacts on return for NZ Super range from -0.10%p.a. to -0.37%p.a. for the current asset allocation and from -0.09%p.a. to -0.55%p.a for the reference portfolio, for different scenarios over 10 and 35 years.

For the purposes of quantifying potential total portfolio impact, we assessed the aggregate impact of the TRIP factors under each climate scenario. NZ Super is reasonably well positioned under the Coordination and Fragmentation scenarios, but is potentially vulnerable under a Transformation scenario over the coming decade – where there could be a -0.37% p.a. impact on returns. The portfolio is less adversely affected under the other scenarios, but even the Coordination scenario, which has the least impact, is still expected to be -0.19% p.a. over ten years.

Over a 35 year period, the Transformation impact is reduced to -0.17% p.a. and is no longer the highest impact scenario. Fragmentation (Higher Damages) is expected to have a -0.23% p.a. impact on median returns over the 35 year time period, which is expected to become more significant beyond 35 years (as physical impacts increase).

If a Transformation scenario eventuates, the cumulative impact over ten years for every $1 billion could be a $68 million reduction. $1 billion could reach $2 billion with a 7.17% p.a. expected return versus reaching $1.93 billion with a 6.80% p.a expected return (i.e. 7.17% minus 0.37%).

2. The approximately 65% exposure to developed markets, emerging markets, and New Zealand equities could be better positioned under a Transformation scenario[1], although the current portfolio is better positioned than the reference portfolio.

Given the scale of response required to transform the economy onto a low-carbon pathway, the impact of the TRIP factors on investment portfolio returns is strongest under the Transformation scenario.

Under this scenario:

- Both global developed market equities and New Zealand equities are expected to be negatively impacted. NZ Super can seek to address these risks by
    - Re-allocating a portion of the more than 80% passive equities exposures towards lower-carbon indices
    - Allocating a portion of active equities towards thematic manager(s) focused on sustainability and the low-carbon economy
- NZ Super could also look to increase the weight of emerging market equities, which are expected to be positively impacted under a Transformation scenario, or take other steps to further diversify its growth assets.

3. The actual return impact on the approximately 8% private equity allocation will depend on the underlying exposures, particularly in the case of a Transformation scenario.

- The estimated climate impact on returns for private equity is negative under Transformation, and marginally negative under the other scenarios.
- However, our analysis assumes a diverse range of private equity exposures and does not break out clean tech or other environmentally driven strategies, which would have positive Policy and Technology responses.
- Reviewing the underlying exposures in light of the climate risk factors is recommended for NZ Super.

[1] This is the most ambitious climate policy scenario, which is intended to keep temperature increases to within 2 degrees above pre-Industrial levels by 2100.

4. The actual return impact on the combined 9% current exposure to timber and agriculture will also depend on the underlying location exposures, with differing impacts expected for each of the four climate risk factors over various time periods.

- The impacts of climate change would be region specific, but overall, we would expect positive Policy and Technology responses in a Transformation scenario. For timber this is based on an increase in the price of timber product prices, land values, and the premium attached to carbon trading-related activities, plus a shift towards more sustainable forestry products, although compliance and monitoring costs may increase. For agriculture, policies are expected to promote sustainable crop methods, reducing the risk of disrupted production and substantial capital is expected to be made available to assist emerging market countries with respect to adaptation in farming methods.
- Resource Availability and Impact are, however, expected to have negative impacts under the other scenarios, particularly Fragmentation (Higher Damages) over time, with drought having the greatest impact.

5. NZ Super's regional equity exposure has an overweight to Utilities, Materials, and Industrials which are expected to be the most negatively impacted by climate change, and an overweight position to the Health sector, which is expected to be positively impacted by climate change. Underweight positions are held in other sectors expected to have negative climate change impacts, such as Energy in particular.

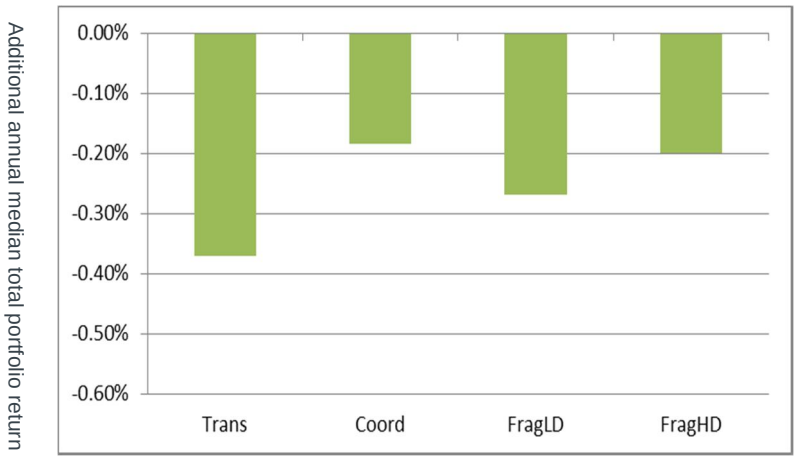
- NZ Super should ensure that the underlying holdings within sectors expected to have negative impacts are well understood internally and discussed with appointed investment managers, given the potential risk in this sector.

1. TOTAL PORTFOLIO RETURN IMPACTS BY SCENARIO

For the purposes of quantifying total fund impact, we have assessed the aggregate impact of each scenario on the NZ Super current allocation and reference portfolio, as shown below. This highlights NZ Super's vulnerability under a Transformation scenario over 10 years, given the current allocation is dominated by equities and growth oriented assets, but a consistent return drag is expected across all scenarios, with the greatest impact over 35 years under a Fragmentation (Higher Damages) scenario.

FIGURE 1: ANNUAL MEDIAN RETURN IMPACT OVER 10 (TO 2025) YEARS

Current Portfolio

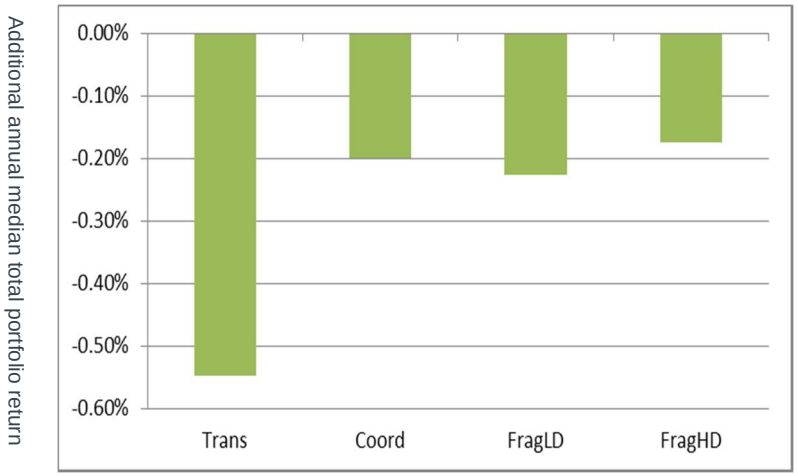


A Transformation scenario, particularly over the coming decade, could see a -0.37% p.a. impact on median returns, assuming no changes are made to current exposures.

In this scenario, the cumulative impact over ten years for every $1 billion could be a $68 million reduction (i.e. 7.17% pa return minus 0.37% pa).

The portfolio is less adversely affected under the other scenarios, but even the Coordination scenario, which has the least impact, is still expected to be -0.19% p.a.

Reference Portfolio

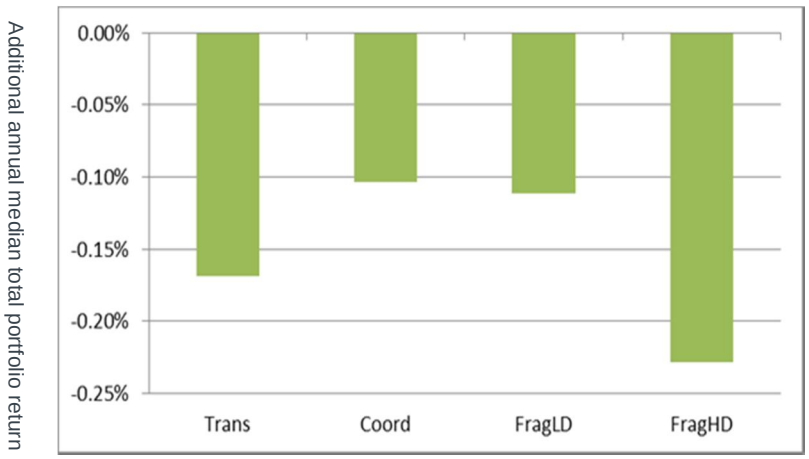


A Transformation scenario would have a significantly higher return impact on the reference portfolio, which could be a -0.55%p.a. impact on median returns.

There is a consistent return drag under the other scenarios of around -20%p.a, which is similar for the current portfolio.

FIGURE 2: ANNUAL MEDIAN RETURN IMPACT OVER 35 (TO 2025) YEARS

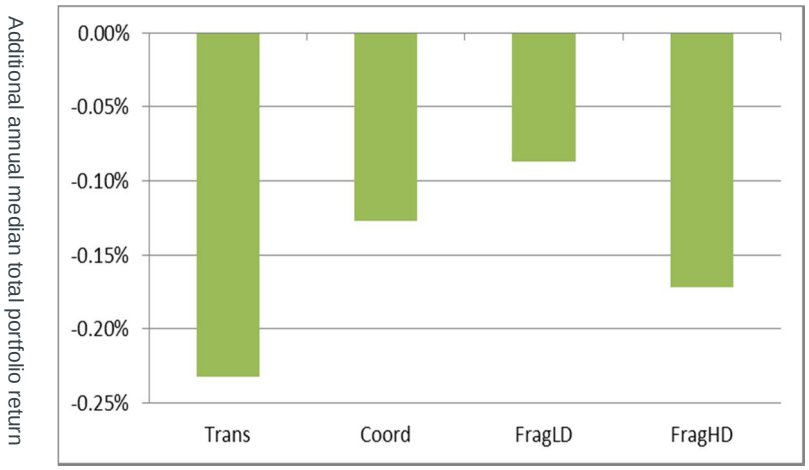
Current Portfolio



Over a 35 year period, the Transformation impact is reduced to -0.17% p.a.and is no longer the highest impact scenario.

Fragmentation (Higher Damages) is expected to have a -0.23% p.a. impact on median returns over the 35 year time period, which is expected to become more significant beyond 35 years (as physical impacts increase).

Reference Portfolio



A Transformation scenario would have a significantly higher return impact on the reference portfolio, which could be a -0.23%p.a. impact on median returns. It also remains as the highest impact scenario. This is driven by the higher Developed Market Equity Exposure versus the current allocation.

There is a return drag under the other scenarios with Fragmentation (Higher Damages) at -0.17%p.a.

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2. ASSET CLASS IMPACTS

The circle charts on the following pages illustrate where asset classes are expected to experience a gain or reduction in returns, when considering climate risk, for the current portfolio.

The black circle represents a total portfolio, with the width of each asset class section representing the respective percentage weighting.

Asset class sections that are expected to experience a reduction in returns under a specific scenario will move towards the centre of the circle, and asset class sections that are expected to experience additional returns will move outwards from the circle.

ASSET CLASS IMPLICATIONS – NZ SUPER CURRENT PORTFOLIO (DATA OVER 10 & 35 YEARS)

- NZ Super could be better positioned for a Transformation scenario. This is driven by the combined approximately 50% exposure to New Zealand and developed market global equity. These losses will be partly offset by potential annual gains in emerging market equity and real assets under this scenario. It should be noted, the more diversified current portfolio is better positioned than the reference portfolio would be.

Negative return impacts at the asset class level – Transformation Scenario

Asset Class	10 year – median annual returns	35 year – median annual returns
Global Equities	-0.82%	-0.42%
Regional (NZ) Equities	-0.72%	-0.44%
Private Equity	-0.83%	-0.48%

  - The negative returns on the above asset classes will be partly offset under the same scenario (**Transformation**) by potential increased returns in the following asset classes:

Positive return impacts at the asset class level – Transformation Scenario

Asset Class	10 year – annual returns	35 year – annual returns
Emerging Market Global Equities	+0.50%	+0.43%
Real Estate (NZD)	+0.45%	+0.35%
Infrastructure	+0.76%	+0.62%
Timber	+0.49%	+0.61%
Agriculture	+0.66%	+0.83%

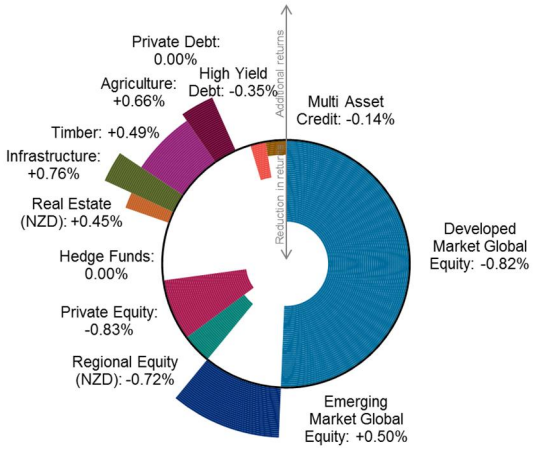
- The Coordination scenario sees less significant annual reductions, with global equities (still -0.30%p.a.) impact on average 10 year returns more negatively exposed to return reductions than New Zealand equities under this scenario. This is because the global and regional equity figures were built from their bottom up sector exposures and New Zealand equities have substantially lower exposure to Energy in particular.
- The Fragmentation scenarios are both negative across all asset classes, with the Higher Damages variant resulting in more negative impacts over the 35 year period, particularly for timber and agriculture, as the Resource Availability impacts become more apparent.

- Under the Fragmentation (Higher Damages) scenario, in the early couple of decades, there will be gains to yields given temperature changes in some regions. To account for this the Resource Availability scripts are actually lower than in Fragmentation Lower Damages through to 2040.This means the combined negative effect of R and I factors are smaller in Fragmentation (Higher Damages) than Fragmentation (Lower Damages) for timber and agriculture for the ten year numbers.
- No climate impact on return is expected for the current 7.5% allocation to hedge funds and minimal impacts to the remaining smaller allocations. This is based on a generic reading of hedge funds. However, given NZ Super has some exposure to Natural Catastrophe Reinsurance, these would be expected to have positive climate sensitivity. More on this is captured in pages 21 and 22 for potential additional opportunities.

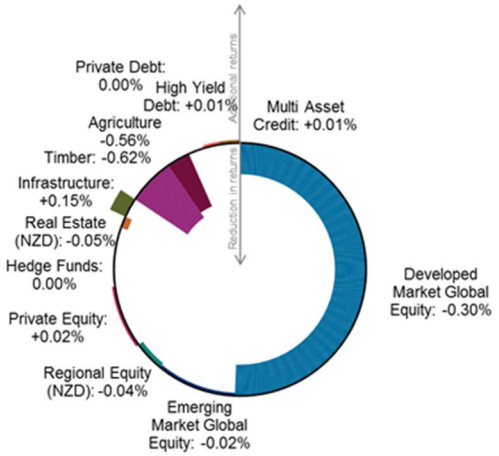
Refer to the Figure 3 and 4 circle charts on the following page.

FIGURE 3: NZ SUPER CURRENT ASSET ALLOCATION (data over 10 years)

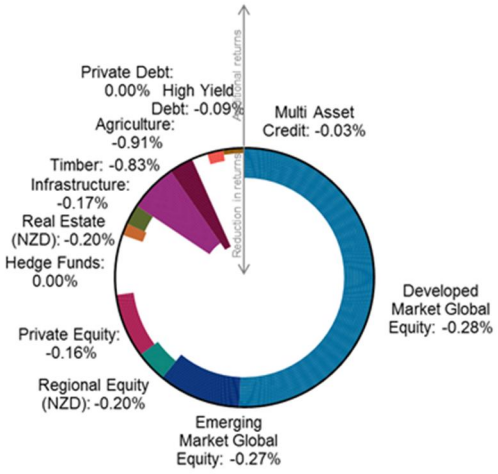
Transformation



Coordination



Fragmentation – Lower Damages



Fragmentation – Higher Damages

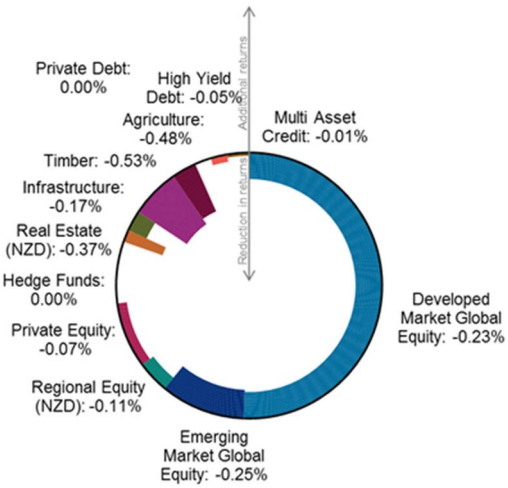
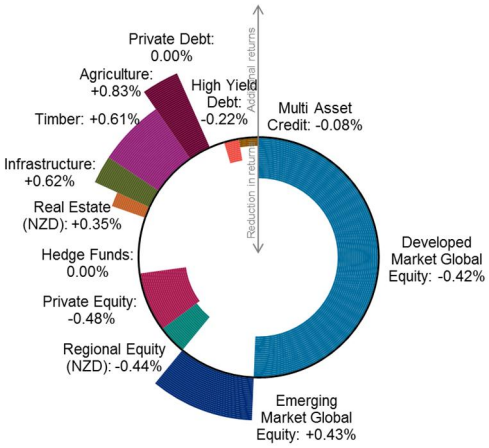
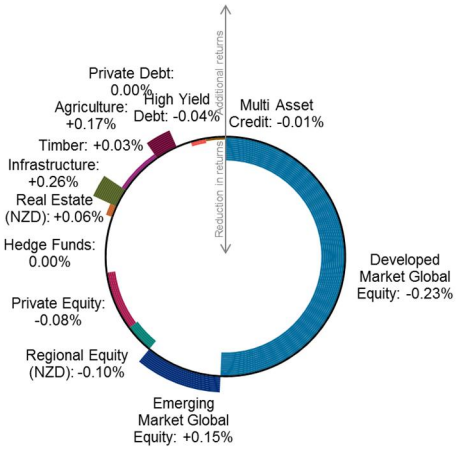


FIGURE 4: NZ SUPER CURRENT ASSET ALLOCATION (data over 35 years)

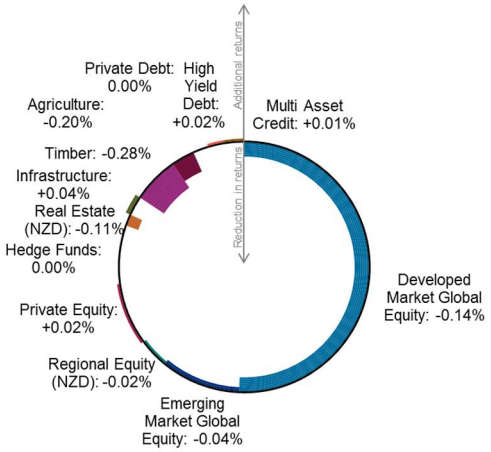
Transformation



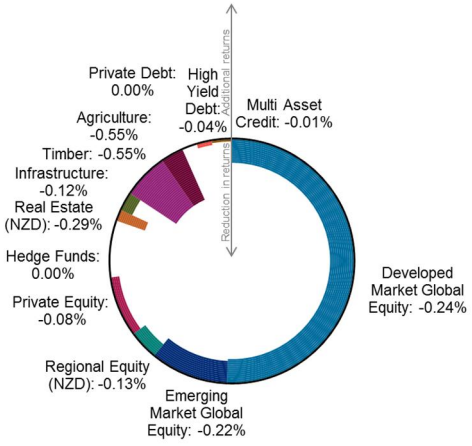
Coordination



Fragmentation – Lower Damages



Fragmentation – Higher Damages



CONSIDERING MITIGATION VS FRAGMENTATION SCENARIOS

- The **Transformation** and **Coordination** scenarios envision stronger levels of mitigation than we see in the Fragmentation scenarios, with the Policy and Technology risk factors representing the most significant influences.

- If NZ Super places a reasonable probability on the likelihood of one of these scenarios eventuating, it should take action to manage the Policy risk in its equity portfolios and seek to gain exposure to the Technology risk factor:

    - If NZ Super is anticipating a **Transformation** scenario, equal focus should be placed on managing Policy risk in domestic and global equities.
    - The Technology factor is a strong signal in both mitigation scenarios, and should lead to positive positioning for companies focused on providing solutions for the low-carbon economy.

- The **Fragmentation** scenarios also see negative impact for equities, but this would be driven more by the Resource Availability and Impact factors. This results in an appropriate focus on environmental risk management versus policy risk management from an equities perspective. The Fragmentation scenarios would also more heavily impact real estate and infrastructure holdings, which warrant increased risk assessment.

Further detail is provided in the recommendations and next steps re managing the potential risks, particularly under a Transformation scenario.

3. INDUSTRY SECTOR IMPLICATIONS

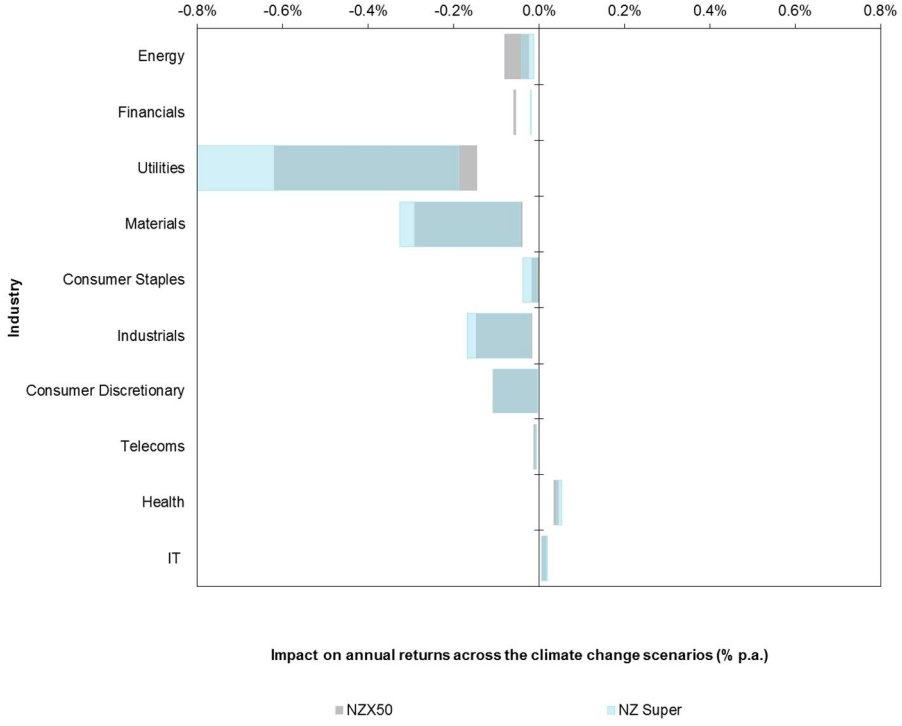
Consistent with the findings in the public report, the impact on different sectors varies widely but can be significant.

NZ Super has around 85% exposure to passive and 15% exposure to active equities across the international and regional (New Zealand) developed market equities exposure. Charts for the regional active manager exposures are below.

The charts show the range, across the four climate change scenarios, of the potential impact on annual median sector returns against benchmark over both 10 years and the 35 year time-frame of the study. The impact figures in these charts reflect a combination of the climate return impact and the weighting for each industry sector. The darker blue shows the overlap between the portfolio sector exposure in light blue and the benchmark exposure in grey.

FIGURE 5: ACTIVE REGIONAL MARKET EQUITIES: INDUSTRY LEVEL ANALYSIS

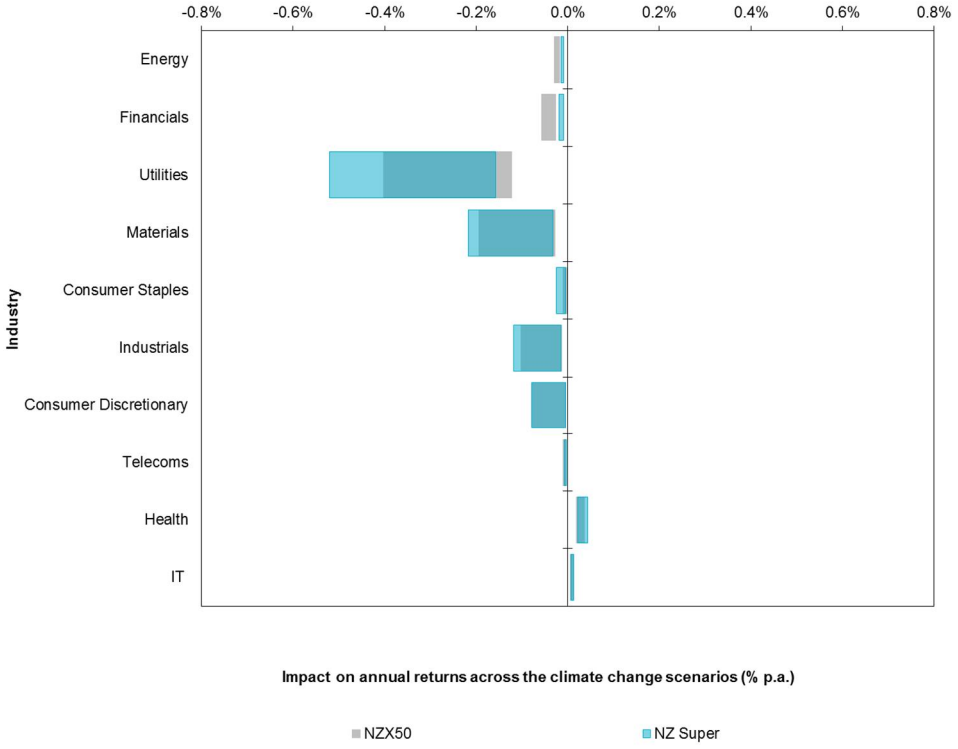
Median annual return impact over 10 years (to 2025)



NZ Super's active regional market equity managers have significantly higher exposure to Utilities, Materials, and Industrials which are expected to be negatively impacted by climate change. An underweight position to Energy, which is also expected to be the most negatively impacted, is positive from a climate perspective.

FIGURE 6: ACTIVE REGIONAL MARKET EQUITIES: INDUSTRY LEVEL ANALYSIS

Median annual return impact over 35 years (to 2050)



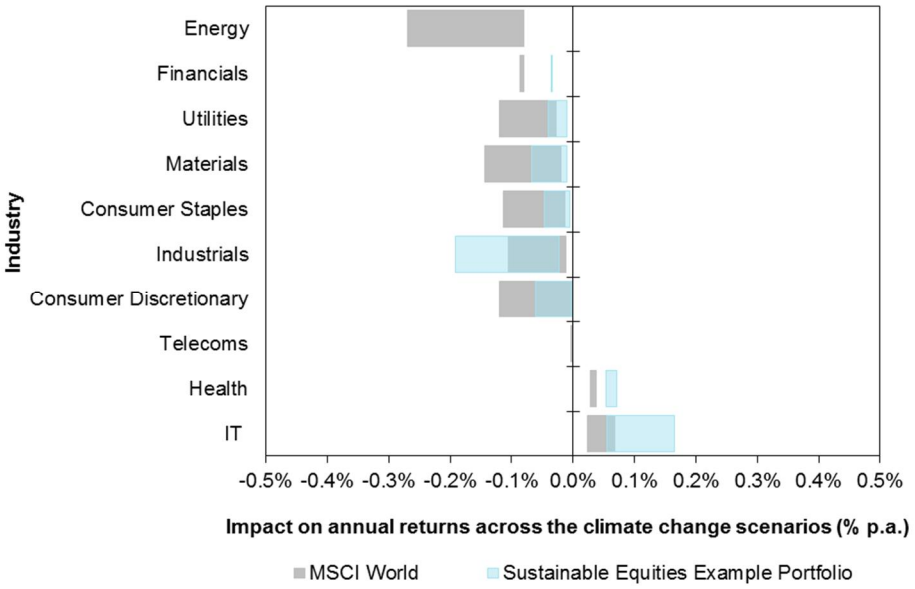
The potential sector impacts narrow over the 35 year time period, but Utilities and Materials are still the largest possible return loss versus benchmark. NZ Super should ensure that the underlying holdings within this sector are well understood.

SECTOR EXPOSURE OF SUSTAINABILITY THEMED MANAGERS

The following chart displays the sector exposure of a group of three global equity sustainability-oriented thematic managers versus the MSCI World. As is apparent, the climate sensitivity of the combined sector weights of these managers is lower than the benchmark, as well as than the combined profile of NZ Super's actively managed equity holdings. This helps to demonstrate the potentially positive influence that the addition of one or more sustainability-oriented managers could have on the overall sector profile of NZ Super's equity exposure.

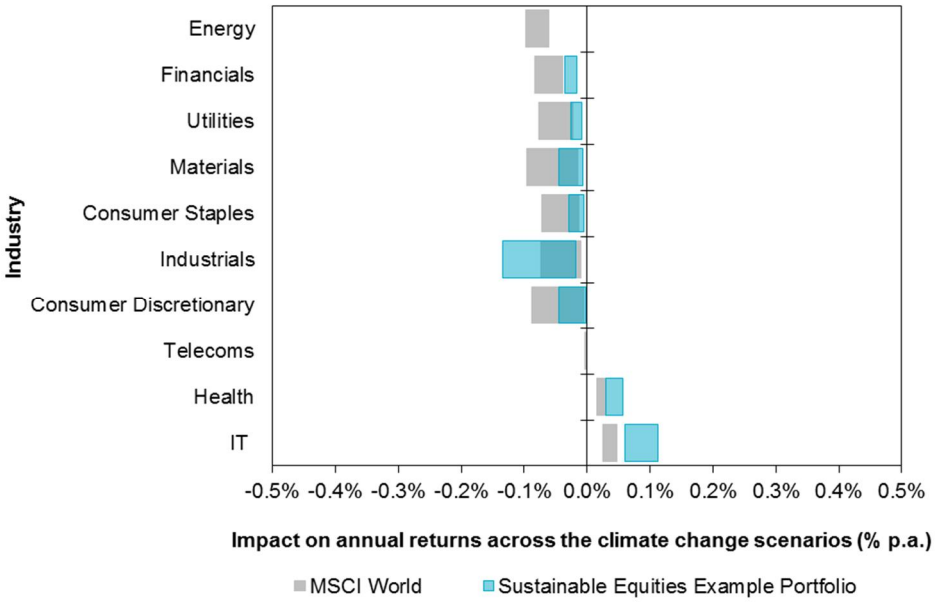
FIGURES 7 & 8: SAMPLE SECTOR PROFILE OF THREE SUSTAINABILITY-THEMED GLOBAL EQUITY MANAGERS

10 years



As is apparent, this group of sustainability themed global equity managers have lower exposure to the sectors that would be expected to be the most negatively impacted by climate change: energy and utilities. The managers are positvely biased towards IT.

35 years



The sustainability themed managers have more exposure to Industrials, wherein stock selection will focus on companies providing solutions to the low-carbon economy.

REAL ASSETS INVESTMENTS – SUPPLEMENTARY ASSET ALLOCATION DETAIL

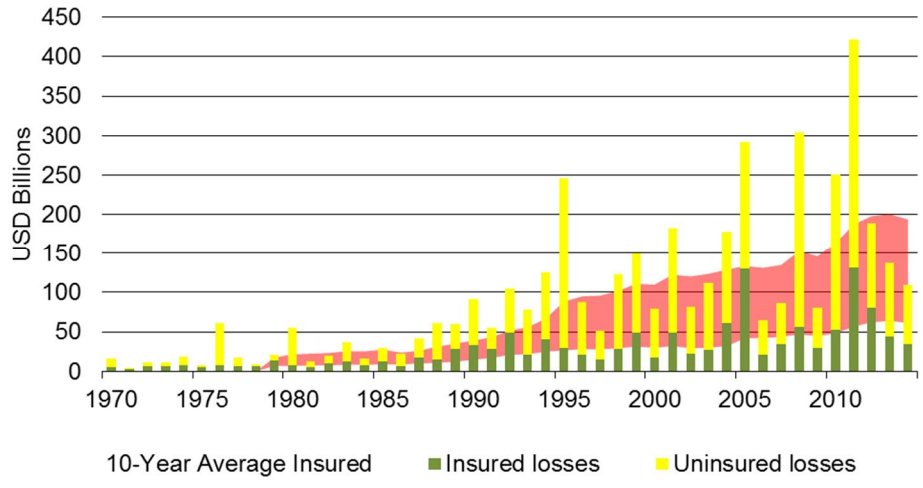
Real asset investments offer investors a variety of attractive attributes, such as a higher return profile than typical fixed income options and a relatively low correlation to broader fixed income and equity markets. However, by virtue of their direct and tangible exposure to the physical manifestations of climate change (short- and long-term weather shifts), the vulnerability of real asset exposures to higher temperature outcomes (e.g. our Fragmentation scenarios) are relatively high versus other asset classes. On the other hand their exposure to climate policy action and resultant investment flows into low-carbon technology is largely positive. Agriculture and timber have the widest-ranging impacts, dependent on the scenario, as they have negative sensitivity to Impact and Resource Availability factors as well as positive Policy sensitivity.

FIGURE 9: REAL ASSET CLASSES – TRIP FACTOR SENSITIVITY

ASSET CLASS SENSITIVITY	T	R	I	P
GLOBAL REAL ESTATE	<0.25	0.00	-0.75	<0.25
INFRASTRUCTURE	0.25	>-0.25	-0.50	<0.25
TIMBER	<0.25	-0.75	-0.50	0.25
AGRICULTURE	0.25	-1.00	-0.50	0.25

Such push and pull results in large return variability across climate scenarios for real assets as depicted by the positive influence of the climate risk factors on Real Estate, Infrastructure, Timber and Agriculture performance under the two mitigation scenarios (Transformation and Coordination), and detraction of returns under the Fragmentation scenarios (as seen in the circle charts). This range of outcomes demonstrates a greater need for monitoring of real asset exposures at the portfolio level to ensure climate change risks – which are in this case largely location dependent – are being monitored and managed.

FIGURE 10: WORLDWIDE UNINSURED CATASTROPHE LOSSES – A WIDENING GAP



Source: Swiss Re Sigma 02/2015

As shown here, the gap between economic and insured losses is widening. Monitoring portfolios for overall exposure to extreme risks and ensuring adequate catastrophe insurance coverages are in place should be a priority going forward.

The manner and method of monitoring these exposures and related protections will differ depending on the manner and method of investment utilised (e.g. direct investment vs. outsourcing to a fund manager and unlisted vs. listed exposures). These real asset classes and related methods of exposure access differ insofar as they have different liquidity and risk/return profiles. The turnover of investments underlying third-party funds is also important.

NZ Super focuses its real asset investments as per the table below. We have provided further commentary on timber and agriculture, as the highest exposures. Further detail on the others is provided in the public report in the Asset Sensitivity chapter.

TABLE 2: NZ SUPER ASSET ALLOCATION

Asset Class	NZ Super
Real Estate (NZD)	1.50%
Infrastructure	2.50%
Timber	6.00%
Agriculture	3.00%
Total	**13.00%**

Timber:

The expected return drivers typically comprise three main components: the strategic risk premium, changes in timber prices, and active management. We would expect timberland investments to benefit from favourable climate policy shifts, based on an increase to the penalties for deforestation and increase in the price of timber product prices, land values, and the premium attached to carbon trading-related activities. Therefore, we would expect existing timberland assets to appreciate in value, whereas new assets will become more expensive to invest in.

With enhanced policy, we would also expect a shift towards more sustainable forestry products, as demanded by customers. We would anticipate compliance and monitoring costs to increase, with additional policy offsetting some of the beneficial price rises. More stringent climate policy would be expected to create incentives to reduce deforestation and protect native forests via initiatives such as the UN's Reducing Emissions from Deforestation and Forest Degradation Programme (REDD and REDD+), and we would expect the demand for sustainably harvested forest resources to increase.

Shifts in long-term temperatures will impact typical timberland growing patterns and locations, causing significant disruption to the sector. Climate change may also lead to increased incidences of timberland pestilence and disease, which have already started to manifest (most notably in Canada). Although timberland is largely insulated from coastal-related catastrophes, drought could have significant impacts, as could wildfire.

Agriculture:

The impacts of climate change on agriculture would be country specific, but at an overall asset class level, we would expect positive Policy and Technology responses in a Transformation scenario, with Resource Availability and Impact driving the negative impacts under the other scenarios.

Transformation policies are expected to promote sustainable crop methods. We would expect agriculture investments to benefit from technological development with respect to more productive and resilient crop varieties, and we would anticipate that more heat and drought tolerant crops would be introduced in order to improve the climate resilience and reliability of production.

Reducing the risk of disrupted production and substantial capital is expected to be made available to assist emerging market countries with respect to adaptation in farming methods. However, there is a risk that protectionist policies in response to food shortages could create unrest and additional geopolitical risk premium for agriculture investments.

Agriculture production is heavily susceptible to long-term shifts in regional weather patterns and water stress. In addition, the capacity of farmers to adapt is difficult to predict and strains on the value chain are likely to arise as a result of climate shifts. Similarly to timberland, agriculture is largely insulated from coastal-related catastrophes, but drought could have significant impacts.

FURTHER DETAIL ON POSITIVE POLICY RISK FACTOR SENSITIVITY

Agriculture is somewhat complex, particularly in relation to potential policy impacts. According to the Agriculture, Forestry and Other Land Use (AFOLU) mitigation chapter in the IPCC's Fifth Assessment report AFOLU represents 20-24% of global emissions making it the second largest sector emitter behind energy. Some forms of agriculture are indeed carbon intensive (especially beef/dairy), although this is less visible in our carbon intensity analysis since agriculture isn't included in the GICS taxonomy or given special attention by MSCI. Also, agricultural emissions (those not generated from fossil fuel combustion) are not always covered by proposed climate laws.

Additionally, the agriculture value chain is very different from the energy value chain:

- The agriculture distribution system differs from the energy distribution system meaning food shortages are typically less frequent (though more severe in terms of human costs) than power outages for instance.
- Consumers can more readily choose between different foodstuffs at the store whereas they cannot typically choose what type of energy they buy. This makes the agriculture sector much more susceptible to demand-side shifts (e.g. buy local, go vegan) than the energy sector.
- People can live without electricity but not without food.
- Farming is a key source of income for many low-income families.

All of these factors make predicting the influence of climate regulations on agriculture more difficult. Here is a summary of Policy factor pros and cons for agriculture:

- + Reduced climate uncertainty allows for proportionally more confidence/less volatility in agriculture investment, which is of course highly location dependent.
- + If temperatures change more dramatically so will growing patterns imposing a very high adaptation cost burden. Strong policy diminishes this cost burden.
- + Strong policy should be expected to increase the R&D budget for sustainable crop methods. This is especially true if a carbon pricing regime encapsulates the agriculture sector as it should precipitate the current trend toward less carbon intensive farming techniques.
- + Strong climate policy results in greater flows of Foreign Direct Investment (FDI) into emerging markets either in the form of mandated "reparations" from developed economies or because emerging markets become more attractive investment locales with the threat of heightened risk from CC lifted and necessary adaptation costs diminished. Since agricultural output represents a much larger portion of overall economic output in emerging markets this regional sector stands to gain substantively from these greater investment flows.
- + While cost-benefit analyses are mixed, over a long enough time horizon agriculture performs much better under transformation-like scenarios than under fragmentation-like scenarios since the payback from mitigation is more dramatic and happens quicker in this sector which is really on the front lines of the physical impacts of climate change. Some analyses show a low cost/benefit ratio as soon as 2030.

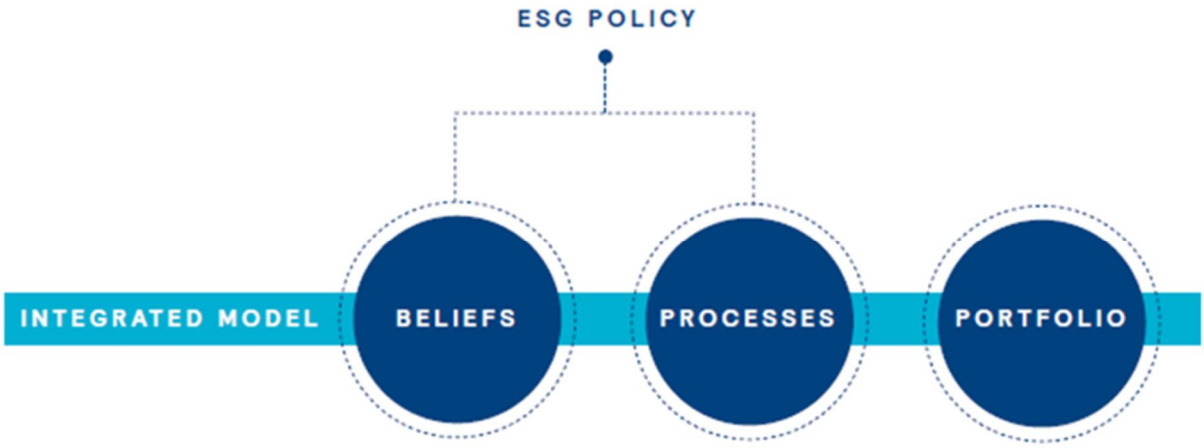
Offsetting these positives would be that the relatively high carbon emissions of the sector could be subject to a carbon tax under a strong policy scenario and increase costs. Any legislation would, however, need to consider agricultural emissions separately since the sector differs in many ways from the energy sector and it is unclear the form this legislation may take i.e. any additional cost would need to be offset to account for issues of social equity (e.g. smallholder farmers should not be unduly burdened).

3

Recommendations for NZ Super

Consistent with a key finding of the public report, our NZ Super specific findings suggest that climate risk is inevitable but outcomes can be improved by being prepared. Addressing climate risk within portfolio decisions is most effective when it is integrated within standard investment decision-making processes. This is consistent with Mercer's recommended approach to incorporating broader environmental, social, and governance (ESG) considerations into investment processes.

FIGURE 11: INTEGRATED MODEL FOR ADDRESSING ESG CONSIDERATIONS

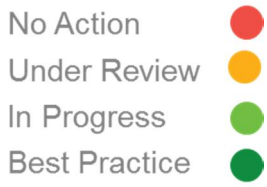


Source: Mercer, An Investment Framework for Sustainable Growth[2]

[2] Mercer. An Investment Framework for Sustainable Growth, 2014, available at http://www.mercer.com/services/investments/investment-opportunities/responsible-investment.html, accessed 11 May 2015.

RECOMMENDATIONS AND NEXT STEPS

The following table provides recommendations for NZ Super, categorising actions by Beliefs, Policy, Processes and Portfolio as in the public report. A dashboard indicator provides a visual summary of the accompanying comments as follows:



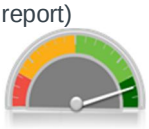
The table captures NZ Super's status and the recommended actions, given the findings in the previous section. We understand that recent appointments, such as Justine Sefton who brings climate specific expertise to the NZ Super Climate Change Project (the CC Project), will continue to evolve NZ Super's progress in integrating climate considerations within the investment process.

Of the recommended actions in the following pages, we expect the following should be given the greatest priority for NZ Super to consider, recognising that a number of these are already on the list as part of the CC Project:

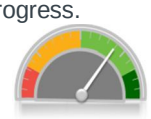
- **Beliefs and Processes**: Recognising climate explicitly within existing Investment Beliefs; the Responsible Investment Framework; voting and engagement; and stakeholder reporting, together with adding the Montreal Pledge to the current industry initiatives that NZ Super participates in.
- **Portfolio Risk Assessment:** NZ Super has already commissioned carbon analysis from MSCI for equities and is looking at other providers for other parts of the portfolio. We recommend that this includes an environmental and climate resilience assessment of timber and agriculture holdings (directly, or by requesting the manager undertake this), as well as real estate and infrastructure investments.
- **Portfolio Risks and Opportunities:**
    - Passive Equities: Reallocate a portion of the significant passive equities exposure to a low-carbon alternative. See Appendix A.
    - Active equities: Introduce thematic strategies focused on sustainability. Opportunities cover both mitigation and adaptation themes, including low-carbon investments, clean energy, water, agriculture, and broad sustainability themes. See Appendix B.
    - Niche exposures: A potential increase to the current allocation to insurance-linked securities and natural catastrophe bonds.

TABLE 3: OVERVIEW OF NZ SUPER ACTIONS WITHIN A FOUR-STEP PROCESS

Activity type		Recommendation	NZ Super Status
1. BELIEFS	**Investment Beliefs**	**Update Investment Beliefs** to expand on the current ESG reference to include a reference to climate change. Climate considerations are implicit in the ESG statement but are not explicit. It is not yet clear whether the CC Project will result in an explicit statement at the beliefs level.	To be considered as part of the CC Project. 
2. POLICIES	**Investment Policies**	**Enhance current Responsible Investment Framework** to explicitly reference climate integration throughout the investment process, particularly for manager expectations to manage climate risks, and how these will be monitored.	In progress as part of the CC Project. 
3. PROCESSES	**Portfolio Specific**	**Establish resourcing needs** and incorporate climate risk within current investment procedures. Justine Sefton's appointment to work with Anne-Maree O'Connor and lead the CC Project has set NZ Super up well to review whether any further process support e.g. additional ESG data requirements, is required. **Work towards incorporating climate risk in reporting and communication to stakeholders**, to disclose annual climate metrics and actions.	In progress as part of the CC Project.  To be considered as part of the CC Project. 
	Systemic (Market-Wide)	**Join relevant collaborative industry initiatives** to engage with policymakers, access ongoing education and share best practices. NZ Super is a signatory to or member of the Investor Group in Climate Change (IGCC); the Principles for Responsible investment (PRI); Carbon Disclosure Project (CDP); International Corporate Governance Network (ICGN); Responsible Investment Association Australasia (RIAA); Australian Council of Superannuation Investors (ACSI); and leverages the UN Global Compact for monitoring frameworks. **Include some focus** on climate in relation to equity voting and engagement, given NZ Super's significant exposure to this area, acknowledging the sensitivities for NZ Super in relation to policy advocacy.	Best Practice  The Montreal Pledge may also be added as part of the CC Project. To be considered as part of the CC Project. 

4. PORTFOLIO	**Risk Assessment**	**Assess climate risks/exposures** at the portfolio, asset and industry sector level. **Undertake carbon footprint analysis**, which could lead to setting portfolio decarbonisation targets. Signing the Montreal Pledge[3], involves committing to undertaking the results of an annual carbon footprint exercise for at least a portion of NZ Super's equity portfolio. This would signal that NZ Super is proactively measuring its carbon risk exposure. NZ Super has already commissioned carbon analysis from MSCI for equities and is looking at other providers for other parts of the portfolio. **Undertake environmental and climate resilience assessment** of timber, agriculture, real estate and infrastructure holdings (directly, or by requesting the manager undertake this). Consider reviewing the underlying location exposures, with differing impacts expected for each of the four climate risk factors over various time periods. Policy related impacts and the increased potential for drought over time would be the top priorities. FarmRight could have specific climate policies for rural dairy exposure added.	Best Practice (this report)  In progress as part of the CC Project.  Not yet considered, but potential for inclusion in the CC Project. 
	Risk Reduction, Transfer, Hedging	**Passive Equities**: Reallocate a portion of the significant passive equities exposure to a low-carbon alternative. See Appendix A. NZ super are also actively reviewing the divestment debate, speaking with sell side analysts and peers to better understand what is driving various decision makers.	To be considered as part of the CC Project. 

[3] See http://montrealpledge.org/ for more information.

	Identify Opportunities	**Active equities**: Introduce thematic strategies focused on sustainability. Opportunities cover both mitigation and adaptation themes, including low-carbon investments, clean energy, water, agriculture, and broad sustainability themes. See Appendix B.	To be considered as part of the CC Project. 
		Private markets: Consider small allocation to sustainability-themed private equity (low-carbon solutions), and/or renewable energy infrastructure. NZ Super has an alternative energy strategy that sits within high level macro themes of resource sustainability and emerging market segmentation. This thematic and opportunistic approach is a driver for looking for new opportunities within private equity and infrastructure.	In progress. 
		NZ Super could consider increasing existing exposure to **niche investment areas which provide additional diversification**, and are also linked to climate resilience, such as insurance -linked securities (ILS), catastrophe bonds, and firms driving innovative solutions to climate-related risks (e.g. micro-insurance). *See below for more detail.	To be considered as part of the CC Project. 
	Engagement with investment managers	**Require investment managers** to provide information on their voting/engagement approach to climate-specific risks and opportunities. Once the information is being reported, additional steps can be considered accordingly. NZ Super should expect managers to focus on: encouraging corporate disclosure of climate/carbon exposure and the development of GHG-reduction plans (mitigation); address corporate lobbying; and, seek companies with large exposure to weather or resource risks to develop climate-risk management plans (adaptation). NZ Super has already appointed BMO Global Asset Management to execute on engagement for global equities. NZ Super decides on the company priorities, pus input to their collaborative engagement, which will include climate, noting the sensitivities around policy advocacy for NZ Super. Voting is also part of the CC Project to review what may be best managed in-house.	In progress. 

*We also understand that returns are not deemed attractive by many potential ILS investors presently due to an overabundance of capital chasing a limited amount of demand for such capital. Though some investors continued to enter the ILS market even as rates were softening, due to the diversification benefit this asset class provides and the low interest rate environment, which makes alternative bond yields of even mid-single-digits appear attractive. There is also a limited window of opportunity for investors in ILS to capitalise on price corrections, should there be any after major catastrophe events, thus some would argue you need to be in the market now and for the long term to access this return boost (the timing of which is of course uncertain).

All this said, investing today in a market where the supply/demand dynamics are causing risk/return challenges only makes sense if you believe in the merits of long term investing and if you think the supply/demand gap will resolve itself in future either by virtue of greater loss activity and/or greater demand for catastrophe risk transfer, both of which could be influenced by climate change. Responsible investors of course have the ability to influence the market and address a significant environmental and social issue (catastrophe un(der)insurance) through their engagement activity which can be used to encourage more disclosure and ultimately transfer of catastrophe risk by companies, countries and municipalities. This is starting to happen a bit now with initiatives like "Aiming for A" but a lot more is needed before anything like a market correction is to occur.

While the above commentary and the ILS market focus on catastrophe risk we should also keep in mind there are other ways to invest in the weather, such as through weather derivatives which provide exposure to longer term weather shifts (e.g. Our Resource Availability factor). While this segment of the ILS market is presently much smaller even than the catastrophe segment the exposure base is actually much larger. If weather hedging takes off in the investment industry the same way currency or interest rate hedging has then this market would be significant.

4

Looking ahead: Future Taker or Future Maker?

Through its participation in this study, NZ Super has already demonstrated its commitment to be a 'climate aware' investor, and determine how different futures will influence potential investment outcomes.

A key question remains, which is – does NZ Super want to adopt a more proactive approach, whereby it seeks to encourage the future climate pathway the world adopts?

Figure 14:
From future taker to future maker

There is growing pressure for financial institutions to articulate their position on climate change, and given that Transformation is expected to better protect long-term returns beyond 2050, we expect to see a growing number of investors align their investment behaviour to align with a 2°C outcome.

Beyond assessing the position of your investments in order to protect and enhance returns to the extent possible in a time of climate change, a strategic question remains: Does NZ Super want to develop a proactive strategy – with associated resource – towards seeking to make a contribution towards limiting global warming to 2 degrees?

We look forward to discussing this opportunity with you.

5

Appendix A – Low-carbon Indices

A number of low-carbon variants of broad market indices have become available over the recent past[4]. Benefits of these indices are that they are relatively straightforward and transparent (i.e. asset owners can point to a clear carbon reduction and impact) and inexpensive (albeit more expensive than broad market indices).

Beyond practical issues (such as cost, accessibility and performance), the key questions investors must consider is whether these indices will serve as downside protection in the face of rising carbon prices, and thus offer an effective hedge for passively managed equities. In a world where the cost of carbon is likely to rise then having less exposure to high carbon companies is intuitive, although it may not always be this straightforward. Two key points should be made here:

- A lower carbon footprint (including both current emissions as measured on CO2 emissions/sales and potential emission from fossil fuel reserves as measured on CO2 emissions/market cap), may not necessarily translate to lower operating cost (and thus relatively higher operating profits). Where demand is inelastic, suppliers may be able to push this cost to consumers, as may be the case for some utilities.
- Existing indices are based on Scope 1 and Scope 2 emissions (which cover direct emissions owned by the company and indirect emissions resulting from energy use by the company). In some cases, such as automotive, the critical measurement is actually Scope 3 (indirect emissions not owned by the company but related to the company's activities). Data on Scope 3 emissions is less prevalent, which may result in misrepresenting the actual net carbon benefit (or deficit) of a company. It should be noted that Scope 3 data is broadly available for the automotive sector and an improvement upon current indices could be to incorporate Scope 3 for this sub-sector.

Additional things to recognise about these indices are that:

- To date, they are based on market cap weighted methodology, and therefore bring with them the same concerns that core benchmarks have in this context (i.e. that investors end up with more exposure to overvalued companies as price fluctuates)
- They do not necessarily capture the opportunity side of the equation (i.e. by shifting from high carbon to lower carbon companies, investors may not necessarily gain exposure to companies leading on the development or provision of products/services best positioned to succeed in a lower carbon environment).
- Currently, index providers do not provide in-depth shareholder engagement on climate risk management as a supplement to index provision. This would be a welcome addition to the current offerings, and is likely to evolve based on client demand and feedback.

[4] Low-carbon versions of numerous indices are available from the large passive index providers.

Given the above considerations, low-carbon indices may not necessarily bring an outperformance premia in the traditional sense – i.e. the premia is low carbon rather than performance. With a low tracking error to the benchmark, that should be ok; however clients should be aware that during periods of extreme stress or market dislocation that the performance of the low carbon indices could deviate significantly from the mainstream benchmark. For example, during 2014 when oil prices declined significantly, low carbon indices performed strongly relative to their parent indices; however, this performance could reverse during periods of strong energy sector performance and rebounding oil prices.

In closing, while low-carbon indices are not a perfect hedge against future uncertain carbon pricing, they do provide an interesting tool for long-term investors. We believe that NZ Super should consider re-allocating some of its passive equities towards a low-carbon index variant, if it is aligned with one or more of the following statements:

a) We believe that action towards climate change mitigation will occur, resulting in some (meaningful) higher price on carbon over the coming 5 year period
b) We believe that climate change mitigation is beneficial to capital markets and NZ Super members over the medium to long run
c) Our stakeholders would like to see us clearly manage climate risk, both in our investments and through our actions as a financial sector stakeholder.

We would be pleased to discuss low-carbon index options in further detail with NZ Super.

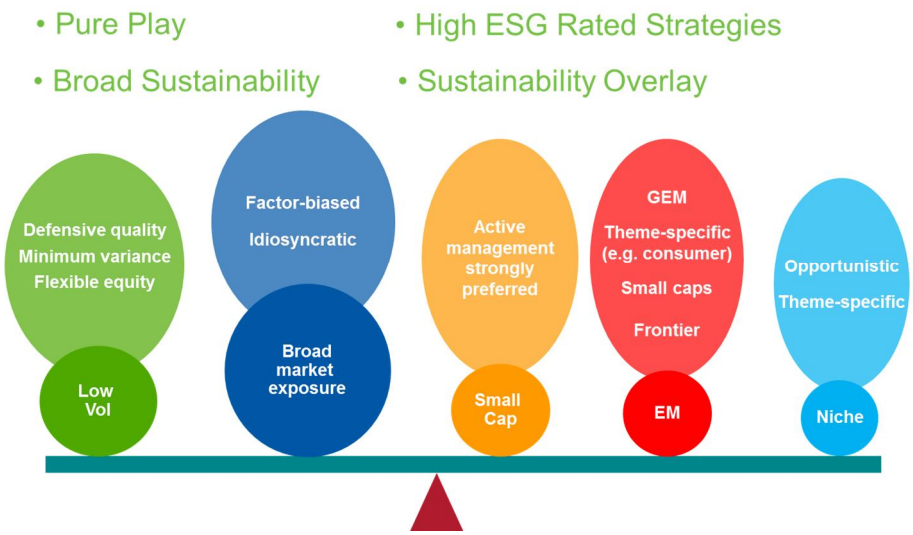
6

Appendix B – Thematic Managers

The opportunity set within listed equity sustainability themes is primarily focused on: water (such as water infrastructure, technologies, and utilities); renewable energy and energy efficiency; food and agriculture; and broad sustainability, capturing some or all of the aforementioned themes in addition to social demographics (such as health, education, and other goods and services).

The majority of the global sustainability-themed and pure-play strategies that we have reviewed currently fit more closely into the broad market or small cap categories within our portfolio construction framework. The following schematic depicts Mercer's view on the role of thematic managers in portfolio construction.

Figure 12:
The role of sustainability in Equity 2.0



Potential diversification benefits from investing in sustainability themes can include the following, although not all "sustainability-oriented" strategies will necessarily reflect each of these themes:

- Long-term investment horizon — managers highlight that the risk/return trade-off for sustainability themes can be more compelling with a longer time horizon as the macro drivers take effect.
- Exposure to stocks with low coverage — many of the niche and broad sustainability-themed strategies tend to have low overlap with broad benchmarks, such as the MSCI World Index, ranging from 10%–30%.
- Emerging technologies — small cap stocks can offer exposure to emerging technologies as many companies tend to be new and pure play.
- Exposure to stocks with revenue opportunities identified as those typically under-appreciated or under-recognised by the market — for example, the impact of stranded carbon assets, the impact of "fat taxes" on the food and drink industry, and opportunities in healthy foods and healthy lifestyles.

We would be pleased to discuss the merits of including one or more sustainability-themed managers in NZ Super's equity exposure.

7

Appendix C – Study Participants

Partners

- Allianz Climate Solutions GmbH – Germany
- Baillie Gifford & Company – UK
- BBC Pension Trust – UK
- British Telecom Pension Scheme (BTPS) – UK
- California State Teachers' Retirement System (CalSTRS) – US
- Church of England National Investing Bodies – UK
- Connecticut Pension Fund – US
- Construction and Building Industry Super (Cbus) – Australia
- Credit Suisse – US
- Environment Agency Pension Fund (EAPF) – UK
- Första AP-fonden (AP1) – Sweden
- Guardians of New Zealand Superannuation Fund (NZ Super) – New Zealand
- International Finance Corporation (IFC), a member of the World Bank Group – Global
- New York State Common Retirement Fund (CRF) – US
- Queensland Investment Corporation (QIC) Limited – Australia
- State Super Financial Services (SSFS) – Australia
- The Department for International Development (DFID) – UK
- WWF-UK – UK

Advisory Group

- Dr Rob Bauer, University of Maastricht – Netherlands
- Dr Barbara Buchner, Climate Policy Initiative – Italy/Global
- Sagarika Chatterjee, Principles for Responsible Investment (PRI) – UK
- Paul Dickinson, Carbon Disclosure Project – UK
- Nathan Fabian, Investor Group on Climate Change – Australia/Global
- Mark Fulton, Carbon Tracker Initiative/ CERES/ Energy Transition Advisors – US/ Australia
- Dr Noah Kaufman, WRI (formerly NERA) – US
- Sean Kidney, Climate Bonds Initiative – UK / Global
- Bob Litterman, Financial Analyst Journal/ Asset Owners Disclosure Project – US
- Nick Robins, UN Environment Programme – UK
- Mike Wilkins, Standard & Poor’s Ratings Services – UK
- Dr Paul Wilson, RMS – UK
- Helene Winch, Low Carbon (formerly PRI) – UK

8

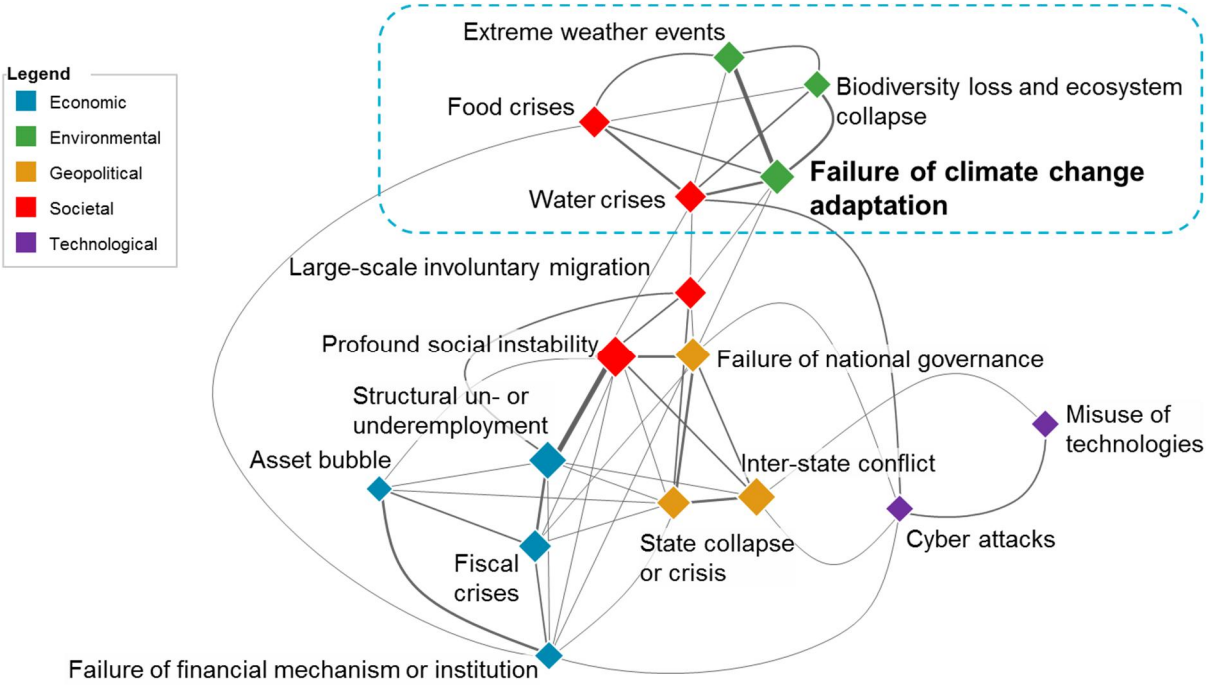
Appendix D – Study Synopsis

AN INTERCONNECTED WORLD: CLIMATE CHANGE IS AN ECONOMIC ISSUE

While climate change, caused by human activities, is an established scientific fact, there remains uncertainty around how climate change will develop and questions prevail, including:

- What level of temperature increase is the world heading for? What are the implications for weather patterns, food and water security and global demographics?
- Will a global climate change agreement be reached later this year? If not, who will the winners and losers be? Can we mitigate the risks in time?
- Will science and technology developments offer solutions? How quickly can we adapt?
- How will geopolitical relations develop? What will a model for sustainable growth look like?

Figure 13:
Global Risks: Interconnections Map 2015



Source: World Economic Forum, Global Risks Report 2015

The complex world between future global economic development and climate change is an extremely difficult minefield to navigate. However, with economic growth being the lifeblood of investments, this is a challenge that long-term investors need to take. To help, we have used scenario analysis and adapted Mercer's investment modelling tool to consider some of the potential future climate change pathways, the impact these may have from an economic perspective and the implications for investors.

TIME-FRAME DISCONNECT: A CHALLENGE FOR INVESTORS

One of the key challenges for investors in considering the risks and opportunities posed by climate change is the disconnect in time-frame between that of investors and that of climate change impacts.

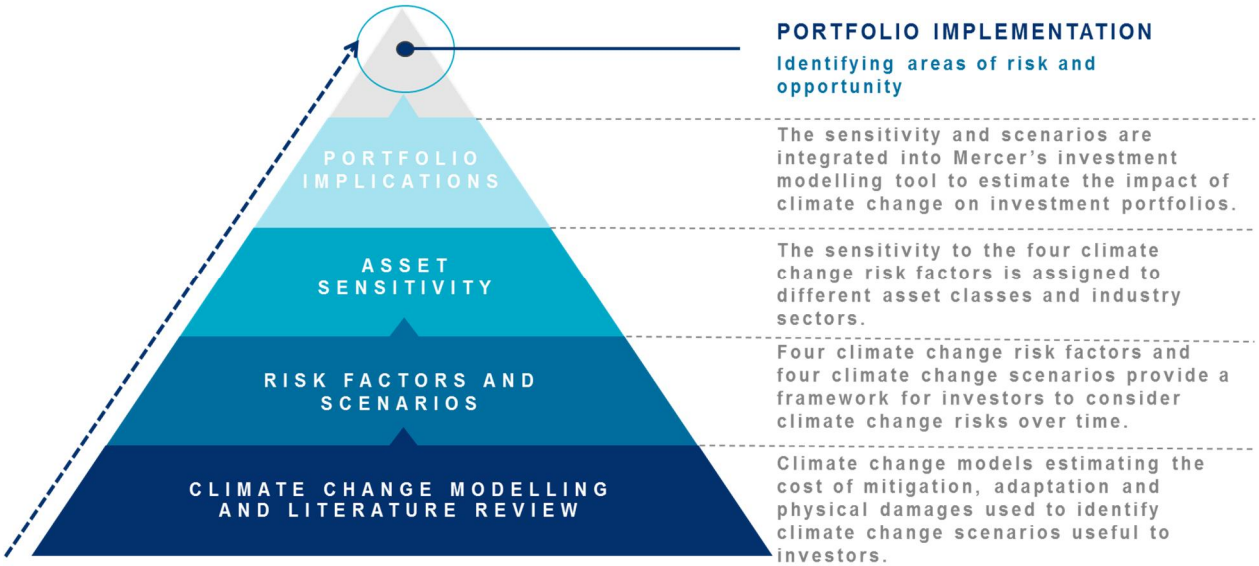
Mercer's study focuses on a 35 year timeframe from 2015 to 2050. This is very long term from an investment perspective; typically, strategic investment advice is based on a modelling period of 10 years and investment managers take investment decisions on a 3-5 year time-frame, or less. However, climate change impacts become increasingly apparent post 2050 and climate models focus on 2100; extending out to 2300 and beyond. 2050 is short-term from a climate change perspective.

In particular, the physical impacts of climate change; such as extreme weather events and sea level rises are expected to be relatively limited over the period to 2050. As such, the post 2050 implications cannot be ignored. However, the further forward we look, the greater the uncertainty and it is difficult to justify investment modelling beyond our 35 year time-frame.

While there is notable dis-connect between the time-frame of investment decision-making and that of climate change considerations, there are nearer-term actions that investors can take and signposts that investors can monitor to better understand future climate change related developments.

STUDY APPROACH: CLIMATE MODELLING - PORTFOLIO IMPLEMENTATION

There were 5 key stages to the study to consider the risk of climate change on investment portfolios, as set out in the diagram below.



Source: Mercer

CLIMATE CHANGE SCENARIOS

Given the uncertainty and complexity of future developments with respect to climate change, we used a scenario based approach to considering the potential risks and opportunities. Four climate change scenarios have been developed in the study, each reflecting different climate change policy ambitions that result in varying CO_2 emissions pathways and levels of economic damages related to climate change. These have been developed using existing climate change models and through an extensive literature review.

THE BUILDING BLOCKS OF THE CLIMATE CHANGE SCENARIOS AND THE IMPORTANCE OF 2°C

GREEN-HOUSE GAS (GHG) EMISSIONS:

There is now wide spread scientific consensus that man-made GHG emissions are the dominant cause of the climate change observed over the past half century. Carbon dioxide (CO_2) is the most prevalent GHG and therefore CO_2 emissions are used as a proxy for GHG emissions more broadly. The level of atmospheric warming is directly related to the level of GHG emissions and so CO_2 emissions pathways are an indicator of the potential extent of warming.

LEVEL OF TEMPERATURE WARMING:

The most common reference is the rise in temperature above pre-industrial levels. All major countries, including the US and China, have recognised the scientific evidence that limiting global warming to 2°C is required to avoid “dangerous” interference with the climate. If temperature increases exceed this level, the world starts to rapidly increase its risk exposure. It is important to note that even if the world stopped all GHG emissions tomorrow, it would still be ‘locked in’ to a degree of further global warming, which is currently estimated to be 1.5°C (Source: World Bank Group, Turn Down the Heat).

MITIGATION ACTIVITIES:

Human intervention to limit climate change and the resulting impacts by reducing GHG emissions (e.g. through subsidies to increase the deployment of renewable energy) or increasing GHG ‘sinks’ (e.g. through afforestation). Mitigation refers to efforts to limit the cause of warming in the first place.

ADAPTATION ACTIVITIES:

Protecting against the impacts of climate change (e.g. building flood walls). Adaptation refers to managing the warming that occurs by making changes.

MITIGATION VERSUS ADAPTATION: The greater investment made in mitigation activities today, the less investment will be required in adaptation activities in the future. The inverse unfortunately is not also true. While investment in adaptation today will improve resilience tomorrow, without some degree of mitigation the impact of climate change is likely to increase unabated until adaptive capacity is overwhelmed.

Four scenarios, Transformation, Co-ordination, Fragmentation (Lower Damages) and Fragmentation (Higher Damages) were identified as being useful for investors to consider a range of climate change outcomes and these are summarised below.

1. TRANSFORMATION	
Ambitious and stringent climate change policy and mitigation action puts the world on a path to limiting global warming to 2°C above pre-industrial temperatures by the end of this century.	
Climate perspective	The most ambitious of the four scenarios considered in this study in terms of climate policy but also the most contentious. This scenario is the critical benchmark: from a scientific perspective it increases the chance of avoiding dangerous climate change, with international climate policy supporting the transformation to a low carbon economy. However, some believe this scenario is already "off the table" as policy makers have not reacted quickly enough to date, with many pledges to reduce emissions not being met sufficiently. If Transformation is to occur, time is certainly of the essence and the results of the Paris negotiations later this year will be a crucial signpost as to its likelihood.
Investor perspective	Where change is fast, near-term and significant, investors that have not considered the risks and opportunities posed by climate change action are likely to be caught off guard. A Transformation scenario could cause significant shorter-term market volatility (e.g. months and years until 2020). Investors that have considered the risks and opportunities posed by climate change should be well positioned relative to those that have not considered such risks and would be expected to benefit from first-mover advantage relative to peers.

2. CO-ORDINATION	
Climate change policy and mitigation actions are aligned and cohesive, keeping warming to 3°C above pre-industrial temperatures by the end of this century.	
Climate perspective	While not as ambitious as Transformation, this scenario assumes a co-ordinated and well-defined policy response to reduce emissions by 2030.
Investor perspective	Where change is more measured and anticipated, investors have more time to react and position their portfolios accordingly. Early movers would be expected to benefit in the shorter term as the policy response becomes increasing apparent to the broader market. However, investors would need to be careful that policy transparency is not mistaken for adequacy in terms of the scale of ambition as this could cause investors to under-estimate the economic damages associated with the long-term physical impacts of climate change.

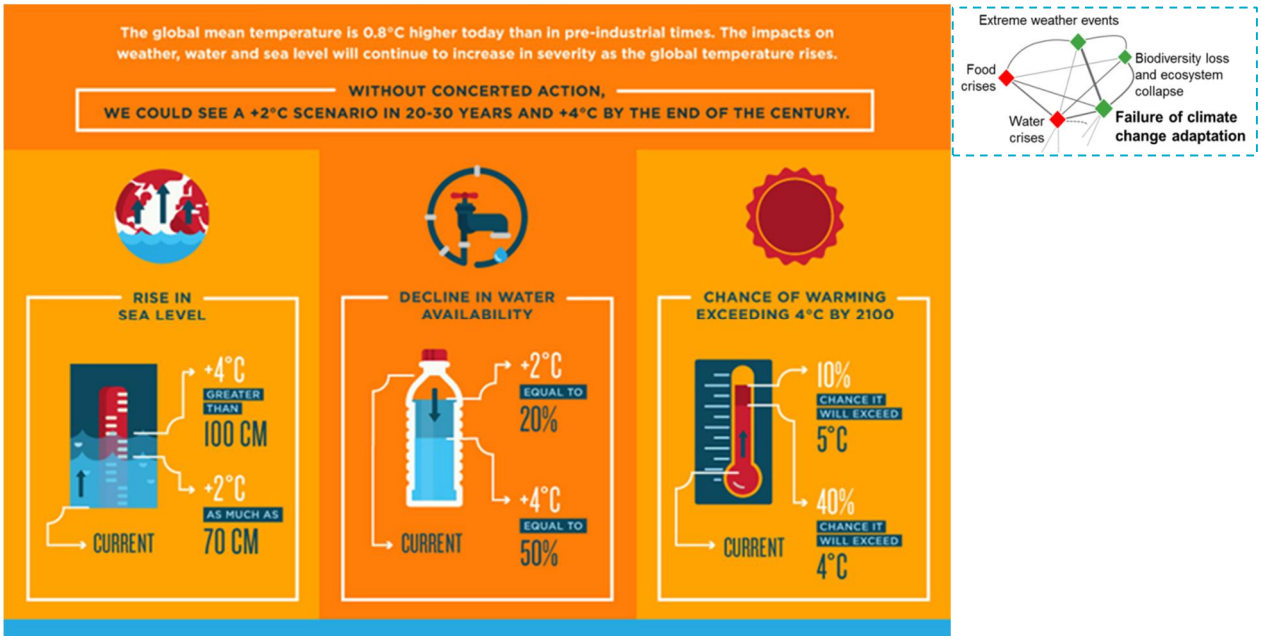
3. FRAGMENTATION (LOWER DAMAGES)	
Limited climate action and lack of co-ordination result in warming rising to 4°C or above from pre-industrial temperatures by the end of this century.	
Climate perspective	This scenario assumes a fragmented policy response (both by region and ambition) with limited additional action from policy agreements currently in place.
Investor perspective	If the policy response is disparate in terms of commitment and timing by region, an increased level of uncertainty is created for investors. While shorter-term, this could lull investors into a false sense of security that it is business as usual, from a longer term perspective investors cannot afford to be complacent about structural economic change and emerging market policy. Those investors that have an increased understanding of the potentially divergent responses are likely to be better able to adapt their investment strategy by anticipating regional differences and positioning their portfolios accordingly.

4. FRAGMENTATION (HIGHER DAMAGES)	
Limited climate action and lack of co-ordination result in warming rising to 4°C or above from pre-industrial temperatures by the end of this century. The physical impacts of this warming are felt more severely.	
Climate perspective	This scenario follows the same CO_2 emissions pathway and policy response as Fragmentation (Lower Damages) but scales up the potential physical impacts of climate change.
Investor perspective	On top of the considerations highlighted for the Fragmentation (Lower Damages) scenario, investors with exposure to investments expected to be most sensitive to the physical impacts of climate change should monitor the risks posed by climate change carefully (particularly where investments are illiquid).

While the Transformation scenario is an ambitious benchmark and could be seen as a "best-case" scenario from a climate change perspective, the Fragmentation (Higher Damages) scenario is by no means a "worst-case" scenario. While it is the least favourable (from a climate change perspective) of the scenarios considered in the study, it broadly equates to a temperature warming of 4°C and is consistent with existing policy commitments. Should countries renege on existing commitments, there is the potential for a more divergent and negative outcome to occur (resulting in a higher level of warming than 4°C).

The following diagram (Figure 17) from the World Bank Group highlights some of the changes that may occur across different levels of temperature warming and links back to the global risks considered by the World Economic Forum.

Figure 17:
Considering different levels of warming: putting the Mercer scenarios into context



Source: World Bank Group, Turn Down the Heat

In order to consider the impact on investment returns and volatility under the different climate change scenarios, Mercer identified four climate change risk factors that can be used to translate each of the climate change scenarios (based on the outputs of the climate change modelling and literature review) into the language of investments. This allows us to build the climate change scenario pathways into the investment modelling tool.

CLIMATE CHANGE INVESTMENT RISK FACTORS

This study built on Mercer's previous work to consider four climate change related investment risk factors: Technology, Resources, Impact of Physical Damages and Policy, together known as the "TRIP" factors.

TECHNOLOGY (T)

The rate of progress and investment in the development of technology to support the low carbon economy.

The Technology factor captures technological advancement and the opportunity for increased efficiency through technological change.

The speed, scale and success of low carbon technologies, coupled with the extent of transformation and disruption of existing sectors, or development of new sectors, are key considerations for investors.

RESOURCE AVAILABILITY (R)

The impact of chronic weather patterns (e.g. long-term changes in temperature or precipitation).

Resource availability is a new aspect being added to the previous Mercer study to identify how changes to the physical environment might impact investments reliant on the use of resources, such as water and agricultural resources at risk of becoming scarcer or, in some cases, more abundant over the log-term as a result in changes to weather patterns. The impacts on agriculture, energy and water are key.

IMPACT OF PHYSICAL DAMAGES (I)

The physical impact of acute weather incidence (i.e. extreme or catastrophic events).

This factor can be interpreted as the economic impact of climate change on the physical environment caused largely by changes in the incidence and severity of extreme weather events.

Examples include damage to property caused by flooding as a result of sea level rises; damage caused by hurricanes and damage caused by wildfire.

POLICY (P)

Collectively refers to all international, national, and sub-national regulation (including legislation and targets) intended to reduce the risk of further man-made climate change.

This factor can be interpreted as the level of co-ordinated ambition of governments to adopt and adhere to policies and regulations to reduce green-house gas emissions.

Examples of climate-related policy include green-house gas emissions targets, carbon pricing, subsidies and energy efficiency standards.

Policies can be classified into those that focus on the supply side (by encouraging the substitution of high emission products with lower emission alternatives) and those that focuse on the demand side (by reducing demand for high emission products).

CLIMATE CHANGE SIGNPOSTS FOR INVESTORS

By considering the climate change scenarios through the lens of our climate change risk factors, we are able to highlight signposts that investors can monitor in order to be prepared for changes that may occur as a result of climate change. We have focused on the following elements; each represented by our TRIP factors, that we believe are important signposts for investors:

- The timeframe of CO_2 emissions peaking, potential changes to the energy mix out to 2050 and modelled mitigation cost estimates
- The rate of investment required into technologies designed to facilitate the transition to a low carbon economy
- Potential shifts in long-term weather patterns and resultant economic impacts as a result of global warming
- Potential shifts in the level of economic damages caused by shifts in the frequency and/or severity of catastrophic weather events, such as floods and hurricanes.

The table below outlines the investor signposts under each of the scenarios by risk factor. Development against these signposts will allow investors to consider the likelihood of different climate change scenarios as additional evidence is presented.

Overall, the highest climate change risk factor impact over the period to 2050 is that of Policy under the Transformation scenario. Under both the Transformation and Co-ordination scenarios, Policy and Technology are dominant relative to Resource Availability and Impact of Physical Damages given the physical impacts of climate change become increasingly apparent post 2050. For the Fragmentation scenarios, particularly Fragmentation (Higher Damages), Resource Availability and Impact (Physical Damages) are more apparent and are not dominated by Policy and Technology developments, which are expected to be limited.

Table 4:
Key signposts for investors by climate change scenario (to 2050)

SIGNPOST FOR INVESTORS	TRANSFORMATION	CO-ORDINATION	FRAGMENTATION LOWER DAMAGES	FRAGMENTATION HIGHER DAMAGES
Potential changes to the energy mix T	Significant change to the energy mix: fossil fuels represent less than half of the energy mix at 2050.	Fossil fuels represent c.75% of the energy mix at 2050.	Fossil fuels continue to be the dominant energy source, representing 85% of the energy mix at 2050.	
Rate of investment in technologies supporting the low carbon economy T	Cumulative investment of US$65 trillion in energy supply and efficiency (ex-fossil fuels) required over 2015–2050.	Cumulative investment of US$47 trillion in energy supply and efficiency (ex-fossil fuels) required over 2015–2050.	Total energy investments increase to US$3.13 trillion in 2050. Limited investment into low carbon energy	
Potential shifts in long-term weather patterns and impact on resource availability R	Limited impact by 2050.	Limited impact by 2050.	Estimated net benefit from resource availability as a percentage of global GDP of 0.5% at 2050. Driven by gains in agriculture, partially offset by losses related to biodiversity.	Estimated net loss from resource availability as a percentage of global GDP of 0.8% at 2050. Driven by losses due to energy, water, and biodiversity.
The level of physical damages caused by catastrophic events, such as floods and hurricanes I	Limited impact by 2050; driven by losses from (extra) tropical storms and coastal flood.	Limited impact by 2050; driven by losses from (extra) tropical storms and coastal flood.	Estimated net loss as a percentage of global GDP of 0.4% at 2050. Driven by losses from (extra) tropical storms and coastal flood.	Estimated net loss as a percentage of global GDP of 0.7% at 2050. Primarily represents losses from wildfire, coastal flood, and extreme temperatures.
Global policy response P	Most effective from a climate change mitigation perspective, Aggressive introduction of carbon pricing and related policy/regulation likely to result in shock to financial markets.	Existing policy pledges with respect to carbon emissions are implemented with mitigation efforts extended to 2030.	Divergent with limited efforts beyond existing pledges. Although a reduction in emissions of 10% (versus 2010 levels) is achieved by 2050 in developed markets, this is outweighed by increases in emissions in emerging markets.	
Expected cost of carbon ($US2013/t CO2) P	Global carbon pricing introduced relatively swiftly, then flattening out to around $180 by 2050.	Global carbon pricing introduced more slowly, picking up pace after 2030 and reaching $210 in 2050.	Lack of development of a global carbon price recognised by the market.	
Global greenhouse gas emissions at 2050 P	22 Gt CO_2e/yr. 56% decrease vs. 2010 levels.	37 Gt CO_2e/yr. 27% decrease vs. 2010 levels	67 Gt CO_2e/yr. 33% increase vs. 2010 levels	

Timeframe for emissions level peaking	P	Emissions peak by 2020.	Emissions peak by 2030.	Emissions peak after 2040.

STRUCTURAL CHANGE: PAST PERFORMANCE IS NOT A GUIDE TO FUTURE PERFORMANCE

A particularly difficult task for investors is in identifying and managing structural changes. The greater the level of change, the more disparity between the winners and losers, and today's "giants" often become tomorrow's "dinosaurs", as those that fail to adapt are left behind. Such changes can create new industries at the expense of existing industries.

It remains very difficult to capture long-term forward-looking changes within quantitative investment modelling processes, and although we know that in practice long-term, sustainable global economic growth is not going to follow the same path as historical economic growth, we have not sought to reflect these uncertain future structural changes within our investment modelling. Therefore:

- **Industry classification is based on today's definition:** We have not made allowance for new industries and/or any re-classification that would be expected as markets reflect the adaptation to a low carbon economy.
- **We have not attempted to forecast changes in the regional composition of global equity indices:** However, over the period modelled to 2050, we would expect certain nations currently classified as emerging markets to be re-classified to developed markets.
- **There is a "negative bias" to the heat maps (that is, more red than green), as a result of our analysis being based on a starting point of today:** We recognise that there will be opportunities created and that across different industries and regions there will be winners and losers, as some companies will adapt business models accordingly and others will not. Within industries and sectors there will continue to be different supply and demand drivers, including those industries where overall sensitivity may be neutral.

HOW SENSITIVE ARE DIFFERENT INVESTMENTS TO CLIMATE CHANGE?

Now that we have identified how different climate change scenarios may develop to 2050 by looking at how the four climate change risk factors progress in terms of influence over time, the next stage is to consider how sensitive different investments are to the climate change risk factors. By combining the development of the TRIP factors over time with the sensitivity of different investments to the TRIP factors we are able to look at the potential impact of climate change on investments.

Mercer has developed climate change sensitivity heat maps that summarise our assessment of the sensitivity of different asset classes and industry sectors to the TRIP factors. We have assigned sensitivity on a relative basis using a scale of -1 where we expect the most negative impact on investment returns, to +1 where we expect the most positive impact on investment returns.

While investors do not typically consider industry level detail when making strategic investment decisions, it is necessary to "drill-down" to this level due to the disparity of sensitivity across different industries. We have focused our attention on those industries we believe to be of most interest for this study; those that are expected to be the most sensitive to climate change.

Although we have not looked at security level analysis as part of this study, it is crucial that NZ Super understands where risks and opportunities might lie and to ensure that investment managers are fully considering these risks when building portfolios, particularly when investing in asset classes, industries and sectors with the highest sensitivity.

Table 5:
Sensitivity to the climate change risk factors: asset class level

ASSET CLASS	T	R	I	P
Developed Market Global Equity	<0.25	>-0.25	>-0.25	>-0.25
Emerging Market Global Equity	<0.25	-0.25	-0.50	<0.25
Low Volatility Equity	0.00	>-0.25	>-0.25	>-0.25
Small Cap Equity	<0.25	>-0.25	>-0.25	>-0.25
Developed Market Sovereign Bonds	0.00	0.00	0.00	0.00
Investment Grade Credit	<0.25	>-0.25	>-0.25	>-0.25
Multi Asset Credit	0.00	0.00	>-0.25	0.00
Emerging Market Debt	0.00	>-0.25	-0.25	<0.25
High Yield Debt	0.00	>-0.25	-0.25	>-0.25
Private Debt	0.00	0.00	0.00	0.00
Global Real Estate	<0.25	0.00	-0.75	<0.25
Private Equity	<0.25	>-0.25	-0.25	>-0.25
Infrastructure	0.25	>-0.25	-0.50	<0.25
Timber	<0.25	-0.75	-0.50	0.25
Agriculture	0.25	-1.00	-0.50	0.25
Hedge Funds	0.00	0.00	0.00	0.00

Negative — Positive

- Growth assets, such as equities, are more sensitive to climate change than defensive assets, such as sovereign bonds.
- Global developed market equities are expected to have a negative sensitivity to policy and a positive sensitivity to technology. Emerging market equities are expected to benefit from additional climate change policy and technology developments, which should help to protect long-term sustainable economic growth in emerging markets.
- Within bonds, emerging market debt and high yield debt are the most sensitive to the climate change risk factors.
- Real estate, agriculture and timberland have the greatest negative sensitivity to the impact of physical damages and resource availability. Agriculture and timberland are the most sensitive (positive) to policy while infrastructure and agriculture have the greatest positive sensitivity to technology.
- We do not expect private debt or hedge funds, in aggregate, to be sensitive to the climate change risk factors.

Table 6:
Sensitivity to the climate change risk factors: industry and sector level

INDUSTRY SECTOR	T	R	I	P
ENERGY	-0.25	-0.75	-0.75	-0.75
Oil	-0.50	-0.75	-0.75	-0.75
Gas	<0.25	-0.50	-0.75	<0.25
Coal	-0.50	-0.75	-0.75	-1.00
Renewable	0.50	-0.25	-0.25	1.00
Nuclear	0.50	-0.75	-0.25	0.50
UTILITIES	-0.25	-0.75	-0.50	-0.50
Electric	-0.50	-0.75	-0.50	-1.00
Gas	-0.25	-0.75	-0.25	-0.50
Multi	-0.25	-0.75	-0.50	-0.75
Water	-0.25	-0.50	-0.25	-0.75
MATERIALS	<0.25	-0.75	-0.25	-0.50
Metals and mining	<0.25	-0.75	-0.25	-0.75
INDUSTRIALS	<0.25	>-0.25	-0.50	-0.25
Transport and infrastructure	<0.25	>-0.25	-0.75	<0.25
CONSUMER DISCRETIONARY	0.00	0.00	0.00	>-0.25
CONSUMER STAPLES	0.00	-0.25	0.00	>-0.25
HEALTH	0.00	<0.25	<0.25	0.00
FINANCIALS	0.00	>-0.25	-0.50	0.00
IT	<0.25	0.00	0.00	0.00
TELECOMMUNICATIONS	0.00	0.00	>-0.25	0.00

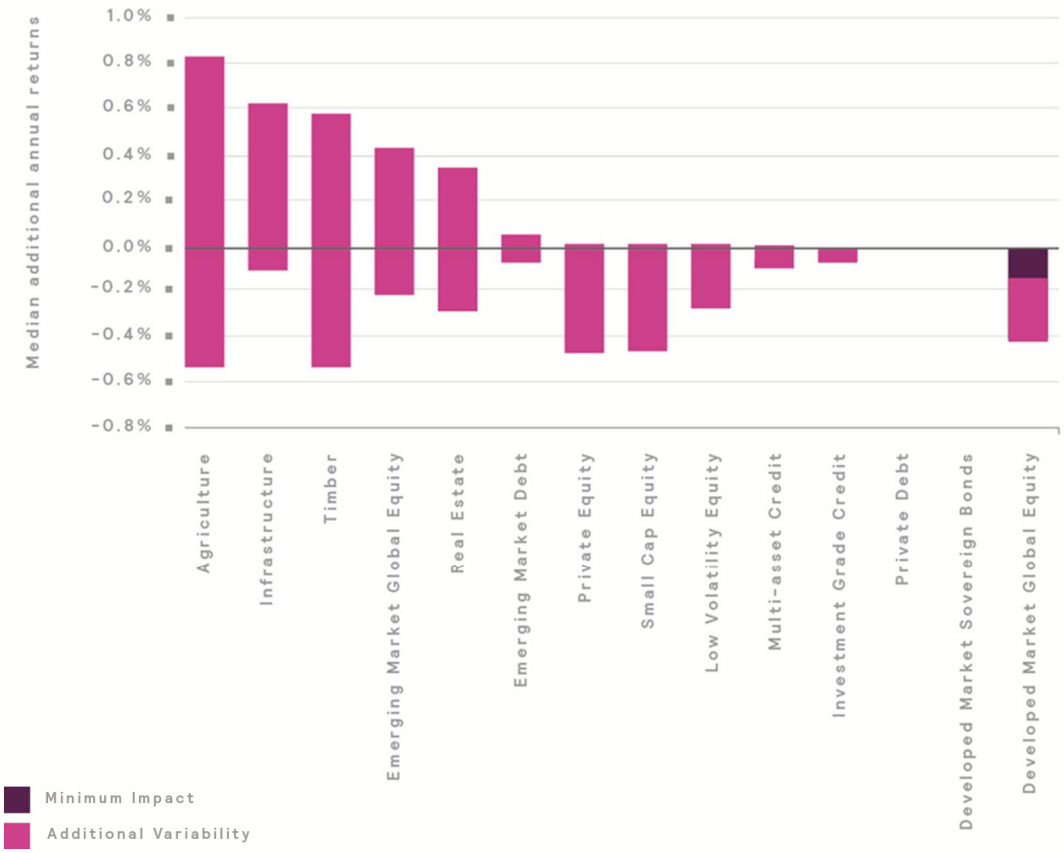
- Policy is the most significant risk factor in terms of sensitivity. The industries expected to be most sensitive are energy and utilities and the sectors with the highest negative sensitivity to policy are coal, electric while renewables has the highest positive sensitivity.
- Energy and utilities have the greatest negative sensitivity to resource availability and physical impacts, with industrials also sensitive to physical impacts.
- Within each sector there will be “winners and losers” at a security level, including those sectors where overall sensitivity is expected to be neutral. Corporate debt could be subject to downgrade and defaults.

STUDY HIGHLIGHTS: COMBINING THE SCENARIOS AND RISK SENSITIVITY

- Over the long term (35 years), for a well-diversified portfolio, a Transformation scenario does not jeopardise financial returns, which has been a common misconception.
- The Fragmentation (Higher Damages) scenario is increasingly detrimental to returns over time and the Transformation scenario becomes increasingly favourable relative to the other scenarios.
- At a total portfolio level, under the Transformation scenario, while the overall impact is less significant (given positive and negative impacts for different asset classes) there are key areas that investors should focus on: e.g. developed market equities vs. EM equities and real assets.
- The most apparent differential between winners and losers is at an industry sector level and investors can position themselves accordingly to manage the downside risks as well as position for favourable opportunities.

Figure 14:
Climate impact on return by industry sector (35 years)

Figure 15:
Climate impact on return by asset class (35 years)



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NOTES

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ITEM 6A CLIMATE CHANGE INVESTMENT STRATEGY UPDATE

Authors: ***Matt Whineray and Anne-Maree O'Connor***

Date: ***2 August 2016***

1 Purpose

1.1 For **discussion.**

1.2 As noted in the Chief Executive's report, we request the Board's input on our proposed Climate Change Investment Strategy.

2. Climate change investment implications

2.1 Climate change represents one of the largest economic and political challenges of this century. Nations, individually and collectively, are developing policy responses to mitigate or manage the risks posed to society. The combination of policy commitments, technology, and society preferences mean that global energy systems must and will change over coming decades. The world will become less reliant on fossil fuels. When and how these changes occur is uncertain.

2.2 The Guardians investment mandate (outlined later in this paper) requires that both climate risk, and climate change mitigation policy risk, be accounted for when investing. The Guardians must factor these risks into our investment policies, and be aware of the carbon emissions and climate impact of our Fund as a whole - so as to both avoid undue risk and to meet our responsible investment commitments.

2.3 This paper provides the outline of and rationale for the Guardians' climate change investment risk strategy. The strategy can be read in conjunction with the background information note (refer attachment 1) that provides more detail on the Fund's carbon emission measure, investment risk related to climate change, and a review of global initiatives and investor reactions to climate change risk.

2.4 Our climate change strategy is multi-dimensional in response and multi-year in implementation and aligns with UN climate convention goals[1] for a transition to a low carbon economy. The strategy is summarised on the following page. In order to implement the strategy we will need to ensure our beliefs are explicit, our strategies consistent with these beliefs, and that the investments are appropriately allocated to the reference portfolio (passive) and/or active portfolio.

[1] United Nations Framework Convention on Climate Change

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3. CLIMATE CHANGE INVESTMENT STRATEGY

GOAL	A portfolio more resilient to climate related risks

TARGET	Reduce the portfolio's carbon footprint by at least 30% by 2020*

PRINCIPLES	**Whole portfolio** - Manage climate risks and opportunities of the whole portfolio **Consistency** - Be as consistent as we can across all investments (listed and unlisted; active and passive) **Best tools** - Use the full range of tools available to us. There is no single solution.

Reduce	Reduce exposure to the highest risk companies *This includes targeted divestment and using a low-carbon index to reweight our equity portfolio away from the highest risk companies*
Analyse	Incorporate climate change into our analysis and decision making toolkit *For example, our valuation models, risk allocation, and manager selection*
Engage	Manage climate risks by being an active owner *Includes our engagement with companies, our voting policy and our direct investments*
Search	Actively seek new investment opportunities *Searching for new investments suitable for long horizon investors, including in the areas of alternative energy, energy efficiency and transformational infrastructure*

** We will anchor that target back to the 2 degree warmer scenario as a reference point in communications*

4. Investment background

4.1 It is becoming increasingly clear that in coming years the global energy system will transition away from fossil fuels. Governments, technology and society are driving an energy transformation. The forces for change include national and global policy, investments in new energy technologies, and pressure from society at large.

These forces are likely to disrupt not only the energy sector, but all industries to different degrees.

4.2 For investors, this creates substantial risks as well as opportunities. Some assets we invest in today may become 'stranded', rendered uneconomic by proper pricing of the carbon pollution externality, or made obsolete by new technologies, or face a dwindling market as consumers vote with their feet.

4.3 Investors also need to consider the potential unpredictability of policy initiatives. A coherent, all-encompassing global policy response is unlikely despite the inroads made at the Paris Conference on Climate Change in December 2015. Instead, industries are at risk from a patchwork of unpredictable and potentially heavy-handed regulatory interventions. Policies may not be well co-ordinated 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.

4.4 These risks – from policy, technology and society – can be and need to be hedged. Reducing our exposure to these risks is good for the portfolio, and is consistent with our mandate to maximise returns without undue risk.

4.5 We believe that financial markets currently under-price carbon risk over the horizon that matters for the Guardians investment purposes. Our own research and experience as investors makes us confident that climate risk is under-appreciated, if not largely ignored, by the majority of investors and analysts because the time horizon is too long. Changes to policy and technology are likely to be a slow-burn issue that pans out over at least a decade. This gives long horizon investors like ourselves an advantage, as we need to believe only that changes *will* occur, and can be less concerned with betting on *when* they will occur.

4.6 For this reason, reducing exposure to climate related risks is a low-cost insurance policy. If we are right that markets under-price 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 fair-priced assets and swapped them for other fair-priced assets. The impact on returns will be minimal over the long term, with the main cost being a minor reduction in portfolio diversification.

5. Climate Change Investment Risk

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

for the prepared and long-horizon investor. One such opportunity is the potential under-pricing of carbon emission risk in company valuations given the relative short horizon of many investors and the uncertainty relating to the timing and magnitude of policy responses.

5.2 The investment risk from climate change arises from impacts on:

a) supply and demand changes due to, for example, substitution to alternative lower carbon products, changing cost structures being imposed in some industries, changing consumer preferences, and regulation;

b) physical damage or disruption to well established industries and economies; and

c) disruption due to the inability of economies to adapt to a lower-carbon world at a reasonable cost over a reasonable time period.

5.3 The New Zealand Superannuation Fund is exposed to global climate change, being a globally diversified, long-horizon, portfolio.

5.4 The Fund's largest climate change exposure is through listed global equity holdings. These holdings have a very wide geographic spread, and include passive investments in high carbon-emitting sectors.

5.5 The Fund's active investments are also exposed to varying degrees, with the magnitude of the impact ultimately determined by the extent of global warming. For example, scenario work undertaken for the Guardians indicate that investments in infrastructure, timber, rural, and alternative energy could benefit from a shift to a low-carbon economy. However, all real assets will face 'locked in' climate risks that, within reasonable scenarios, can negatively impact all asset classes.

6. Guardians Investment Mandate

6.1 The NZ Superannuation Income & Retirement Act (s58) states an investment mandate that aims to invest the Fund so as to:

1. maximise financial returns without undue risk, while

2. employing best practice portfolio management and

3. avoiding prejudice to NZ's reputation as a responsible member of the world community.

6.2 The Guardians also have reputation and ethical considerations when investing, as guided by our ***Responsible Investment (RI) Framework***. The guidelines for making engagement, divestment and exclusion decisions based on reputation and ethical grounds are:

- the severity of the issue, and the degree of involvement of the company;
- international law and conventions;
- New Zealand law and significant domestic policy; and
- whether engagement is likely to succeed and/or is too resource intensive.

The Guardians is cognisant of these guidelines in considering if companies are materially breaching acceptable standards of corporate behaviour as contained in our RI Framework.

6.3 Finally, two of our ***investment beliefs*** the Guardians hold necessitate us having regard to climate change risk when building our portfolio - that:

- "responsible investors must have concern for environmental, social, and governance (ESG) factors because they are material to long-term returns" and;
- "Investors with a long-term horizon can outperform more short-term focused investors over the long-run."

Climate change

6.4 We believe that investment risk associated with climate change is material, and hence if ignored in our investment decisions could be considered taking "undue risk". As such, climate change should be factored into the Guardians decision making on an ongoing basis. This entails managing and monitoring the carbon-intensity of the Fund, and looking to exploit the long horizon investment opportunities that arise from climate change.

Role of the Reference Portfolio and our mandate

6.5 The Reference Portfolio is designed to achieve the all 3 legs of the Guardians' investment mandate described earlier. As such, responsible investment exclusions should form part of the Reference Portfolio benchmark as a matter of policy principle.

6.6 To date we have taken a pragmatic approach to the choice of Reference Portfolio benchmark exclusions – balancing the implementation cost of the exclusions against the potential active risk introduced between the Actual and Reference Portfolio. The Guardians' investment exclusions made to date (e.g., tobacco, cluster munitions, etc) are currently not part of the Reference Portfolio benchmark – due to the cost of doing so relative to the low-cost design principle of the Reference Portfolio, and the relatively small active risk introduced. Of course the difference in returns created by the exclusions are captured in the Actual portfolio and accounted for in our 'value-add' measure.

6.7 Any exclusions made with regard to climate change due to the undue investment risk (such as a move to a 'low-carbon passive index') will also be fit for consideration in the Reference Portfolio – subject to the same business cost/tracking error decision outlined above. As such we will need to review the Reference Portfolio as part of implementing the climate change strategy.

6.8 Looking ahead, "avoiding prejudice" will also grow as a purpose for our climate change risk strategy, as governments produce their own response plans to the global climate change post- the Paris accord.

7. Investment Options to Manage Climate Change Risk

7.1 As a responsible investor the Guardians have a variety of options and processes to achieve our climate change policy goals and meet our near-term emissions target.

7.2 Until recently, most of the pressure to manage climate change (carbon stranded assets in particular) has focused on divestment from companies in the fossil fuel sectors. Divestment is a necessary option at times. It is, however, just one means of influencing the change in company behaviour necessary in the energy sector and is insufficient to limit global warming on its own. Selective divestment also involves

picking 'winners and losers', thereby creating active risk by deviating from the 'market' risk and returns. Divestment also means forgoing the rights of an owner to demand change.

7.3 Fortunately there are additional tools at the Guardians' disposal. Our strategy has a four-pronged approach: **reduce, analyse, engage** and **search**:

Reduce exposure to the highest risk assets

7.4 Reducing the Fund's exposure to companies that are most at risk from climate change policy, most likely using a low-carbon global equity index with minimum tracking-error to the whole of market index. Decarbonised indexes with a low tracking error are useful in protecting against time horizon risk, i.e. if the market performance on carbon emitters is not impacted for some time. As long as carbon emissions are not priced the indexes are designed to produce returns matching the benchmark. But if and when carbon begins to be priced the decarbonised index is expected to outperform the benchmark portfolio.

7.5 We found little evidence that climate risk was being priced in so we do not believe climate risk is currently over-priced. However, it could be in the future and our tracking error constraints should aim to manage this.

7.6 The carbon intensity of our global equity portfolio will be the primary tool for managing whole of portfolio climate change risk. This approach will reweight our global equity portfolio away from companies that are more exposed to climate risks. It will not necessarily reduce our exposure to certain companies all the way to zero.

7.7 In some cases, we may also introduce targeted full divestment from the highest intensity companies that are unable to change to alternative – lower carbon - energy production or usage. We will still remain exposed to carbon intensive assets across the portfolio to varying degrees but will materially reduce the whole of portfolio carbon footprint over time. This means, for example, that we may from time to time invest in carbon intensive assets where the opportunities are both sufficiently compelling and consistent with our mandate.

7.8 The primary measure of progress will be the carbon footprint of the portfolio. For practical reasons, at this stage we are able to target Scope 1 and 2 emissions[2] only. We will track other metrics such as fossil fuel reserves exposure as part of more targeted risk analysis and positive investment in climate solutions.

Analyse – incorporate climate change into our analysis and decision making toolkit

7.9 Developing a consistent set of investment decision making frameworks that explicitly account for climate investment risk in valuation models and the cost of capital i.e., ensuring we are adequately identifying and accounting for climate change risk;

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[2] See page 18 Background documents. Scope 1 = emissions direct emissions from companies own production. Scope 2 = indirect emissions such as from electricity use or transport.

7.10 Undertaking regular whole of portfolio, and specific investment, climate change scenario tests to best identify investment risk;

7.11 Ensuring an ongoing investment bias toward low-carbon investment options when confronted with choice,

7.12 Ensuring that carbon intensity is an explicit factor in our risk allocation process and investment ranking; and

7.13 Ensuring our manager selection process includes an assessment of their commitment to adhering to our climate change policy, and providing the necessary transparency to enable our ability to monitor their actions.

Engagement with companies, managers and policymakers

7.14 Being an active shareholder in companies we are invested in to ensure company dividend and re-investment decisions are consistent with achieving our climate change strategy. We will also seek better climate risk management, adaptation and disclosure in the companies that we invest in;

7.15 Influencing our portfolio companies to lower their carbon intensity, especially companies in which we hold Board positions; and

7.16 Voting across the whole portfolio consistent with our desired climate change strategy.

Search – actively seek new investment opportunities

7.17 We will continue to assess and invest in alternative energy opportunities, subject to sufficient confidence in expected risk-adjusted returns.

7.18 Our existing Energy Opportunity focuses on alternative energy and gas as a bridging fuel. We will also seek and assess opportunities in energy efficiency, transformational infrastructure, transport and resource and land management.

7.19 We will also assess innovative investment platforms and instruments that promote lower carbon intensity usage (for example, the Aligned Intermediary platform that the Guardians are a member of).

7.20 In assessing new opportunities we will continue to maintain our investment discipline as low-carbon solutions are at times overhyped and overpriced. This in itself creates opportunities for long horizon investors as it enables us to buy assets when they are out of favour. This strong boom-bust cycle is also why we believe it would not be appropriate to set a specific numerical target for investments in low-carbon alternatives.

Attachments:

1. **Climate Change Strategy Background Document**

NZSUPERFUND
Te Kaitiaki Tāhua Penihana Kaumatua ō Aotearoa

Section 1. Climate change strategy summary

[Strategy document to be inserted when finalised]

Section 2. Climate change investment risks

Climate change has become a major risk factor for investors. The Guardians recognises the momentum behind this issue and how it is driving policymakers, regulators, consumers and entrepreneurs. We also recognise the long-term physical impacts of climate change on some types of assets.

Of course, this also creates investment opportunities. Climate change policy risk is a two-sided coin, and long term investors are well placed to benefit from the long-term shift in the way the world generates its energy.

These risks and opportunities need to be factored into all aspects of our investment process.

Types of investment risk

Risks to individual companies or sectors can be classified as:

- Supply and demand changes, which could be driven by policy, regulation, technological change or changing consumer preferences;
- Increases in the cost of doing business, which are also driven by regulation and policy;
- Physical damage or disruption to assets, industries or even whole economies;
- Disruption if economies are not able to adapt to a lower-carbon world at a reasonable cost over a reasonable timeframe.

Policy risk has increased significantly, even over the last few years. Global policymakers are to some extent playing catch-up to a groundswell movement from civil society. The Paris Conference on Climate Change in December 2015 led to a significant global commitment to aim to keep global temperature increases below 2 degrees Celsius, with a stretch target of 1.5 degrees.

Clearly, the speed and extent to which individual countries follow through on their promises is highly uncertain. For investors, this uncertainty – and the potential differences in approach across countries – is a risk that needs to be taken into account. Moreover, whatever action governments do ultimately take, it is likely to be significantly stronger than investors might have guessed a couple of years ago.

Investors also need to consider the likely unpredictability – and even irrationality – of the policy response. Judging by the attempts so far, including the limited success of the Kyoto Protocol and outright failure of most carbon markets, it is very difficult to get a coherent, all-encompassing policy response. The “first best” policy in economic terms, which is a carbon price that reduces global emissions at the least possible cost, looks unattainable.

Instead, industries are at risk from a patchwork of unpredictable and potentially heavy-handed regulatory interventions. Policies may not be well co-ordinated across countries, further raising the cost of doing business. The recent Volkswagen emissions scandal is a good illustration of how differences in regulations across countries can create major problems for producers, and how the regulatory backlash can be severe for companies and investors.

The pressure from **civil society** can be equally unpredictable. Consumers are much more able and willing to embark on co-ordinated actions that companies may not forsee or be able to react appropriately to. Sometimes, when people are not well informed, the actions may be irrational (for example, the controversy regarding food miles a few years ago) but the damage to companies may nonetheless be severe.

Energy efficiency can also have a significant impact on demand for energy production and transmission assets. The International Energy Agency estimates that fuel-efficient vehicles and energy-saving appliances could reduce oil consumption by the equivalent of what Germany, France and the UK together consume today. Better insulation and smart grids are also easy wins that are happening today.

Improved energy efficiency can be driven by regulation and by **consumer preferences**. For example, many consumers are willing to pay slightly more for cleaner electricity or cars in order to 'do their bit' for global climate change. Investors who are sceptical about whether policymakers will ever show teeth should nonetheless be considering what consumers may choose to do on their own.

Smart grids and energy efficiency are at the lower end of the technology scale. At the other end of the scale are the **disruptive technologies**. In our assessment, technology risk has more potential than policy or civil society to alter the investment landscape in fundamental ways. For instance, wind power has become cost competitive with traditional electricity generation, albeit with major complications for grid management. The cost of solar panels has halved between 2010 and 2014. Breakthroughs in battery storage could fundamentally alter power networks and, of course, accelerate the death of the internal combustion engine.

The **physical impacts** of climate change have also tended to be underestimated. Water scarcity, natural disasters and rising sea levels can cause physical damage to real assets such as agriculture, forestry, infrastructure and real estate.

The experience of the insurance industry following Hurricane Andrew in 1995 shows that a poorly prepared industry can be brought to its knees by catastrophic climate events. It also demonstrates how new opportunities can be created, for example the invention of catastrophe bonds.

Unburnable carbon

The concept of unburnable carbon is that most of the world's fossil fuel reserves cannot be burned if we are to avoid dangerous levels of climate change. It is a key part of the ethical and investment-based arguments for divesting from fossil fuels.

The consensus of the IPPC (the UN panel of climate scientists) is that the world needs to limit global temperature increase to no more than two degrees Celsius (2^oC) relative to pre-industrial levels in order to have a reasonable chance of avoiding dangerous climate change. This view has been accepted by the international community, including New Zealand.

This objective can be translated into a global budget for carbon emissions up until 2050. There is a limit to how much carbon can be burned if the 2^oC limit is to be achieved. However, the world has already used up more than half this 2050 carbon budget. The energy sector makes up the lion's share of global emissions.

To stay within budget, it is estimated that no more than one-third of total fossil fuel reserves can be consumed prior to 2050, and only a minimal amount thereafter. Successful application of carbon capture and storage (CCS) technology could extend this by only a small amount.

The key facts about the global carbon budget are:

- Existing fossil fuel *reserves* represent emissions approximately three times the global carbon budget. (Total fossil fuel resources are much greater than actual reserves, being more than ten times the global carbon budget);
- Coal reserves alone exceed the global carbon budget;
- Around three-quarters of global reserves are owned by governments or state-owned companies, with only a quarter controlled by publicly listed companies.
- Of the listed company reserves, *proven* ('1P') reserves are approximately two-thirds of the global carbon budget, while *proven and probable* ('2P') reserves amount to 1.5 times the budget.
- Theoretically, this means that listed companies could burn all their 1P reserves without jeopardising the global carbon budget only if the other State players cut back production massively. More realistically, if everyone continues to produce in proportion to their reserves then 60-80% of listed company 1P reserves, and all of their 2P reserves, would be unburnable if the world is to stay within its carbon budget.

Do markets recognise and price these risks?

It appears that analysts typically assume a negligible probability of carbon regulatory or demand risk in their valuation models (see the Box below). In effect, they are assuming that governments will take little or no policy action to constrain or price emissions from fossil fuels, or that any action will have negligible impact on listed companies.

Like the fossil fuel companies, analysts appear to be assuming the continued support of host country governments. Valuations do not penalise the potential value wastage from investing in new exploration and production.

Scenario analysis around climate risks appears to be uncommon. Our work with Mercer has looked at the potential impact of policy initiatives and technological changes. The potential impact of these scenarios on returns for fossil fuel companies, and especially coal companies, is estimated to be large.

In short, by assuming that all 1P oil reserves can be burned, markets are betting that there will be no significant policy action for some time yet; or that OPEC and other countries slash production to make room for the oil majors; that the massive investment in new energy technologies fails to bear fruit over a reasonable time frame; or that most of the adjustment falls on the coal sector.

Some investors accept many of the arguments put forward by the divestment proponents, but reject divestment as the solution. They argue that full divestment is not feasible in practice, or is a blunt tool, or that there are more effective ways to reduce the carbon footprint of a portfolio. Others argue that engagement is the appropriate response, though some believe it is naïve to think that

engagement will succeed. Other investors prefer a positive investment response, focusing on investment in renewables and other 'climate solutions'.

How does the market value fossil fuel companies?

We interviewed a range of energy market analysts and experts to understand how the valued listed energy companies. Based on these interviews, and our experience, we conclude that:

- Oil and gas valuations are based primarily on projected cash flows from 1P or proven reserves which are expected to be monetised within 10-15 years. Most of that value is placed on the early stages since oil and gas fields tend to peak and then rapidly deplete. Little or no value is placed on income from 2P or 3P reserves unless there is a clear pathway to market.
- Thermal coal is valued over life of mine, which is typically longer than for oil and gas projects. Analysts assume all reserves will be burnt on a steady-state basis. They typically apply a long-term coal price rather than the spot price.

Common market practice regarding integration of climate factors into asset valuation:

- Analysts appear to be pricing fossil fuel assets as if a 2^{o}C scenario will not apply.
- Consideration of global or national carbon budgets does not feature.
- Carbon regulatory risk is not explicitly factored into company valuations unless there are tangible measures in place in relevant markets.
- Climate-related demand impacts might, to some extent, be factored into forward price forecasts, which are plugged into DCF models but this is unclear.

More generally:

- Carbon risk is judged immaterial in the timeframe of (at least) 1P reserves, and unlikely to move the dial anyway in the context of much larger idiosyncratic risks facing the industry.
- Analysts believe that host country governments have a vested interest in profitability of oil and gas companies and may continue to engineer things so that carbon costs are neutralised (what they take with one hand they will give back with the other).
- Small exploration companies are viewed as being more exposed to carbon risk than the large, mature E&P companies because their value depends on 2P/3P reserves.
- The timeframe for carbon to impact oil is perceived to be longer than for coal, because there is no established alternative transport fuel.
- Gas is viewed by many to be an important "bridge" fuel in the low-carbon economy transition.
- Other market fundamentals are more important than climate change (such as an oversupply of thermal coal and uncertainty over whether India will pick up the demand slack from China).
- There may be some stranding of long-life coal projects, particularly lower quality product which is feeling the impact of China's pollution controls.

Section 3. Climate scenarios and their impact on portfolios

The Guardians have considered implications for the Fund from climate change risk factors across different scenarios, leading to different climate change outcomes and across different time periods. The scenarios are summarised in a declining order of policy coordination (and hence growing impacts on society from higher global warming). A summary of the scenarios can be found in Mercer Report.

Mercer Scenario Analysis – drivers of climate change risks

Along with a group of other investors, the Guardians commissioned Mercer to provide an analysis of climate change scenarios on portfolio returns. The Mercer approach modelled four climate risk factors that would affect asset prices:

- **Technology**: The rate of progress and investment in development of technology to support the low-carbon economy e.g. alternative energy
- **Resource availability**: The impact on investments of changes to weather patterns brought about by climate change e.g. permanent change to rainfall and therefore agricultural output or raising sea levels
- **Impact**: The impact on investments from severe weather events – e.g. floods, storms
- **Policy**: Any change to legislation and regulation to reduce climate risk or to help achieve domestic and international targets.

Mercer's climate change analysis seeks to take physical climate models (IPCC); policy pathways; and technology impacts and turn these into return forecasts. They present these under four different scenarios. Effectively, the different scenarios reflect different impacts from the risk factors above and the different climate outcomes as a result.

- **Transformation**: Climate change is contained to 2DC. Fossil fuel use is reduced to less than 50% of the energy mix by 2050 due to policy and technology – i.e. technology and policy risk factors have a larger effect on asset returns than impact and resource availability.
- **Coordination**: Climate change is contained to 3DC. Fossil fuel use is constrained to 75% of energy mix by 2050. All risk factors play a role across asset returns.
- **Fragmentation (low damage**): Climate change contained to 4DC.
- **Fragmentation (high damage**): Climate change contained to 5DC.
- Both Fragmentation scenarios represent a lack of action and assume marginal impact from the technology and policy risk factors, but significant affects from the Impact and Resource availability risk factors as the world does little, at least initially, to address climate change.

The Mercer modelling approach provides impacts on returns to our current portfolio over the next 10 years and over the next 35 years to present both long and short-term implications across the four scenarios. It helps set out a rational approach for long-term investors like ourselves to develop

climate-resilient strategies. Because the approach is based on new and relatively untested modelling, we believe it is more useful to consider the relativity between scenarios and opportunities, and the relative impacts of the risk factors on the portfolio, rather than the (overly exact) returns data itself.

Likelihood of scenarios

The COP21 conference in Paris led to widespread global support for action on climate change. Almost all countries in the world have committed to a global ambition of a minimum 2°C temperature rise, with efforts 1.5°C.

It is very difficult to assess the likelihood of the different scenarios. It is hard to gauge the extent to which countries will walk the talk, and technology could lead to transformational breakthroughs earlier than expected – or potentially struggle to make headway for years to come. Mercer's assessment of the likely actions following COP21 are:

- A lack of action would put the world on a Fragmentation pathway (+4°C or higher). This is not the most likely scenario.
- Existing national pledges look consistent with a Coordination scenario (+3°C). This scenario has a *high probability.*
- The ambitious goals in Paris for a +2°C pathway (and a stretch goal of 1.5°C) suggests Transformation is *increasingly possible*.

These steps make a Transformation or Coordination scenario more likely and improves signals to the private sector for low-carbon investment. In addition:

- The renewable energy sector is showing signs of becoming less tied to the oil price.
- While the oil price has been volatile, it is currently not far from the breakeven level for the most productive shale fields (and the breakeven price for shale has been falling rapidly due to productivity and cost improvements; this will lower the longer-term equilibrium oil price).
- OPEC production remains high, partly due to the return to full production in two countries. There are also increasing signs that co-ordination amongst OPEC members is breaking down.
- National carbon proposals are showing clear signs of subsidy reform, with a shift from fossil fuels to renewables.
- Awareness among investors has increased sharply. Many have begun to estimate their carbon footprint or broader climate risk.
- Social, political, business, investor and regulatory groups have begun to work together to support effective climate action and improve policy certainty.

Climate risks in the Fund

Transformation scenario

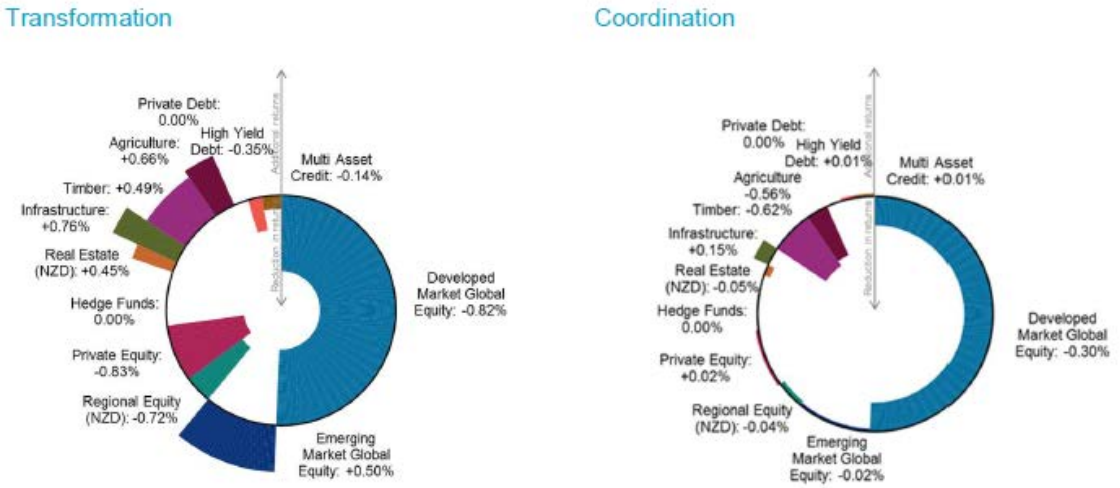
The transformation scenario over both timeframes benefits a number of asset classes through reduced exposure to physical risks, increased investment into infrastructure and forestry, a premium attached to sustainable forestry products and improved technology.

Negatives to global equities are due to higher exposure to key sectors which suffer from policy action and technology substitution.

Coordination scenario – 10 year picture, 35 year picture

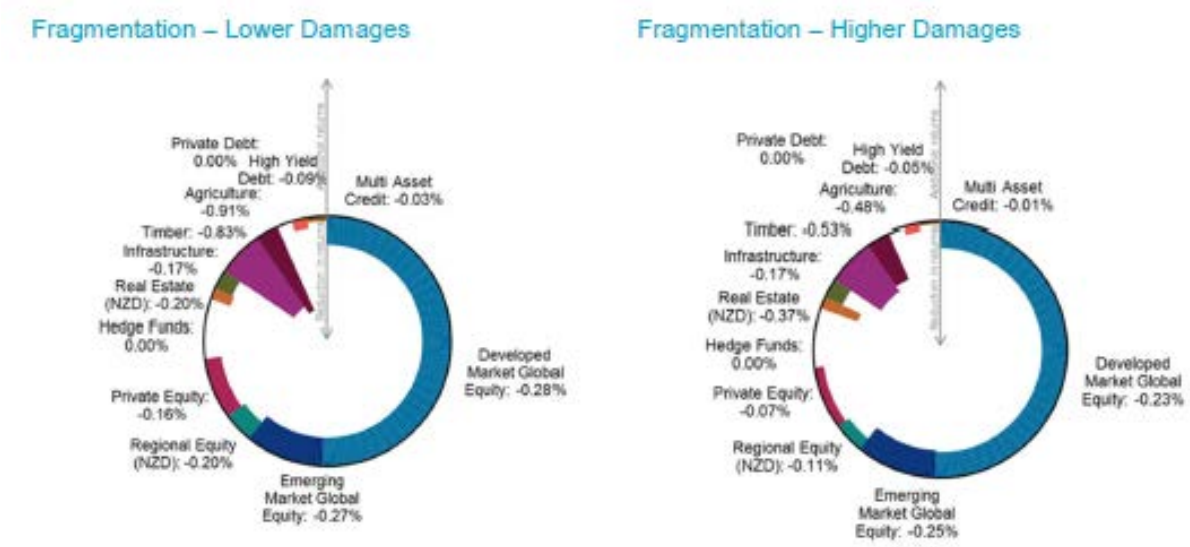
If policy action is less ambitious, all opportunities (apart from infrastructure) suffer giving a smaller but cumulative impact across the portfolio. Physical (real) assets face negative impacts from climate change over the shorter term but this changes as climate mitigation sets in over the longer term. Infrastructure still benefits from investment flows to build climate-resilient into infrastructure as countries adapt to locked-in climate change.

Figure 1:
NZ Super Asset Allocation (data over 10 years)



Fragmentation scenario

Under both damages scenarios, all asset classes face negative returns, although this is attenuated over 35 years. The challenge with the fragmentation scenarios is that they assume no policy response at all despite what would be strong social pressure arising due to severe climate impacts.



The emerging market based assets lose from weak climate action as they face higher physical impacts and resource scarcity, and so have more to gain from the transformation or coordination scenarios (reducing the downside). Potentially, China policy may also produce “winners” by enforcing large scale technological change in the energy and intensive industry sectors.

Many of the Guardians active opportunities – infrastructure, timber, rural, and alternative energy – are positioned well and benefit from a low-carbon Transformation scenario. Partly this is due to avoided risks from water resources and physical damage which they experience under a slower transition.

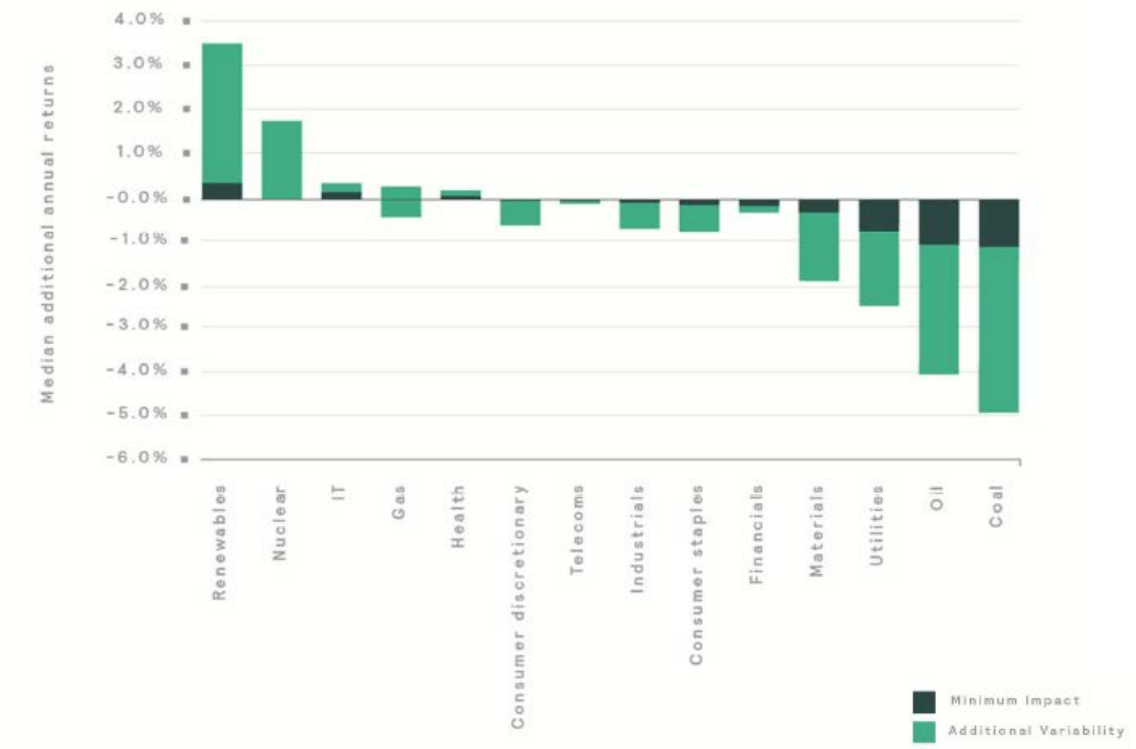
Equity portfolio and sector risks in detail

From the Mercer study of the Fund, the most material negative impact is on the global equity portfolio over the next ten years should a transformation scenario play out.

The negative impact on the global equity portfolio under the 10 year transformation scenario is a reduction in returns by around 0.8% per annum. It is important to look at the underlying industry sectors where divergence (positive and negative) provide a more meaningful picture. Reducing exposure to the most impacted industries and increasing exposure to beneficiaries is an obvious strategy to improve returns.

Importantly, the analysis indicates that at the sector level the market is not pricing in carbon risks. Climate change risks are most obvious in those industries that are energy intensive; fossil fuel dependent; and exposed to physical assets.

Figure 18:
Climate impact on return by industry sector (35 years)



The sectors with the biggest potential downside risks – coal, oil, utilities, materials – are also those identified as the Fund's largest carbon emissions sectors (making up less than 1.8% of the portfolio but accounting for nearly 50% of emissions). As such, emissions metrics are a useful indicator for investment risk.

The chart above shows median annual returns for industry sectors over the next 35 years. These impacts should be considered in context as a percentage of underlying expected returns (which generally range from 6-7% per annum). For example, the coal sub-sector annual returns could be reduced from 6.6% to between 1.7% – 5.4% p.a. over 35 years depending on scenario.

The impact is more marked over a 10 years period. The oil sector, given its larger weight in the portfolio, causes the most concern for investors with average returns falling from 6.6% p.a. to 2.5% p.a.). Coal is still negative under all scenarios ranging from a fall anywhere from circa –25% to –140% of annual returns. Gas captures both upside and downside risks.

The renewables sub-sector sees an increase in annual returns of between circa. + 5% to +100% over a 10 year period. Strong climate action is also supportive of rail transport, electric vehicles and energy efficiency investments.

'Stranded asset' risk and mispricing are underpinning themes. Sectors reliant on fossil fuels (including service providers such as infrastructure) are at risk from stranded assets on their balance sheet.

Coal & Utilities

Coal is most at risk as it has the highest carbon intensity of any energy source, it is substitutable, and its replacement is the fastest way for countries to achieve progress to their targets. Coal power is also contributing to severe health issues in China and other developing countries from pollutant emissions. It is however cheap.

Utilities with coal fired power plants have a high likelihood of these assets stranding. For this reason, coal mining, coal transport and ports reliant on coal also risk taking write-downs on stranded assets. Diversified utilities and those transitioning to gas or renewable alternatives should be more resilient.

Energy – oil & gas

Although declining, oil will still make up nearly half our energy needs in the coming 20-30 years – the question is whose?

The tension between listed oil companies and State players will increase. If both continue to produce in proportion to their reserves then 60-80% of listed company 1P reserves, and all of their 2P reserves, will be unburnable if the world is to stay within its carbon budget.

In 2014, on average oil majors projections for oil demand out to 2035 were higher than the IEA scenario for 2DC and 4DC. In effect, factoring in no impact at all from carbon policy action or technology disruption.

OPEC's response to the COP21 stated that whilst the world must continue to develop renewables, there was a role for oil but the low price environment was a result of too much investment in high cost production.[1]

The spotlight is also on higher energy intensity and higher cost producers including Canadian oil sands and US shale. Failure to gain approval for the Keystone pipeline servicing the oil sands shows the risk to midstream assets.

Gas is widely seen to benefit from ongoing substitution of coal power and greater potential to play a role in transport. Gas's Achilles heel could be a failure to reduce fugitive methane emissions which is a powerful greenhouse gas. Disruption could also come if technology allows developing markets to jump direct from coal to off-grid and renewables. But most models point to an important role for gas in replacing coal power.

Materials

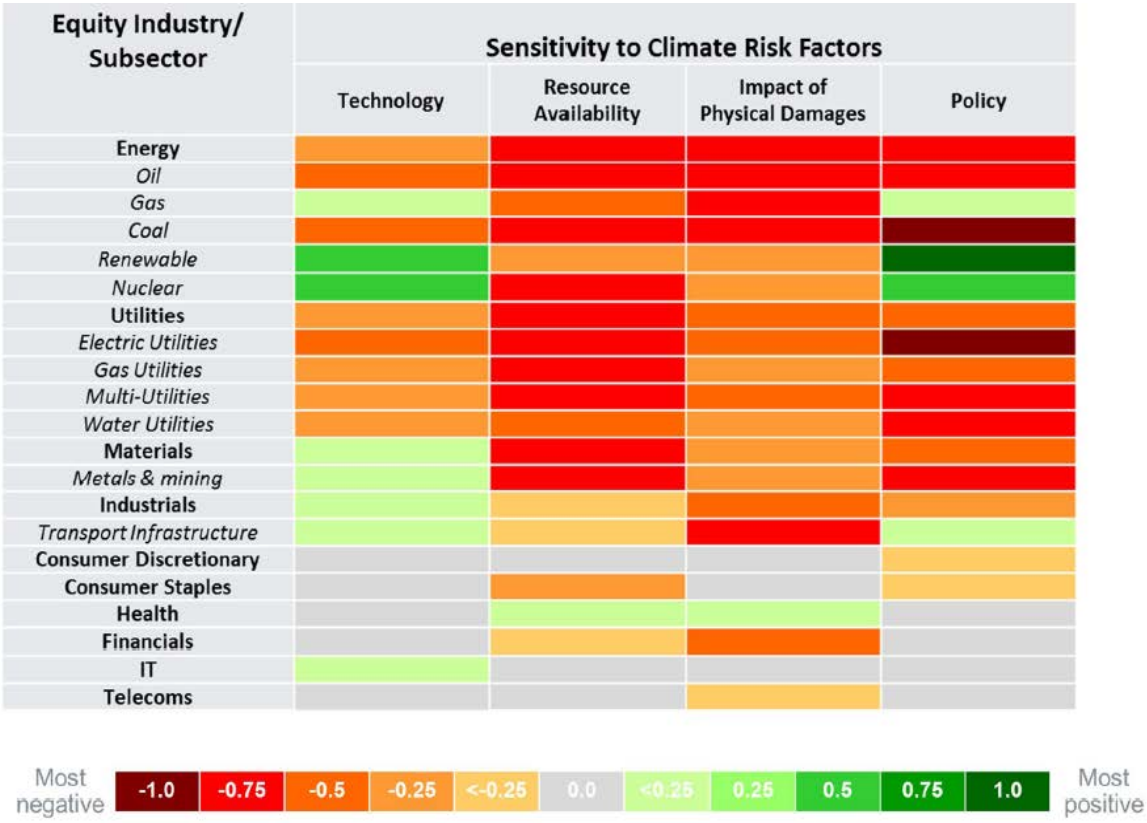
Within the Materials sector, the cement and steel industry has super-sized emissions, and are major contributors along with coal to MSCI Emerging Markets carbon intensity. Steel making has no developed alternatives to the use of metallurgical coal and has high energy consumption. Similarly cement uses coal for fuel (although some displacement here is possible) but the actual cement process itself releases CO_2 which is unavoidable. The construction industry will absorb some passed

1. OPEC bulletin 02/16

through carbon cost given difficulty in substituting at scale. Lower carbon materials such as wood could benefit through substitution.

These sectors are also the most exposed to other weather-related factors e.g., access to water; weather damage to physical assets; and technology disruption. There is no scenario under which they avoid being impacted negatively from climate change – unless they can adapt.

TRIP factors by Industry and subsector



Other investments

Mercer's analysis covered a number of the Guardians core active opportunities. The most impacted opportunities are Shale Energy, Infrastructure, Timber and Agriculture.

Figure 1: Climate Impact on Returns by Asset Class (35 Years)

Source: Mercer

Shale Energy

Shale is the Guardians' only direct fossil fuel opportunity. There are very different outlooks for oil versus gas under climate scenarios. The Guardians' shale opportunity is already focused on a climate-change theme, driving gas to replace coal in US power stations. The policy climate for retiring coal stations has strengthened, supported in part by affordable gas. However, the price is proving too low presently for producers.

The outlook for oil is negative across all risk factors which is reflected in lower returns. The Guardians' shale opportunity includes midstream and downstream opportunities, plus some exposure upstream through a fund.

It will take longer to displace oil in transportation than coal in power. However, the stranded asset debate shows little room in the global carbon budget for high cost long-lived oil exploration.

Real Assets

Impacts on timber, agriculture, real estate and infrastructure are dependent on the climate change scenario.

The downside for real assets relate primarily to the physical impacts of climate change. The upside is the significant investment in infrastructure required globally to adapt to climate change (climate finance and climate resilient infrastructure programmes).

FIGURE 9: REAL ASSET CLASSES – TRIP FACTOR SENSITIVITY

ASSET CLASS SENSITIVITY	T	R	I	P
GLOBAL REAL ESTATE	<0.25	0.00	-0.75	<0.25
INFRASTRUCTURE	0.25	>-0.25	-0.50	<0.25
TIMBER	<0.25	-0.75	-0.50	0.25
AGRICULTURE	0.25	-1.00	-0.50	0.25

Infrastructure and property

Property investments will need to pay attention to rising regulatory and customer expectations on energy efficiency in particular. Costly retrofits maybe needed to remain current. On the flip side there are opportunities from increased energy efficiency requirements.

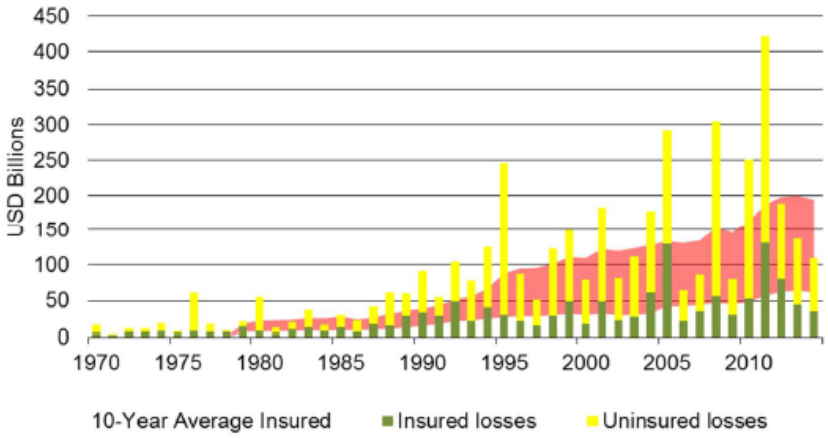
Infrastructure benefits from climate action, to reduce physical damage to assets and to benefit from large-scale investment the UNFCCC has earmarked for stimulating investment in “climate-resilient” infrastructure.[2]

Some types of infrastructure – airports, roads, pipelines – may also face policy risk through increased carbon pricing. We have a number of exposures to these types of assets.

Infrastructure and property face risks from rising sea-levels, flooding, or cyclone damage. They also face the potential for uninsured damages. There are signs that uninsurable losses are rising. This could lead to new demand for one of our opportunities - catastrophe bonds.

2. The Fund is a signatory to a commitment to actively seek climate-resilient infrastructure. The commitment sets out some of the requirements for regulators to stimulate private capital.

FIGURE 10: WORLDWIDE UNINSURED CATASTROPHE LOSSES – A WIDENING GAP



Source: Swiss Re Sigma 02/2015

As shown here, the gap between economic and insured losses is widening. Monitoring portfolios for overall exposure to extreme risks and ensuring adequate catastrophe insurance coverages are in place should be a priority going forward.

Current infrastructure assets may not be pricing in the cost of adapting to climate change. A recent example of weighing up the costs is illustrated by the decision to increase the height at which the new runway at Brisbane airport would be built to be more resilient to rising sea-levels.

In New Zealand, Christchurch is particularly exposed to rising sea-levels and any investment in reconstruction would be wise to model at least "baked in" climate change impacts. Sea-level rises are significant for other NZ cities even at a 10 cm rise. In New Zealand, sea level is projected to rise by about 30 cm between 2015 and 2065. This rise would lead to extreme weather events currently expected every 100 years to be experienced:3

- Every 4 years in the port of Auckland
- Once a year at the port of Wellington
- Once a year at the port of Christchurch
- Every 2 years at the port of Dunedin.

Timber and Agriculture

Agriculture and timber have the most divergent sensitivities depending on the scenario. Impacts from droughts may be overstated for timber in Mercer's analysis – except as they relate to fire – but are very real for agriculture.

Economic models based on crop yield shocks tend to agree on direction of climate shocks, but differ significantly in magnitude. Some regions will increase yields from more rainfall and warmer

3. NZ Environment Commissioner's report

temperatures but overall these opportunities face very real direct physical impacts from lack of action to combat climate change

Disease – both for crops and animal/human health – is a less well understood potential disruptor.

The Guardians' global agriculture opportunity is currently accessed through NZ dairy farms. The carbon footprint of dairy is comparatively high because methane and nitrogen emissions from livestock are hard to abate. Mitigation is poorly researched to date but research is being fast-tracked through the UNFCCC process – with NZ a lead sponsor.

Timberland is hardier to changes in temperature and rainfall than agriculture, but is exposed to increased fire risk, wind damage and exposure to disease.

Geographical diversification can offer some protection but climate policy action is the best long-term protection.

As it is normal to map weather and water resources for these opportunities, predictive models more specifically integrating climate change mapping is a reasonable next step for timber and agricultural investment strategies.

Our other opportunities should also consider exposure to climate risks by considering if they are exposed to high risk (or high opportunity) sectors. For example distressed and high yield credit, asset selection, volatility and even tilting opportunities could all be exposed through the capital stack to coal risks. Natural catastrophe bonds, insurance and commodities are exposed to physical damages, so geographic assessments are more relevant.

Feedback noted July 2016 NW. Timber risk is lower compared to the Mercer study regarding risk from temperature changes and changing rainfall patterns. The range in temperature and rainfall zones that even a single species like Radiata pine can tolerate and be productive in is way outside the predictions of changes that may occur due to climate change. For example it will grow productively in rainfalls as low as 600mm/year in Canterbury and West Coast at 2.0 Metres/year.

Similarly average temperature Radiata is growing in in NZ ranges from Southland to Kaitaia, so is extremely well adapted to a range of climates. The growth rate and density increases due to growing in warmer climes will be strong positives, without the benefit of potentially getting paid to store carbon.

Whilst the above is relating to Radiata, similar arguments could be developed for all of the key plantation species. The other consideration with Timber is that it is not permanent, short rotation crops could be harvested in 10 years, and the longest we invest in around 25-30 years. This provides the opportunity to replant with more suitable species/clones as climate impacts evolve. Intensive management of the type we would invest in is likely to be a strong mitigant to negative impacts of fire and disease.

In the agriculture space, whilst some areas may be severely affected by temperature and rainfall impacts, some areas will benefit. For example Northern and southern areas will get warmer and not necessarily drier.

Section 4. Is divestment from fossil fuels the right approach?

The arguments put forward for divesting completely from fossil fuels are partly investment based and partly ethical.

The investment argument is that fossil fuel producers are poor investments because they may be overpriced and subject to stranded asset risk. The concept of ‘unburnable carbon’ is a key part of the argument.

The ethical claim is that investors should not support an activity that is widely accepted as driving climate change. “If it is wrong to wreck the climate, then it is wrong to profit from that wreckage,” as 350.org puts it. Principles of fiduciary duty are also used to support divestment.

Over time, the debate has shifted towards the investment rather than ethical case.

More recently, the discussion have focussed on coal given that coal-based electricity production is responsible for nearly half of CO_2 emissions from global fossil fuel use, but is only a small fraction of the global equity universe.

Calls for divestment are sometimes coupled with appeals to re-invest freed-up capital into renewable energy solutions (for example, the “Divest Invest” campaign). Other stakeholder campaigns are aimed at investors’ management of climate-related financial risks and are less prescriptive on means – e.g. the “Asset Owners Disclosure Project”.

Various organisations have called on the Guardians to divest from all fossil fuel mining and production companies. Private members bills have been introduced to Parliament but have not found support.

The investment arguments

Proponents of divestment argue that fossil fuel companies are overvalued because markets are not pricing the cost of carbon (see Section 2) or the risk to future earnings from potentially unburnable reserves and what they see as the inevitable decline of the of fossil fuel industry.

Global policy and technological change are focused on transitioning to a low-carbon economy. Both efforts are expected to reduce demand for fossil fuels and to increase costs for fossil-fuel users. The potential changes include pricing the carbon externality through regulation, taxes or emissions trading schemes; removal of fossil fuel production and consumption subsidies; energy efficiency gains and falling renewable energy costs, bolstered by policy incentives; technological improvements in energy efficiency and battery storage; and technology leap-frogging in developing countries assisted by international financial assistance.

Increasing civil society and shareholder activism will amplify or even pre-empt government policy, and could independently impact investor returns and reputation.

Proponents of divestment argue that these changes will leave some assets ‘stranded’, especially the fossil fuel reserves currently on the books of listed companies. It is argued that equity and credit markets are not systematically pricing this long-term value risk into their financial models.

Divestment proponents also argue that oil and gas companies continue to re-invest profits on a business-as-usual basis into new exploration and production which faces a high probably of being economically stranded. Similar risks are said to apply to capital expenditure on fossil fuel dependent infrastructure such as refining, pipelines, transport and electricity generation.

They also question whether natural gas is a feasible bridging fuel. They argue that the emission savings in switching from oil to gas are overstated because fugitive methane emissions from gas can be high.

The view of fossil fuel companies

When it comes to the basic facts over the global carbon budget (discussed in Section 2), there is little dispute over the basic numbers. It is increasingly accepted that less than one-third of existing fossil fuel reserves can be burned if the world is to stay within its 2°C carbon budget, and that listed company proven reserves (1P-reserves) are approximately twice this level.

The disagreement comes from whether government policy or action by civil society will ever be strong enough to limit warming to 2°C, and where the burden of adjustment will lie (the State players vs the corporate sector; and oil versus coal).

Fossil fuel companies generally rebut stranded asset claims, as follows.

1. They judge there to be no material stranded asset risk in the timeframe relevant to current market valuations. They are confident about sustained long-term demand for fossil fuels - coming primarily from developing countries - based on scenario planning that they say is consistent with IEA forecasts. They are sceptical about global policy ambition driving a 2°C scenario.

2. The oil and gas companies argue that:

    - Even under a 2°C scenario, the IEA forecasts a substantial role for oil and gas out to 2050 and beyond.
    - OPEC will act to keep oil prices high, some say.
    - Competitive alternative technologies in transport have yet to emerge.
    - Coal will take the biggest hit; it is the largest emitter and can easily be substituted.

3. Thermal coal companies have different arguments:

    - Coal will remain an essential part of the global energy mix.
    - Coal is the solution to energy poverty - low-cost coal will continue to be the main driver of sales in developing markets.
    - Clean coal plants will address environmental concerns; near zero emissions can be achieved when combined with CCS.

4. Both types of fossil fuel companies claim to be adequately managing the longer-term risk - e.g. by integrating climate risks into their strategy and risk management; applying shadow

carbon price in project economics; diversifying and investing into cleaner fuels, energy efficiency, CCS and renewables.

5. They believe they have decades to adapt because they judge that renewable energy cannot scale up fast enough to replace existing fossil fuel supply.

6. They are confident about carbon capture and storage being deployed at scale.

Ethical investment issues

Most proponents of divestment take an ethical as well investment viewpoint. They argue that there is a moral imperative to divest from fossil fuels, based on the 'unburnable carbon' thesis and the social and environmental consequences of breaching the global carbon budget. Analogies are often drawn with previous apartheid and tobacco divestment campaigns.

Proponents point to the extensive body of work on the physical, resource and economic impacts of climate change.

Some investors have been prepared to divest on ethical or sustainability grounds alone, even if it means sacrificing returns.

The most common response to the ethical argument is that the elimination of fossil fuels would impoverish many energy-intensive poor countries, especially those that are currently dependent on coal. They argue that fossil fuel production is not unethical *per se*, as it is such a systematic part of all global activities.

Divestment proponents say that this under-estimates the potential for developing countries to leapfrog straight to the cleanest modern technology, supported by international climate finance initiatives.

Others believe there might be a case for selective or sequenced divestment – e.g. prioritising divestment from the most high-carbon and readily substitutable fossil fuels – and potentially for differential approaches to developed and developing countries.

Some have argued that from an ethical standpoint divestment is the wrong option because it will not reduce emissions, especially if equities are simply changing hands. so, divestment does not address the risk to the climate from the three-quarters of fossil fuel reserves that are outside of listed companies' hands.

Relevance to our responsible investment framework

The Guardians also have reputation and ethical considerations when investing, as guided by our Responsible Investment Framework. The guidelines for making engagement, divestment and exclusion decisions based on reputation and ethical grounds are:

- The severity of the issue, and the degree of involvement of the company;
- international law and conventions;
- New Zealand law and significant domestic policy; and
- whether engagement is likely to succeed and/or is too resource intensive.

International policy and law

Through the United Nations Framework Convention on Climate Change (UNFCCC), the international community has adopted the findings of the IPCC and has agreed to a goal of limiting global temperature increase to 2ºC (and to keep under review the adequacy of this ambition). New Zealand has ratified this convention.

At the UNFCCC meeting in Paris in December 2015 parties aim to agree a new, post-2020 2ºC climate agreement that covers all countries. In parallel, the G20 and APEC have both pledged to phase-out inefficient fossil fuel subsidies, although there is little evidence of progress so far.

The US, China and the European Union have all submitted post-2020 emission reduction pledges to the UN and taken action targeting coal fired power generation and promoting renewables and energy efficiency.

- China has pledged to peak emissions before 2030, reduce carbon intensity by two-thirds on 2005 levels by 2030. It is implementing an ETS as part of its approach. Tackling air pollution from coal-fired power generation among top political priorities of Chinese government.
- The US has pledged to cut emissions by about a quarter below 2005 levels by 2025. President Obama launched a revised US Clean Power Plan, under which electricity generators must cut carbon dioxide emissions by 32% from 2005 levels by 2030 (coal fired power plant provide more than a third of US electricity supply).
- The EU has pledged to cut emission by at least 40% below 1990 levels by 2030. EU-wide regulations are phasing out dirty coal and ambitious renewable energy and energy efficiency targets.

NZ policy and law

Along with other Parties to the UNFCCC, New Zealand has committed to a 2ºC global goal and said it will do its “fair share” towards achieving the necessary global emissions reductions.

The Government has four national targets for reducing greenhouse gas emissions that cover both the medium and long term:

- A pledge for the Paris convention to reduce emissions to 30% below 2005 levels by 2030 (equivalent to 11% below 1990 levels).
- An unconditional target of 5% below 1990 levels by 2020.
- A conditional target range of 10 to 20% below 1990 levels by 2020, if there is a comprehensive global agreement and other conditions are met.
- A long-term target of 50% below our 1990 levels by 2050.

The government’s principle policy tool is the Emissions Trading Scheme. Current carbon prices are very low (just a few dollars per tonne), which means the ETS is essentially ineffective at present. By linking the ETS to global carbon markets, the government is trying to ensure that domestic mitigation costs are in line with costs faced by companies overseas.

Other policies relevant to fossil fuels include:

- New Zealand ratified the Kyoto Protocol and looks like it has met its emission reduction target to 2012 made under the Protocol.
- Exempting electric vehicles from road user charges until 2020 and investing $42mn in biofuels;
- Championing fossil fuel subsidy reform internationally through "The Friends of Fossil Fuel Subsidy Reform" – a group of non-G20 countries formed in June 2010 to support G20/APEC commitments.
- No subsidies for fossil fuel exploration or production;
- Taxes on petrol are 5th lowest in OECD;
- New petroleum exploration licences are being granted. The Energy Minister was quoted as saying that "we are on a transition to a lower-carbon economy, but it is not realistic to turn off the tap overnight" and that "not all fossil fuels are created equal; we need to see a transfer from coal en-masse to much cleaner and more efficient energy sources – with gas playing bridging fuel role".
- The government owns 100% of Solid Energy, a coal mining company.

What have other investors done about fossil fuels?

Our peers are at various stages of developing climate change strategies and in grappling with the calls for fossil fuel divestment. Most are taking time to undertake systematic analysis of carbon/fossil fuel risk exposure across their portfolio.

Some funds are acting on specific climate change investment beliefs. For example:

- AP4: "Our underlying premise is that financial markets under-price carbon risk. Moreover, our fundamental belief is that eventually, if not in the near future, financial markets will begin to price carbon risk….Virtually all financial analysts overlook carbon risk…"
- PGGM has a target to halve the carbon footprint of the portfolio and quadruple "solutions investments" by 2020. This is based on a belief about the societal impacts of climate change and linking that to members' interests.
- The UK's Environmental Agency Pension Fund has a formal belief that climate change is a key financially material risk for the fund and they have a fiduciary duty to act.

Decisions by peers and other investors are summarised in the Table at the end of this Section.

A small number of institutional investors have announced divestment strategies, mostly limited to listed coal companies. For the most part they are religious, academic and charitable organisations, local governments and individuals. In many cases, it is motivated on purely ethical or sustainability grounds.

The most high profile divestment action to date is Norway's Government Pension Fund (GPF). Norway's parliament rejected the advice of an independent Expert Panel - which recommended against divestment – and has directed GPF to divest from companies that generate than 30% of their output or revenues from coal-related activities. The stated rationale is that investing in coal poses

both a climate risk and future economic risk, and that coal is in a class by itself among fossil fuels, as the source with the greatest responsibility for global greenhouse gas emissions.

Some investors feel they lack sufficient certainty or visibility on stranded asset risk to justify complete divestment in the short-to-medium term. Others think there are better ways to reduce the portfolio's carbon footprint. For example, AP4 is applying optimised low-carbon indices to listed equity portfolios in which the heaviest emitters in each sector are eliminated from the index. It plans to extend this to its entire equities portfolio.

Some large US pension funds are driving shareholder resolutions targeting large 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. Some resolutions seek carbon reduction targets. Interestingly, proxy voting agencies such as ISS usually vote in favour; the large passive managers such as BlackRock and State Street often vote against.

There is also a growing number of investor-led collaborative initiatives on climate change including the Montreal Carbon Pledge, the Portfolio Decarbonisation Coalition, the Carbon Asset Risk Initiative, the Climate Resilient Infrastructure Pledge (NZSF is a signatory) and the Investor Group on Climate Change (NZSF is a member).

Our engagement provider BMO is conducting two climate-change related thematic engagements targeting multiple companies. One is on stranded asset risk in the fossil fuel sector. Specifically, BMO is requesting companies in the oil and gas, mining and utilities sectors to develop clearer strategies to protect their business models against the impact of long-term demand shifts away from fossil fuels. They are also pressing companies on transparency and climate change lobbying practices.

Conclusion

The Fund does not believe that investment in fossil fuels is contrary to its Responsible Investment framework. Complete divestment from all fossil fuel companies would not be appropriate.

Divestment may be a necessary option in limited cases. It is, however, just one means of influencing the change in company behaviour necessary. Full divestment from fossil fuel companies also involves picking 'winners and losers', thereby creating significant short-term portfolio risk by deviating significantly from market risk and returns. Divestment also means forgoing the rights of an owner to demand change.

The Guardians believes that a more targeted approach would have a significantly greater impact when it comes to managing climate change risks.

We also believe that we should use all tools at its disposal. These include: active ownership; enhancing investment decision-making tools to account for climate change risk; utilising low-carbon indexing; investing opportunistically in alternative energies; and operating transparently to be held accountable to a lower carbon footprint for the Fund as a whole.

Appendix: The Fund's exposure to fossil fuels

While investment risk extends potentially across the whole fossil fuel value chain, divestment campaigns have targeted mostly targeted upstream (mining, exploration and production) companies, which is also where stranded asset is likely to be greatest. Divestment action by peers has, in some cases, extended to coal-fired utilities.

The Table below gives several measures of the Fund's exposure to upstream coal, oil and gas. The complication is that many 'fossil fuel companies' are part of broader conglomerates, so a sorting by GICS industry code is inaccurate (this is particularly the case for coal, as there are very few pure play listed coal companies).

The broadest measure is Carbon Underground's "Top 200" list which identifies the top 100 public coal companies and the top 100 public oil and gas companies globally, ranked by the carbon content of their reported reserves. As at February 2015, we directly held 127 of the 200 companies, with a total exposure around 3½ per cent of the Fund (including derivative exposure).

The broadly defined energy sector is approximately 10% of the Fund. This includes energy utilities and alternative energy companies.

DIFFERENT MEASURES OF FOSSIL FUEL EXPOSURE

			PORTFOLIO WEIGHT	
			Exposure (% of equity portfolio)	**% Fund**
PUBLIC MARKETS	**Weight of certain sectors in the MSCI World IMI* Index**	Coal & Consumable Fuels	0.03	0.01
		Oil & Gas Exploration and Production	1.3	0.7
		Integrated Oil & Gas	3.0	1.5
	Exposure to fossil fuel reserves in the MSCI ACWI index	Potential emissions from high impact (coal, oil, shale oil, shale gas) reserves – top 5 contributors to portfolio	2.5	1.4
		Coal reserves ownership – top 5 contributors to index	0.4	0.2
		Oil reserves ownership – top 5 contributors to index	1.5	0.8
		Gas reserves ownership – top 5 contributors to index	2.1	1.2
		Potential emissions from high impact (coal, oil, shale oil, shale gas) reserves – top 5 contributors to portfolio	2.5	1.4
	Our exposure to companies on "Carbon Underground" 2014 list – i.e. top 200 listed coal, oil and gas companies, ranked by their estimated reserves (at 27 Feb 2015)	Holding in companies on the list (127 companies)	**6.4**	**3.5**
		of which: coal (42 companies)	0.8	0.4
		of which: oil + gas (78 companies)	5.2	2.9
		of which: hybrid (7 companies)	0.4	0.2
NZ LISTED EQUITIES	**Oil + gas upstream**	NZ Oil + Gas	$5.2m	0.02
PRIVATE EQUITY & INFRASTRUCTURE	**Oil + gas upstream**	KKR EAGF Shale (from $115mn allocated)	$43.5m	0.2
	Fund of Fund fossil fuel sector exposure	HIG, Coller and Harbourvest	$1.4m	0.005

* Used as a proxy for MSCI ACWI as we do not have the full weights for MSCI ACWI. The difference should be small.

** The table covers companies directly involved in the production and mining of fossil fuels. We have not included companies that are heavily dependent on fossil fuels, such as coal-fired or oil-fired power generators or oil refineries.

RESPONSES OF OTHER FUNDS TO FOSSIL FUEL DIVESTMENT CAMPAIGN					
NAME	**FUND TYPE**	**COUNTRY**	**TYPE OF RESPONSE**	**SCOPE**	**STATED RATIONALE**
Government Pension Fund Global	Peer	Norway	Partial divestment	Divestment from companies that generate than 30% of their output or revenues from coal-related activities. The new criteria would apply to both coal producers (mining companies) and coal consumers (power generators).	Investing in coal poses both a climate risk and future economic risk. Coal is in a class by itself, as the source with the greatest responsibility for global GHG emissions. Emphasis on sending a strong signal also.
AP4	Peer	Sweden	Under-weighting	Appling (MSCI + S&P) optimised low-carbon indices to its US and EM listed equity portfolios; plans to extend to its entire global equities portfolio. Sector blind approach - most carbon intensive companies from each sector eliminated from index (within thresholds) and remaining stocks re-weighted.	Environmental sustainability, ethics and investment risk. Consistent with fiduciary duty. Believe that financial markets are systematically under-pricing carbon risk. Preference for tilting over divestment: more dynamic; hedging against carbon risk rather than taking a bet on fossil fuel sector.
FFR	Peer	France	Under-weighting	Similar to AP4	Similar to AP4
AP2	Peer	Sweden	Partial divestment	Divestment from 12 coal and 8 oil and gas companies.	Investment risk from exposure to fossil-fuel based energy. Protect the Fund's long term return on investment
Environment Agency Pension Fund	Other Govt. Pension Fund	UK	Tilting	Applying (MSCI) optimised low-carbon index to passive equity portfolio. Sector blind approach.	Environmental sustainability and investment risk. "Divestment from the fossil industry is neither an industry-leading nor progressive strategy. Reducing investment exposure to the fossil fuel industry does not precipitate a reduced prevalence of that industry."
Local Government Super	Other Govt. Pension Fund	Australia	Partial divestment	Divestment from companies that make more than a third of their revenues from coal mining or coal-fired electricity generation.	Climate change is an unarguable scientific reality and a real investment risk. Coal industry faces near-and-present stranded asset risk.
CalPERS	Other Govt. Pension Fund (peer)	US	Neither	Policy advocacy, engagement with portfolio companies and investing in climate change solutions. Climate change a specific risk factor in investment policy.	Climate change a material risk to society, the economy and the impacts on our investment decisions. Prefer constructive engagement to divesting as a means of influencing conduct of investee companies. Divestment generally contrary to fiduciary obligations.
CalSTRS	Other Govt. Pension Fund (peer)	US	Neither	As per CalPERS	As per CalSTRS

KLP	Other Pension Fund	Norway	Partial divestment	Divestment from companies that derive more than 50% of their revenues from coal. Re-invest in renewable energy.	Highlight the necessity of switching from fossil fuel to renewable energy. Confident can deliver comparable returns in future.
Storebrand	Other Pension Fund	Norway	Partial divestment	Divestment from 13 coal extractors, six firms that are heavily exposed to oil sands and coal-heavy utilities.	Environmental sustainability and investment risk. Goal is to ensure long term positive returns by reducing the risk in the portfolio.
Church of Sweden	Ethical Fund	Sweden	Full divestment	Divestment from all fossil fuels.	Ethical (climate change impact).
Church of England National Investing Bodies	Ethical Fund	UK	Partial divestment	Divestment from companies with more than 10% of revenues from extraction of thermal coal or production of oil from tar sands.	Ethical (climate change impact). Coal and tar sands unlikely to be part of transition to low-carbon economy.
Anglican Church – some dioceses	Ethical Fund – NZ	NZ			
The Guardian Media Group	Other Fund	UK	Full divestment	Divestment from all fossil fuels. Pledge to re-invest capital into climate-friendly companies.	Poor performance of fossil fuel assets in recent years and threat of future climate change action plus strong renewables growth means socially responsible investment criteria can be adopted without putting at risk core purpose.
AXA	Other Fund	Global	Partial divestment	Divestment from companies most exposed to coal-related activities, for assets internally managed.	Carbon is a risk; responsibility as part of global energy transition. Burning coal for energy is one of biggest obstacles from reaching 2DC target.
Nordea	Other Fund	Sweden	Partial divestment	Divestment from up to 40 coal mining companies.	Thermal coal mining is the most environmentally compromising fossil-fuel resource.
Stanford University	Endowment	US	Partial divestment	Divestment from all coal mining companies. Ongoing student/Faculty lobby to extend that to all fossil fuels.	On the basis of “social injury”. Divesting from coal is a small but constructive step to develop sustainable energy solutions for the future.
Harvard University	Endowment	US	Neither	Resisted calls for divestment to date; continued pressure from students, alumni and faculty members	The university will not commit to divestment, and will fight climate change through research and other work. Do not believe that divestment from the fossil fuel industry is the appropriate answer to the climate change challenge.
Rockefeller Brothers Fund	Endowment	US	Partial divestment	Initially, divestment from coal and tar sands. Ultimately, all fossil fuels.	Ethical (climate change impact). Decrease dependence on fossil fuels and mitigate effects of climate change.
Wellcome Trust	Other Fund	US	Neither	Rejected divestment campaign specifically targeting the Trust.	Support action on climate change but believe that, while divestment is a “grand gesture”, it is not as effective as engaging with fossil fuel companies. Were they to sell their holdings, it is unlikely that the

					buyers would exert the same influence as the Trust.
Bill & Melinda Gates Foundation	Endowment	US	Neither	Rejected divestment campaign specifically targeting the Foundation.	Support action on climate change but believe that fossil fuel divestment would have little impact. Technology innovation is the only way to reach a positive scenario. Urgent need for “high risk” investments in breakthrough technologies. Plan to double current investments in renewables over the next five years.
Dunedin City Council	Local govt	New Zealand	Full divestment	Divestment from all fossil fuels re the Council’s $82.5 million Waipori Fund.	Socially responsible investment.

Section 6. Climate solutions: a framework for positive investing

[TBC]

ITEM	**4B**	**WP3 CLIMATE CHANGE RISKS**
Presented by:		*Anne-Maree O'Connor*
Date:		*9 June 2016*

1 Purpose

For Discussion – Working Paper 3 in the climate strategy project.

Feedback has been provided in parts by Asset Allocation, Investment Analysis, NZ Direct & International Direct.

2 Summary

2.1 Building a more climate-resilient portfolio means staying ahead of the climate risk curve and positioning the portfolio to take advantage of investment opportunities, particularly from innovation in technology and policy action.

2.2 Wide-spread societal action is driving policy, legal action and consumer behavior that will have a material impact on business, investment firms and legislation over the next 10 years. States have signed up to the UNFCCC global climate treaty commitment (COP21) to limit global temperature rises to 2 degrees celsius (DC).

2.3 Key downside risk comes from structural shift to a low-carbon economy where investors are unprepared, and from higher physical damages (to agriculture, timber, infrastructure and real estate).

2.4 Risk arises from impacts on

a) supply and demand from substitution, higher costs, consumer preference, and regulation;

b) physical damage or disruption; and

c) inability to adapt at reasonable cost.

Stranded assets can result from any of these risks where the assets are so badly impacted they lose their value.

2.5 The work reflected in this paper considers implications to our portfolio from climate change risk factors across different scenarios leading to different climate change outcomes and across different time periods (10 and 35).

2.6 The global equity portfolio is where our most material risk to returns lie due to its size and the inclusion of high carbon-emitting sectors.

2.7 On the whole, many of our favoured opportunities – infrastructure, timber, rural, (EM up-weight), alternative energy – are positioned well and should benefit from a shift to a low-carbon economy (captured in our "Transformation" scenario).

2.8 Lesser, but still co-ordinated, global action (captured in our "Co-ordination" scenario) reduces the negative impact on the equity portfolio, as regulatory and technological change is less disruptive, but real assets will face "locked in" weather risks because targeted temperature change is not met. Lack of climate action (our Fragmentation scenario) has negative impacts across all asset classes, but the balance shifts to externalities with society bearing more of the cost..

2.9 Climate change risks need to be understood at the industry and geographic level across the portfolio. On fossil fuels in particular, coal is a definite loser under all scenarios and there seems to be no way back for this industry. Oil is under pressure but gas is a beneficiary - depending on the degree to which it can substitute coal (over nuclear or renewables). High emissions and water use sectors also face headwinds.

2.10 We propose that the best response is preparing/positioning the Fund for a Transformation (2DC) scenario, which aligns with current international targets, and hedge this with a less ambitious, but Co-ordinated action scenario (3DC).

2.11 Specifically this requires:

- applying geographic risk assessments and diversification to manage risks within our rural, timber, property and infrastructure portfolios;
- applying sector risk assessments to investment selection and weights across our passive portfolio and active opportunities;
- encouraging companies and sectors to develop their own climate strategies in order to address systemic issues across the portfolio.

3 Introduction

3.1 The objective of this paper is to utilise the work undertaken for us by Mercer to discuss the implications of climate risks to our portfolio as it currently stands and outline potential mitigation strategies.

3.2 The Climate Change Project delivers five working papers – WP1-4, which provide the basis for recommending a Climate Change Strategy for *IC Approval* (WP5). To summarise:

- WP1. Fossil Fuels – covers the debate over stranded assets; mispricing & divestment;
  - There is broad agreement that only a portion of current fossil fuel reserves can be used to limit global warming to 2 degree celsius (2DC) rise. The argument is around *who* gets to burn theirs (coal vs gas; State-owned vs oil majors) and *how much* will get burnt (i.e. will policy action or substitution exceed or stabilize at 2DC warming).[1]
  - When we considered mispricing last year, investment analysts were not pricing carbon regulation or demand risk into their models. Oil companies and analysts were assuming that OPEC would slash production, which would support the oil majors, that there would not be significant policy action, and new energy technologies would develop at a relatively slow rate.
- WP2. Portfolio Carbon Footprint – where is the carbon? discusses the carbon footprint within our Fund:
  - Our Fund, unsurprisingly, holds 75% of its carbon footprint in the global and active equities portfolios, with emissions (both direct and within fossil fuel reserves) concentrated in companies within the Utilities, Materials, and

[1] Existing reserves are 3 times the 2DC carbon budget with coal alone exceeding the budget. Proven (1P) *listed* reserves make up to-thirds of 2 DC carbon budget. However, most reserves are Government-owned - accounting for three quarters of *global* reserves and public companies only one quarter.

Energy sectors. The Fund's footprint could be halved by removing selected companies representing 1.8% of the equity portfolio

- WP3. Climate Change Risks – where are the risks? (this paper).
- WP4 will outline potential opportunities and WP5 will present a climate change strategy for the Fund.

3.3 The remaining sections of this paper cover the following questions:

- What are the drivers of climate change risks for investors?
- What types of risks does the Fund face, where are these concentrated and how should we consider these over time.
- How can we manage risks to deliver a climate resilient portfolio? – this links to what to cover in WP5 Strategy for next steps.

4 Mercer Scenario Analysis – drivers of climate change risks[2]

4.1 NZSF commissioned Mercer to provide an analysis of climate change on asset returns. The Mercer approach modelled four climate risk factors that would affect asset prices:

- **Technology**: The rate of progress and investment in development of technology to support the low-carbon economy e.g. alternative energy
- **Resource availability**: The impact on investments of changes to weather patterns brought about by climate change e.g. permanent change to rainfall and therefore agricultural output or raising sea levels
- **Impact**: The impact on investments from severe weather events – e.g. floods, storms
- **Policy**: Any change to legislation and regulation to reduce climate risk or to help achieve domestic and international targets.

4.2 Mercer's climate change analysis seeks to take physical climate models (IPCC); policy pathways; and technology impacts and turn these into return forecasts. They present these under 4 different scenarios. Effectively, the different scenarios reflect different impacts from the risk factors above and the different climate outcomes as a result.

- T**ransformation**: Climate change is contained to 2DC. Fossil fuel use is reduced to less than 50% of the energy mix by 2050 due to policy and technology – i.e. technology and policy risk factors have a larger effect on asset returns than impact and resource availability.
- **Coordination**: Climate change is contained to 3DC. Fossil fuel use is constrained to 75% of energy mix by 2050. All risk factors play a role across asset returns.
- **Fragmentation (low damage**): Climate change contained to 4DC.

[2] The Full Reports (General & NZSF Tailored) can be found here Mercer Public Report & Mercer Tailored

- **Fragmentation (high damage**): Climate change contained to 5DC.

  - Both Fragmentation scenarios represent a lack of action and assume marginal impact from the technology and policy risk factors, but significant affects from the Impact and Resource availability risk factors as the world does little, at least initially, to address climate change.

4.3 The Mercer modelling approach provides impacts on returns to our current portfolio over the next 10 years and over the next 35 years to present both long and short-term implications across the four scenarios. It helps set out a rational approach for long-term investors like ourselves to develop climate-resilient strategies. Because the approach is based on new and relatively untested modelling, we believe it is more useful to consider the relativity between scenarios and opportunities, and the relative impacts of the risk factors on the portfolio, rather than the (overly exact) returns data itself.

4.4 ***Likelihood of Scenarios***

4.5 The COP21 conference in Paris can be viewed as (relatively) successful. Member States signed up to a global ambition of a minimum 2DC temperature rise – with efforts towards 1.5DC. Post COP 21, Mercer's current view is:

- Lack of action puts the world on a Fragmentation +4DC pathway
- Existing pledges has a Coordination +3DC scenario as a *high probability*
- The ambitious goals in Paris for a +2DC pathway (stretch goal of 1.5DC) suggests Transformation is *increasingly possible.*

4.6 These steps make a Transformation or Coordination scenario more likely and improves signals to the private sector for low-carbon investment. In addition:

- The renewable energy sector is showing signs of becoming decoupled from the oil price.
- OPEC production continues and together with the Shale productivity boom has driven oil price declines.
- Country level INDCs (climate intentions/targets) shows clear signs of subsidy reform – with a shift from fossil fuels to renewables.
- Investors have begun to carbon footprint portfolios, which is the first step in making portfolio adjustments themselves.
- Social, political, business, investor and regulatory groups have begun to work together to support effective climate action and improve policy certainty.

5 Where are climate-risks in our portfolio concentrated?

5.1 The risk to returns for the equity portfolio is to be caught on the wrong side of a Transformation scenario over the next 10 years.

5.2 The NZSF climate-related risks (discussed more below) are concentrated in:

- Global Equities Portfolio – due to size and materiality

5.3 The active portfolio is small compared to equities but within this risks are concentrated in:

- Rural – severe drought under fragmentation scenarios, regulation targeted at methane emissions under transformation scenario
- Energy – shale (with a distinct difference between oil vs gas) across scenarios
- Timber – fire, disease, particularly under fragmentation scenarios
- Sectoral level exposure within most other opportunities.

6 Summary impacts under different scenarios

6.1 *Transformation scenario*

The transformation scenario over both timeframes benefits a number of asset classes through reduced exposure to physical risks, increased investment into infrastructure and forestry, a premium attached to sustainable forestry products and improved technology.

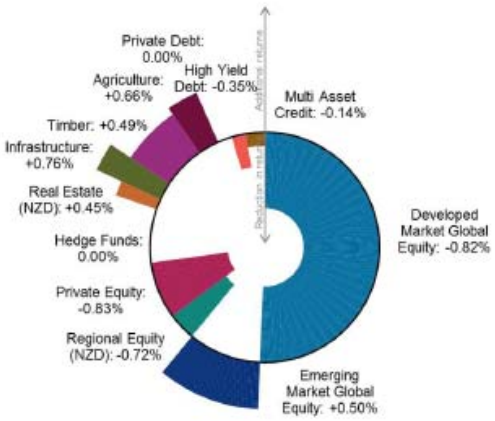
Negatives to global equities are due to higher exposure to key sectors which suffer from policy action and technology substitution.

6.2 *Coordination scenario* – 10 year picture, 35 year picture

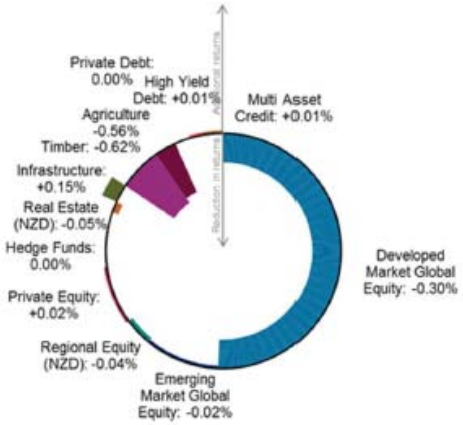
If policy action is less ambitious, all opportunities (apart from infrastructure) suffer giving a smaller but cumulative impact across the portfolio. Physical (real) assets face negative impacts from climate change over the shorter term but this changes as climate mitigation sets in over the longer term. Infrastructure still benefits from investment flows to build climate-resilient into infrastructure as countries adapt to locked-in climate change.

Figure 1:
NZ Super Asset Allocation (data over 10 years)

Transformation

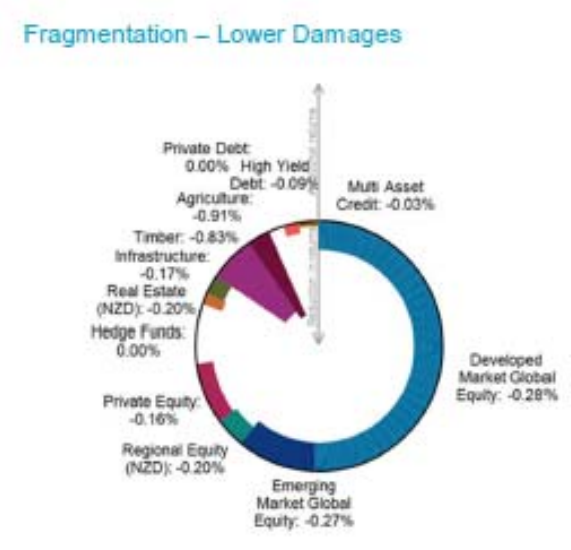


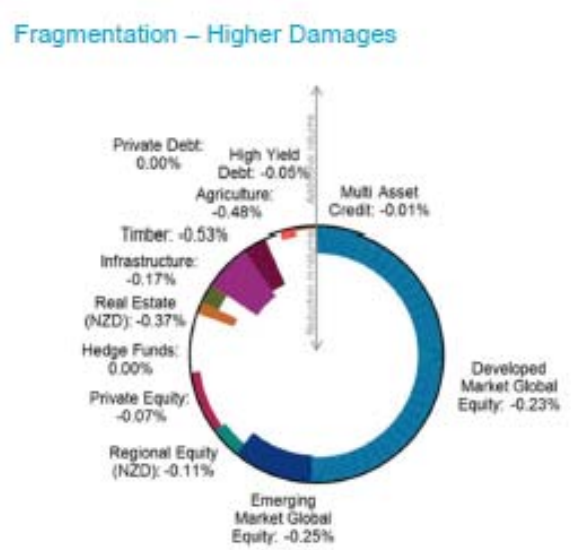
Coordination



6.3 *Fragmentation scenario*

Under both damages scenarios, all asset classes face negative returns, although this is attenuated over 35 years. The challenge with the fragmentation scenarios is that they assume no policy response at all despite what we would anticipate would be strong social pressure arising due to severe climate impacts.





6.4 The emerging markets lose from weak climate action as they face higher physical impacts and resource scarcity, and so have more to gain from the transformation or coordination scenarios (reducing the downside). Potentially, China policy may also produce "winners" by enforcing large scale technological change in the energy and intensive industry sectors.

6.5 In summary, many of our favoured opportunities – infrastructure, timber, rural, (EM up-weight), alternative energy – are positioned well and benefit from a low-carbon Transformation scenario. Partly this is due to avoided risks from water resources and physical damage which they experience under a slower transition.

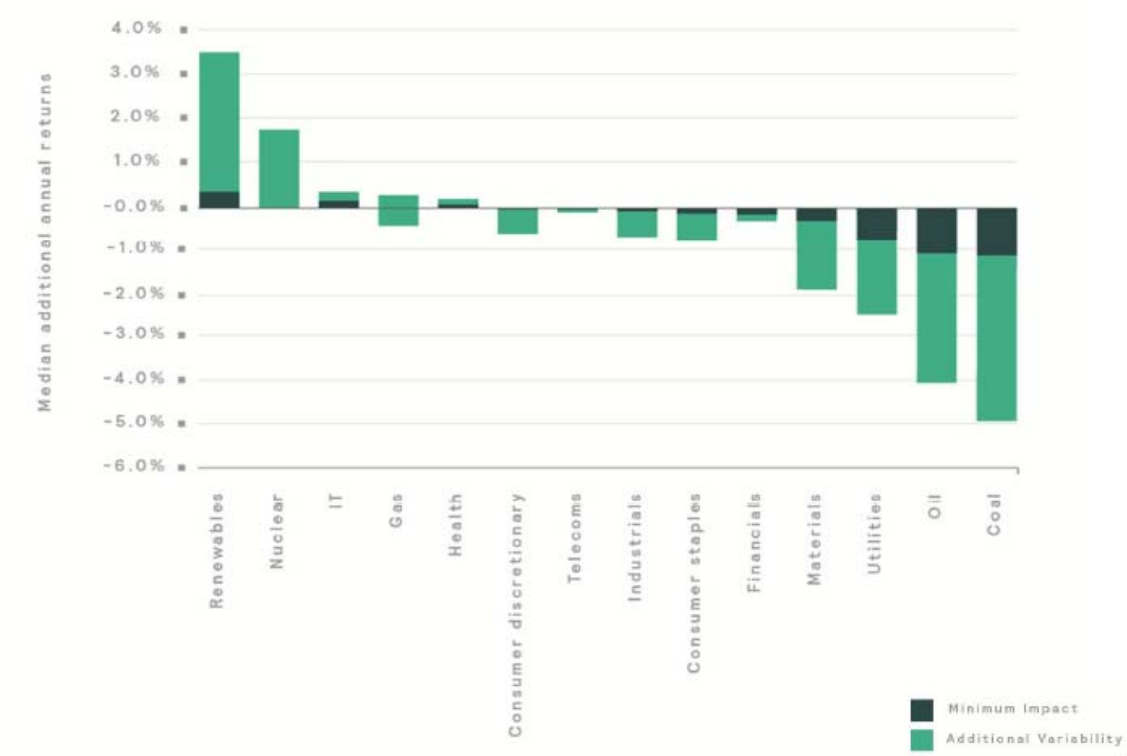
7 Equity portfolio and sector risks in detail

7.1 From the Mercer study of our portfolio, the most material negative impact is on the global equity portfolio over the next ten years should a transformation scenario play out.

7.2 The negative impact on the global equity portfolio under the 10 year transformation scenario is circa - 80 bp on annual returns. It is important to look at the underlying industry sectors where divergence (positive and negative) provide a more meaningful picture. Reducing exposure to worst hit industries and increasing exposure to beneficiaries is one strategy to improve returns.

7.3 The analysis indicates that at the sector level the market is not pricing in carbon risks. Climate change risks are most obvious in those industries that are *energy intensive:; fossil fuel dependent:* and *exposed to physical assets.*

Figure 18:
Climate impact on return by industry sector (35 years)



7.4 The sectors with the biggest potential downside risks – coal, oil, utilities, materials. are also those identified under our foot-printing with the largest emissions (making up less than 1.8% of the portfolio but accounting for nearly 50% of emissions). This shows that emissions metrics can be a useful indicator for investment risk. (See Appendix 1).

7.5 The chart above shows median annual returns for industry sectors over the next 35 years. These impacts should be considered in context as a percentage of underlying expected returns (which generally range from 6-7% per annum). For example, the coal sub-sector annual returns could be reduced from 6.6% to between 1.7% - 5.4% p.a. over 35 years depending on scenario.

7.6 The impact is more marked over a 10 years period (see Mercer report). The oil sector, given its larger weight in the portfolio, causes the most concern for investors with average returns falling from 6.6% p.a. to 2.5% p.a.). Coal is still negative under all scenarios ranging from a fall anywhere from circa - 25% to -140% of annual returns. Gas captures both upside and downside risks.

7.7 The renewables sub-sector, a winner from coal's demise, sees an increase in annual returns of between circa. + 5% to +100% over a 10 year period. Strong climate action is also supportive of rail transport, electric vehicles and energy efficiency investments. Nuclear benefits providing costs for down-time and waste management is competitive.

7.8 Stranded asset risk and mispricing are underpinning themes. Sectors *reliant* on fossil fuels (including service providers such as infrastructure) are at risk from stranded assets on their balance sheet.

Coal & Utilities

7.9 Coal is most at risk as it has the highest carbon intensity of any energy source, it is substitutable, and its replacement is the fastest way for countries to achieve progress to their targets. Coal power is also contributing to severe health issues in China and other developing countries from pollutant emissions. It is however cheap.

7.10 Utilities with coal fired power plants have a high likelihood of these assets stranding. For this reason, coal mining, coal transport and ports reliant on coal also risk taking write-downs on stranded assets. Diversified utilities and those transitioning to gas or renewable alternatives should be more resilient.

Energy – oil & gas

7.11 Although declining, oil will still make up nearly half our energy needs in the coming 20-30 years – the question is whose?

7.12 From our WP2 paper, the tension between listed oil companies and State players was highlighted. If both continue to produce in proportion to their reserves then 60-80% of listed company 1P reserves, and all of their 2P reserves, will be unburnable if the world is to stay within its carbon budget.[3]

7.13 In 2014, on average oil majors projections for oil demand out to 2035 were higher than the IEA scenario for 2DC *and* 4DC. In effect, factoring in no impact *at all* from carbon policy action or technology disruption.

7.14 OPEC's response to the COP21 stated that whilst the world must continue to develop renewables, there was a role for oil but the low price environment was a result of too much investment in high cost production[4].

7.15 The spotlight is also on higher energy intensity and higher cost producers including Canadian oil sands and US shale. Failure to gain approval for the Keystone pipeline servicing the oil sands shows the risk to midstream assets.

7.16 Gas is widely seen to benefit from ongoing substitution of coal power and greater potential to play a role in transport. Gas's Achilles heel could be a failure to reduce fugitive methane emissions which is a powerful greenhouse gas. Disruption could also come if technology allows developing markets to jump direct from coal to off-grid and renewables. But most models point to an important role for gas in replacing coal power.

Materials

7.17 Within the Materials sector, the cement and steel industry has super-sized emissions, and are major contributors along with coal to MSCI Emerging Markets carbon intensity. Steel making has no developed alternatives to the use of metallurgical coal and has high energy consumption. Similarly cement uses coal for fuel (although some displacement here is possible) but the actual cement process itself releases CO2 which is unavoidable. The construction industry will absorb some passed through carbon cost given difficulty in substituting at scale. Lower carbon materials such as wood could benefit through substitution.

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[3] In IEA 's 2 degrees scenario more than two-thirds of current proven (1P) fossil-fuel reserves are not commercialised before 2050, unless carbon capture and storage (CCS) is widely deployed. More than 50% of the oil and gas reserves are developed and consumed, but only 20% of today's coal reserves, which are much larger. Currently predicts CCS only reducing 3% of emissions from reserves.

[4] OPEC bulletin 02/16

7.18 These sectors are also the most exposed to other TRIP factors – access to water; weather damage to physical assets and technology disruption. There is no scenario under which they avoid damage – unless they can adapt.

Table 1 Mercer's TRIP factors by Industry and subsector

Equity Industry/ Subsector	Sensitivity to Climate Risk Factors			
	Technology	Resource Availability	Impact of Physical Damages	Policy
Energy				
Oil				
Gas				
Coal				
Renewable				
Nuclear				
Utilities				
Electric Utilities				
Gas Utilities				
Multi-Utilities				
Water Utilities				
Materials				
Metals & mining				
Industrials				
Transport Infrastructure				
Consumer Discretionary				
Consumer Staples				
Health				
Financials				
IT				
Telecoms				

Integration Point for WP5 Paper on Climate Strategy::

The drag on returns for the equity portfolio is underpinned by material upside and downside at the industry sector level. We can take advantage of this by applying carbon factors to investment selection and weights across our equity portfolio. The objective would be to improve returns and deliver a more climate resilient portfolio.

8 Active Opportunities

8.1 Mercer's analysis covered a number of our core active opportunities in our portfolio. We focus in this section on the most impacted opportunities. Shale Energy, Infrastructure, Timber and Agriculture.

Figure 1: Climate Impact on Returns by Asset Class (35 Years)

Source: Mercer

9 Shale Energy

9.1 Shale is our only pure-play fossil fuel opportunity. There are very different outlooks for oil versus gas under climate scenarios. Our opportunity is already focused on the climate theme driving gas to replace coal in US power stations. The policy climate for retiring coal stations has strengthened, supported in part by affordable gas. However, the price is proving too low presently for producers.

9.2 The outlook for oil is negative across all TRIP factors which is reflected in lower returns. Our opportunity includes mid and downstream opportunities and EIGF which are exposed to the upstream oil side of the shale industry.

9.3 It will take longer to displace oil in transportation than coal in power. However, the stranded asset debate shows little room in the global carbon budget for new or high cost oil exploration.

9.4 Canadian oil shale and tar sands are not part of our opportunity. These are amongst the most carbon intensive of unconventional sources, and are likely to be targeted after coal in low-carbon investment strategies.

Integration Point for WP5:

Integrate the Mercer TRIP factors separately to oil and gas in shale investments. Consider potential for stranding and other climate-related risks to up, mid and downstream investments.

10 Real Assets

10.1 Impacts on timber, agriculture, real estate and infrastructure are very dependent on the scenario.

10.2 The downside for our real assets relate primarily to the physical impacts of climate change. The upside is the significant investment in infrastructure required globally to adapt to climate change (climate finance and climate resilient infrastructure programmes.

FIGURE 9: REAL ASSET CLASSES – TRIP FACTOR SENSITIVITY

ASSET CLASS SENSITIVITY	T	R	I	P
GLOBAL REAL ESTATE	<0.25	0.00	-0.75	<0.25
INFRASTRUCTURE	0.25	>-0.25	-0.50	<0.25
TIMBER	<0.25	-0.75	-0.50	0.25
AGRICULTURE	0.25	-1.00	-0.50	0.25

11 Infrastructure & property

11.1 Property investments will need to pay attention to rising regulatory and customer expectations on energy efficiency in particular. Costly retrofits maybe needed to remain current. On the flip side there are opportunities from increased energy efficiency requirements.

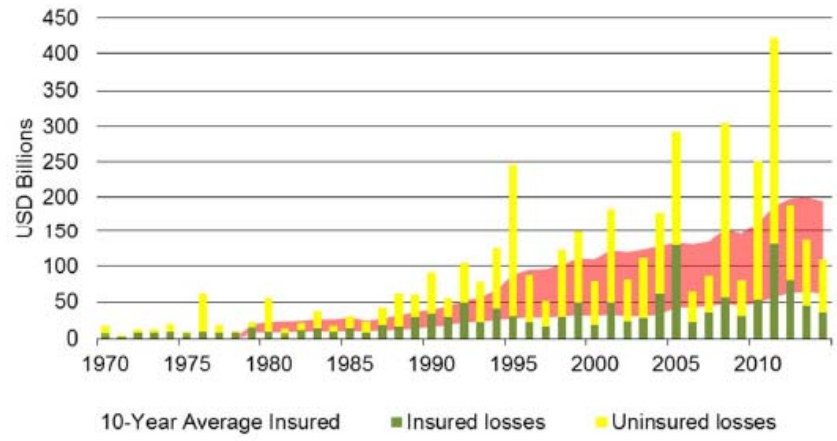
11.2 Infrastructure benefits from climate action, to reduce physical damage to assets and to benefit from large-scale investment the UNFCCC has earmarked for stimulating investment in "climate-resilient" infrastructure.[5] We will consider the opportunities in the next paper.

11.3 Some types of infrastructure – airports, roads, pipelines – may also face policy risk through increased carbon pricing. We have a number of exposures to these types of assets.

11.4 Infrastructure and property face risks from rising sea-levels, flooding, or cyclone damage. They also face the potential for uninsured damages. There are signs that uninsurable losses are rising. This could lead to new demand for one of our opportunities - catastrophe bonds.

[5] NZSuper is a signatory to a commitment to actively seek climate-resilient infrastructure. The commitment sets out some of the requirements for regulators to stimulate private capital.

FIGURE 10: WORLDWIDE UNINSURED CATASTROPHE LOSSES – A WIDENING GAP



Source: Swiss Re Sigma 02/2015

As shown here, the gap between economic and insured losses is widening. Monitoring portfolios for overall exposure to extreme risks and ensuring adequate catastrophe insurance coverages are in place should be a priority going forward.

11.5 *Current* infrastructure assets may not be pricing in the cost of adapting to climate change. A recent example of weighing up the costs is illustrated by the decision to increase the height at which the new runway at Brisbane airport would be built to be more resilient to rising sea-levels.

11.6 In New Zealand, Christchurch is particularly exposed to rising sea-levels and any investment in reconstruction would be wise to model at least "baked in" climate change impacts. Sea-level rises are significant for other NZ cities even at a 10 cm rise. (See Appendix 2)

11.7 In New Zealand, sea level is projected to rise by about 30 cm between 2015 and 2065. This rise would lead to extreme weather events currently expected every 100 years to be experienced:[6]

- Every 4 years in the port of Auckland
- Once a year at the port of Wellington
- Once a year at the port of Christchurch
- Every 2 years at the port of Dunedin.

12 Timber and Agriculture

12.1 Agriculture and timber have the most divergent sensitivities depending on the scenario. Impacts from droughts may be overstated for timber in Mercer's analysis – except as they relate to fire - but are very real for agriculture.

12.2 Economic models based on crop yield shocks tend to agree on direction of climate shocks, but differ significantly in magnitude. Some regions will increase yields from more rainfall and warmer temperatures but overall these opportunities face very real direct physical impacts from lack of action to combat climate change

12.3 Disease – both for crops and animal/human health – is a less well understood potential disruptor.

12.4 Our global agriculture opportunity is currently accessed through NZ dairy farms. The carbon footprint of dairy is comparatively high because methane and nitrogen emissions from livestock are hard to abate. Mitigation is poorly researched to date

[6] NZ Environment Commissioner's report

but research is being fast-tracked through the UNFCCC process – with NZ a lead sponsor. Our carbon footprinting provides a basis for reducing emissions where it is possible. An interesting offset option could be sequestration of carbon in soil e.g. through restoration of organic soils, avoiding overgrazing and utilizing deep-rooting or more resilient grass varieties.

12.5 Timberland is hardier to changes in temperature and rainfall than agriculture, but is exposed to increased fire risk, wind damage and exposure to disease.

12.6 Geographical diversification can offer some protection but climate policy action is the best long-term protection.

12.7 As it is normal to map weather and water resources for these opportunities, predictive models more specifically integrating climate change mapping is a reasonable next step for our timber and agricultural investment strategies.

12.8 Our other opportunities should also consider exposure to climate risks by considering if they are exposed to high risk (or high opportunity) sectors. For example distressed and high yield credit, asset selection, volatility and even tilting opportunities could all be exposed through the capital stack to coal risks. Natural catastrophe bonds, insurance and commodities are exposed to physical damages, so geographic assessments are more relevant.

Integration Point for WP 5 for Real Assets:

Granular geographic climate mapping, insurance considerations and diversification are a natural extension to current risk analysis for real assets. Take account of the impact of carbon tax and consumer trends. Consider risk over longer timeframes – 10-35 years.

Other active opportunities should look-through to under-lying carbon risk exposure.

13 Conclusions and next steps:

13.1 Climate change risks will impact returns regardless of scenario and therefore action to address climate risks will lead to better investment outcomes than no action. .

13.2 Investment analysis is relevant at opportunity, asset class and industry level. The impact of different sectors varies widely and can be significant. We should aim to reduce downside risk and leverage the upside.

13.3 At the whole of portfolio level, diversification still offers protection, particularly over the long term under all scenarios.

13.4 In addressing portfolio climate risks, we **recommend** WP5 focuses on preparing the Fund for a Transformation (2DC) scenario, and hedge this with a less ambitious but Co-ordinated action scenario (3DC).

13.5 Specifically this requires developing a strategy for:

- *applying geographic risk assessments and diversification to manage risks within our rural, timber, property and infrastructure portfolios.*
- *applying sector risk assessments (including using carbon footprinting) to investment selection and weights across our equity portfolio and active opportunities.*
- *encouraging companies and sectors to develop their own climate strategies in order to address systemic issues across the portfolio.*

Appendix 1 – What is the relationship between Carbon Footprinting and Investor Risk?

The Carbon Footprint is a good indicator of carbon risk related to:

- those industries/companies most exposed to risk from directly releasing emissions; or that are intensive energy users (Scope 1 & 2 emissions)
- fossil fuel reserves exposure

What the carbon metrics don't capture is:

- risk to industries or companies or assets *reliant on* high emitters or fossil fuel companies, that do not have a high carbon footprint themselves;
- ability for industries or companies to adapt;
- risks from physical, water resource or weather impacts caused by climate change.

The Mercer analysis fills some of these gaps. Many of the high emissions sectors also have the highest negative returns under the Mercer scenarios.

Carbon metrics are a straight forward way to quantitatively under or overweight constituents within our equity portfolio.

MSCI produce carbon management ratings which could be used as an indicator of the companies that have a better ability within their sectors to adapt.

Appendix 2 New Zealand Sea-level Rises

Table 3.2 Exceedances of today's '100 year events' occur more and more often as the sea level rises.

SLR	Auckland
0cm	Every 100 years
10cm	Every 35 years
20cm	Every 12 years
30cm	Every 4 years
40cm	Every 2 years
50cm	Every 6 months
60cm	Every 2 months
70cm	Every month
80cm	Every week
90cm	Twice a week
100cm	Every day

SLR	Wellington
0cm	Every 100 years
10cm	Every 20 years
20cm	Every 4 years
30cm	Once a year
40cm	Every 2 months
50cm	Twice a month
60cm	3 times a week
70cm	Every tide
80cm	Every tide
90cm	Every tide
100cm	Every tide

SLR	Christchurch
0cm	Every 100 years
10cm	Every 22 years
20cm	Every 5 years
30cm	Once a year
40cm	Every 3 months
50cm	Twice a month
60cm	Twice a week
70cm	Every day
80cm	Every tide
90cm	Every tide
100cm	Every tide

SLR	Dunedin
0cm	Every 100 years
10cm	Every 29 years
20cm	Every 9 years
30cm	Every two years
40cm	Every 9 months
50cm	Every 3 months
60cm	Once a month
70cm	Once a week
80cm	4 times a week
90cm	Every tide
100cm	Every tide

ITEM 2b **Education Session: Climate change fossil fuel divestment debate**

Justine Sefton, Anne-Maree O'Connor and David Rae

August 2015

1. Purpose

This paper reviews the claims, counter-claims and facts around the calls for investors to divest from fossil fuels. It is **for discussion**.

We look at the arguments around fossil fuel divestment, what other funds are doing, New Zealand and international policy around climate change, all within the context of our Responsible Investment framework.

This is the first of six work packages under the climate change project, the others being:

Project 2: Knowing our portfolio (carbon analytics)
Project 3: Risks
Project 4: Opportunities
Project 5: Integration
Project 6: Options and recommendations

We do not make recommendations about how to respond to fossil fuel risks. This will come after considering all the options, in Project 6.

2. Background to the divestment campaign

The arguments put forward for divesting from fossil fuels are partly investment based and partly ethical.

The investment arguments hinge around fossil fuel producers being poor investments because they are over-priced and subject to stranded asset risk. The concept of 'unburnable carbon', which is discussed later in the paper, is a key part of the argument. In addition, some claim that markets are not properly pricing in the risk of future policy action around climate change such as carbon taxes or regulatory restrictions.

The ethical argument is that it is unethical to support an activity that is widely accepted as driving climate change. "If it is wrong to wreck the climate, then it is wrong to profit from that wreckage," as 350.org puts it.

Cross-cutting responsible investment, fiduciary duty and long-term investment principles are also used to support divestment or other forms of portfolio decarbonisation.

The most well organised and vocal group is Bill McKibbon's "350.org" which is calling for complete divestment from all fossil fuel companies on ethical grounds. However, the issue is now widespread, and has a momentum that does no longer relies on any individual activist group. The arguments from the proponents have become more sophisticated and targeted over time, moving from an ethical argument to more of an investment case.

More recently, the arguments have targeted coal rather than all fossil fuels as it is seen as a weak point. Coal-based electricity production is responsible for 44% of CO_2 emissions from global fossil fuel use, but is only a small fraction of the global equity universe. Consequently, it is harder for investors to defend their investments in coal companies.

Calls for divestment are sometimes coupled with appeals to re-invest freed-up capital into renewable energy solutions (for example, the "Divest Invest" campaign). Other stakeholder campaigns are aimed at investors' management of climate-related financial risks and are less prescriptive on means – e.g. the "Asset Owners Disclosure Project".

In New Zealand, the Green Party is calling for the Fund to divest from all fossil fuel mining and production companies, starting with coal, on both ethical and financial grounds.

They have also introduced two private members bills into Parliament, though neither have made it to a second reading. The most recent bill asked us to divest from and exclude companies directly involved in the exploration, mining and production of fossil fuels.

We have met with the Greens twice in the past few months to explain what we are doing in relation to climate change risks. While they have been receptive, we expect the pressure will continue.

In addition, the Fund is frequently targeted by social media campaigns, calling for divestment and more recently on how we vote at fossil fuel company AGMs. Over the past two years, we have faced numerous calls to divest from coal or fossil fuels more broadly.

We may face another wave of public scrutiny on fossil fuels in the run-up to the Paris climate negotiations in December this year.

3. Relevance to our Responsible Investment framework

Our Responsible Investment Framework provides a practical basis for integrating ESG into the investment and stewardship of our portfolio and also guides our ethical decision-making.

Relevant here are investment risks (our mandate to maximise returns without undue risk), our reputational/ethical considerations (guided by our exclusions criteria) and our beliefs (including our ESG belief).

Our Responsible Investment Framework – current or potential actions

Integration (UNPRI P1) includes the integration of climate-change-driven risk and opportunities into our investment decision making.

Ownership (UNPRI 2) includes our engagement with managers and companies on climate change issues, voting on climate-change related resolutions and other aspects of building climate-change into the assets we own e.g. energy efficiency in property, agricultural practices etc. This also includes decision around exclusions from the portfolio (see below) which is, of course, particularly relevant to the divestment debate

Reporting (UNPRI 3) includes encouraging companies to report on climate change policies, risk management and emissions.

Best practice and collaboration (UNPRI 4 and 5) includes working with others to build good practice and solutions on the issue of climate change.

Communications (UNPRI 6) includes our own communications and stakeholder relations on this issue.

Our investment beliefs are also relevant, in particular that "*responsible investors must have concern for ESG factors because they are material to long-term returns*". Also pertinent is our belief that "*Investors with a long-term horizon can outperform more short-term focused investors over the long-run*."

Our framework includes guidelines for making exclusion decisions based on reputational or ethical grounds. Where possible, our preference is to engage rather than exclude.

The key decision criteria are:

- The severity of the issue, and the degree of involvement of the company;
- International law and conventions
- New Zealand law and significant policy
- Whether engagement is likely to succeed or is too resource intensive.

The closest parallel to fossil fuels is our decision to exclude tobacco even though the product itself was not illegal. We divested from tobacco manufacturers because eliminating smoking was a major policy position of successive New Zealand governments and the international community.

It may be that our exclusion guidelines are not up to the task of making decisions on such long-term systemic issues as climate change. We will consider this as part of WP6.

4. Our current exposure to fossil fuels

While investment risk extends potentially across the whole fossil fuel value chain, divestment campaigns have targeted mostly targeted upstream (mining, exploration and production) companies, which is also where stranded asset is likely to be greatest. Divestment action by peers has, in some cases, extended to coal-fired utilities.

The Table below gives several measures of the Fund's exposure to upstream coal, oil and gas. The complication is that many 'fossil fuel companies' are part of broader conglomerates, so a sorting by GICS industry code is inaccurate (this is particularly the case for coal, as there are very few pure play listed coal companies).

The broadest measure is Carbon Underground's "Top 200" list which identifies the top 100 public coal companies and the top 100 public oil and gas companies globally, ranked by the carbon content of their reported reserves. As at February 2015, we directly held 127 of the 200 companies, with a total exposure around 3½ per cent of the Fund (including derivative exposure).

The broadly defined energy sector is approximately 10% of the Fund. This includes energy utilities and alternative energy companies.

We will be providing more detailed analysis as part of Work Package 2.

DIFFERENT MEASURES OF FOSSIL FUEL EXPOSURE

			PORTFOLIO WEIGHT	
			Exposure (% of equity portfolio)	% Fund
PUBLIC MARKETS	**Weight of certain sectors in the MSCI World IMI* Index**	Coal & Consumable Fuels	0.03	0.01
		Oil & Gas Exploration and Production	1.3	0.7
		Integrated Oil & Gas	3.0	1.5
	Exposure to fossil fuel reserves in the MSCI ACWI index	Potential emissions from high impact (coal, oil, shale oil, shale gas) reserves – top 5 contributors to portfolio	2.5	1.4
		Coal reserves ownership – top 5 contributors to index	0.4	0.2
		Oil reserves ownership – top 5 contributors to index	1.5	0.8
		Gas reserves ownership – top 5 contributors to index	2.1	1.2
		Potential emissions from high impact (coal, oil, shale oil, shale gas) reserves – top 5 contributors to portfolio	2.5	1.4
	Our exposure to companies on "Carbon Underground" 2014 list – i.e. top 200 listed coal, oil and gas companies, ranked by their estimated reserves (at 27 Feb 2015)	Holding in companies on the list (127 companies)	**6.4**	**3.5**
		of which: coal (42 companies)	0.8	0.4
		of which: oil + gas (78 companies)	5.2	2.9
		of which: hybrid (7 companies)	0.4	0.2
NZ LISTED EQUITIES	**Oil + gas upstream**	NZ Oil + Gas	$5.2m	0.02
PRIVATE EQUITY & INFRASTRUCTURE	**Oil + gas upstream**	KKR EAGF Shale (from $115mn allocated)	$43.5m	0.2
	Fund of Fund fossil fuel sector exposure	HIG, Coller and Harbourvest	$1.4m	0.005

* Used as a proxy for MSCI ACWI as we do not have the full weights for MSCI ACWI. The difference should be small.

** The table covers companies directly involved in the production and mining of fossil fuels. We have not included companies that are heavily dependent on fossil fuels, such as coal-fired or oil-fired power generators or oil refineries.

5. Unburnable carbon

The concept of unburnable carbon is that most of the world's fossil fuel reserves cannot be burned if we are to avoid dangerous levels of climate change. It is a key part of both the investment-based and ethical-based arguments for divestment.

According to the IPPC (the UN panel of climate scientists), the world needs to limit global temperature increase to no more than two degrees Celsius (2°C) relative to pre-industrial levels, to have a reasonable chance of avoiding dangerous climate change. This view has been accepted by the international community, including New Zealand.

This objective can be translated into a global carbon emissions budget to 2050 and beyond. The world has already used up more than half of this 2050 carbon budget. The energy sector makes up the lion's share of global emissions.

To stay within a 2°C global carbon budget, it is estimated that no more than one-third of total fossil fuel reserves can be consumed prior to 2050, and only a minimal amount thereafter. Successful application of carbon capture and storage (CCS) technology could extend this by only a small amount.

The key facts about the global carbon budget are:

- Existing fossil fuel *reserves* represent emissions approximately three times the global carbon budget. (Total fossil fuel resources are much greater than actual reserves, being more than ten times the global carbon budget);

- Coal reserves alone exceed the global carbon budget;
- Around three-quarters of global reserves are owned by governments or state-owned companies, with only a quarter controlled by publicly listed companies.
- Of the listed company reserves, *proven* ('1P') reserves are approximately two-thirds of the global carbon budget, while *proven and probable* ('2P') reserves amount to 1.5 times the budget.

  Theoretically, this means that listed companies could burn all their 1P reserves without jeopardising the global carbon budget, but only if the other State players cut back production massively. More realistically, if everyone continues to produce in proportion to their reserves then 60-80% of listed company 1P reserves, and all of their 2P reserves, would be unburnable if the world is to stay within its carbon budget.

There is not much dispute over these facts between the two sides of the divestment campaign. The disagreement comes from whether government policy or action by civil society will ever be strong enough to limit warming to 2ºC, and where the burden of adjustment will lie (the State players vs the corporate sector; and oil versus coal).

6. The main arguments and counter-arguments regarding investment risk

Proponents of divestment argue that fossil fuel companies are overvalued because markets are not pricing the cost of carbon or the risk to future earnings from potentially unburnable reserves and the inevitable decline of the of fossil fuel industry.

Global policy and technological change are focused on transitioning to a low-carbon economy. Both efforts are expected to reduce demand for fossil fuels and to increase costs for fossil-fuel users. The potential changes include pricing the carbon externality through regulation, taxes or emissions trading schemes; removal of fossil fuel production and consumption subsidies; energy efficiency gains and falling renewable energy costs, bolstered by policy incentives; technological improvements in energy efficiency, and especially battery storage; and technology leap-frogging in developing countries assisted by international climate finance and development aid.

Increasing civil society and shareholder activism will amplify or even pre-empt government policy, and could independently impact investor returns and reputation.

Proponents of divestment argue that these changes will leave some assets 'stranded', especially the fossil fuel reserves currently on the books of listed companies. It is argued that equity and credit markets are not systematically pricing this long-term value risk into their financial models.

Divestment proponents also argue that oil and gas companies continue to re-invest profits on a business-as-usual basis into new exploration and production which faces a high probably of being economically stranded. Similar risks are said to apply to capital expenditure on fossil fuel dependent infrastructure such as refining, pipelines, transport and electricity generation.

They also question whether natural gas is a feasible bridging fuel. They argue that the emission savings in switching from oil to gas are overstated because fugitive methane emissions from gas can be high.

Fossil fuel companies' position

Fossil fuel companies generally rebut stranded asset claims, as follows.

1. They judge there to be no material stranded asset risk in the timeframe relevant to current market valuations.
    - They are confident about sustained long-term demand for fossil fuels - coming primarily from developing countries - based on scenario planning that they say is consistent with IEA forecasts. They are sceptical about global policy ambition driving a 2^{o}C scenario.
    - The oil and gas companies' position:
        - Even under a 2^{o}C scenario, the IEA forecasts a substantial role for oil and gas out to 2050 and beyond.
        - OPEC will act to keep oil prices high, some say.
        - Competitive alternative technologies in transport have yet to emerge.
        - Coal will take the biggest hit; it is the largest emitter and can easily be substituted.
    - The thermal coal companies' position:
        - Coal will remain an essential part of the global energy mix.
        - Coal is the solution to energy poverty - low-cost coal will continue to be the main driver of sales in developing markets.
        - Clean coal plants will address environmental concerns; near zero emissions can be achieved when combined with CCS.
2. They claim to be adequately managing the longer-term risk - e.g. by integrating climate risks into their strategy and risk management; applying shadow carbon price in project economics; diversifying and investing into cleaner fuels, energy efficiency, CCS and renewables.
3. They believe they have decades to adapt because they judge that renewable energy cannot scale up fast enough to replace existing fossil fuel supply.
4. They are confident about carbon capture and storage being deployed at scale.

Company valuations – are risks properly priced in by the market?

It appears that analysts typically assume a negligible probability of carbon regulatory or demand risk in their valuation models (see the Box below). In effect, they are assuming that governments will take little or no policy action to constrain or price emissions from fossil fuels, or that any action will have negligible impact on listed companies.

Like the fossil fuel companies, analysts appear to be assuming the continued support of host country governments. Valuations do not penalise the potential value wastage from investing in new exploration and production.

How the market values fossil fuel companies

We interviewed a range of energy market analysts and experts to understand how the valued listed energy companies. Based on these interviews, and our experience, we conclude that:

- Oil and gas valuations are based primarily on projected cash flows from 1P or proven reserves which are expected to be monetised within 10-15 years. Most of that value is placed on the early stages since oil and gas fields tend to peak and then rapidly deplete. Little or no value is placed on income from 2P or 3P reserves unless there is a clear pathway to market.
- Thermal coal is valued over life of mine, which is typically longer than for oil and gas projects. Analysts assume all reserves will be burnt on a steady-state basis. They typically apply a long-term coal price rather than the spot price.

Common market practice regarding integration of climate factors into asset valuation:

- Analysts appear to be pricing fossil fuel assets as if a 2°C scenario will not apply.
- Consideration of global or national carbon budgets does not feature.
- Carbon regulatory risk is not explicitly factored into company valuations unless there are tangible measures in place in relevant markets.
- Climate-related demand impacts might, to some extent, be factored into forward price forecasts, which are plugged into DCF models but this is unclear.

More generally:

- Carbon risk is judged immaterial in the timeframe of (at least) 1P reserves, and unlikely to move the dial anyway in the context of much larger idiosyncratic risks facing the industry.
- Analysts believe that host country governments have a vested interest in profitability of oil and gas companies and may continue to engineer things so that carbon costs are neutralised (what they take with one hand they will give back with the other).
- Small exploration companies are viewed as being more exposed to carbon risk than the large, mature E&P companies because their value depends on 2P/3P reserves.
- The timeframe for carbon to impact oil is perceived to be longer than for coal, because there is no established alternative transport fuel.
- Gas is viewed by many to be an important "bridge" fuel in the low-carbon economy transition.
- Other market fundamentals are more important than climate change (such as an oversupply of thermal coal and uncertainty over whether India will pick up the demand slack from China).
- There may be some stranding of long-life coal projects, particularly lower quality product which is feeling the impact of China's pollution controls.

Scenario analysis around climate risks appears to be uncommon. Our work with Mercer has looked at the potential impact of policy initiatives and technological changes. The potential impact of these scenarios on returns for fossil fuel companies – and especially coal companies – is estimated to be large.

In short, by assuming that all 1P oil reserves can be burned, markets are betting that there will be no significant policy action for some time yet; or that OPEC and other countries slash production to make room for the oil majors; that the massive investment in new energy technologies fails to bear fruit over a reasonable time frame; or that most of the adjustment falls on the coal sector (but that's not priced into coal company valuations either).

Other considerations

Some investors accept many of the arguments put forward by the divestment proponents, but reject divestment as the solution. They argue that full divestment is not feasible in practice, or

is a blunt tool, or that there are more effective ways to reduce the carbon footprint of a portfolio. Others argue that engagement is the appropriate response, though some believe it is naïve to think that engagement will succeed. Other investors prefer a positive investment response, focusing on investment in renewables and other 'climate solutions'. Some investors, including ourselves, have argued that divestment could harm the overall portfolio by reducing diversification, and that this needs to be weighed against any potential benefit.

These issues are canvassed in a later section, and will be dealt with in more detail in a later Work Package.

7. The main ethical arguments and counter-arguments

Most proponents of divestment take an ethical as well investment viewpoint. They argue that there is a moral imperative to divest from fossil fuels, based on the 'unburnable carbon' thesis and the social and environmental consequences of breaching the global carbon budget. Analogies are often drawn with previous apartheid and tobacco divestment campaigns.

Proponents point to the extensive body of work on the physical, resource and economic impacts of climate change and the much higher socio-economic costs to economies of a BAU vs. low-carbon transformation pathway.

Some investors have been prepared to divest on ethical or sustainability grounds alone, even if it means sacrificing returns.

The most common ethical counter-argument is that the elimination of fossil fuels would impoverish many energy-intensive poor countries, especially those that are currently dependent on coal. They argue that fossil fuel production is not unethical *per se*, as it is such a systematic part of all global activities ("we are all guilty").

Divestment proponents say that this under-estimates the potential for developing countries to leapfrog straight to the cleanest modern technology, supported by international climate finance initiatives.

Others believe there might be a case for selective or sequenced divestment – e.g. prioritising divestment from the most high-carbon and readily substitutable fossil fuels – and potentially for differential approaches to developed and developing countries.

Lastly, some argue that from an ethical standpoint divestment is the wrong option because it will not reduce emissions, especially if stocks are simply changing hands. This is similar to the financial argument that divestment is futile and engagement is better. Also, none of these options can address the risk to the climate from the three-quarters of fossil fuel reserves that are outside of listed companies' hands.

8. International and New Zealand policy

International policy and law

Through the United Nations Framework Convention on Climate Change (UNFCCC), the international community has adopted the findings of the IPCC and has agreed to a goal of limiting global temperature increase to 2ºC (and to keep under review the adequacy of this ambition). New Zealand has ratified this convention.

At the UNFCCC meeting in Paris in December 2015 parties aim to agree a new, post-2020 2ºC climate agreement that covers all countries. In parallel, the G20 and APEC have both pledged to phase-out inefficient fossil fuel subsidies, although there is little evidence of progress so far.

The US, China and the European Union have all submitted post-2020 emission reduction pledges to the UN and taken action targeting coal fired power generation and promoting renewables and energy efficiency.

- China has pledged to peak emissions before 2030, reduce carbon intensity by two-thirds on 2005 levels by 2030. It is implementing an ETS as part of its approach. Tackling air pollution from coal-fired power generation among top political priorities of Chinese government.
- The US has pledged to cut emissions by about a quarter below 2005 levels by 2025. President Obama launched a revised US Clean Power Plan, under which electricity generators must cut carbon dioxide emissions by 32% from 2005 levels by 2030 (coal fired power plant provide more than a third of US electricity supply).
- The EU has pledged to cut emission by at least 40% below 1990 levels by 2030. EU-wide regulations are phasing out dirty coal and ambitious renewable energy and energy efficiency targets.

NZ policy and law

Along with other Parties to the UNFCCC, New Zealand has committed to a 2ºC global goal and said it will do its "fair share" towards achieving the necessary global emissions reductions.

The Government has four national targets for reducing greenhouse gas emissions that cover both the medium and long term:

- A pledge for the Paris convention to reduce emissions to 30% below 2005 levels by 2030 (equivalent to 11% below 1990 levels).
- An unconditional target of 5% below 1990 levels by 2020.
- A conditional target range of 10 to 20% below 1990 levels by 2020, if there is a comprehensive global agreement and other conditions are met.
- A long-term target of 50% below our 1990 levels by 2050.

The government's principle policy tool is the Emissions Trading Scheme. Current carbon prices are very low (just a few dollars per tonne), which means the ETS is essentially ineffective at present. By linking the ETS to global carbon markets, the government is trying to ensure that domestic mitigation costs are in line with costs faced by companies overseas.

Other policies relevant to fossil fuels include:

- New Zealand ratified the Kyoto Protocol and looks like it has met its emission reduction target to 2012 made under the Protocol.
- Exempting electric vehicles from road user charges until 2020 and investing $42mn in biofuels;

- Championing fossil fuel subsidy reform internationally through "The Friends of Fossil Fuel Subsidy Reform" – a group of non-G20 countries formed in June 2010 to support G20/APEC commitments.
- No subsidies for fossil fuel exploration or production;
- Taxes on petrol are 5th lowest in OECD;
- New petroleum exploration licences are being granted. Energy Minister Simon Bridges was quoted as saying that "we are on a transition to a lower-carbon economy, but it is not realistic to turn off the tap overnight" and that "not all fossil fuels are created equal; we need to see a transfer from coal en-masse to much cleaner and more efficient energy sources – with gas playing bridging fuel role".
- The government owns 100% of Solid Energy, a coal mining company.

9. What have other investors done about fossil fuels?

Our peers are at various stages of developing climate change strategies and in grappling with the calls for fossil fuel divestment. Most are taking time to undertake systematic analysis of carbon/fossil fuel risk exposure across their portfolio.

Some funds are acting on specific climate change investment beliefs. For example:

- AP4: "Our underlying premise is that financial markets under-price carbon risk. Moreover, our fundamental belief is that eventually, if not in the near future, financial markets will begin to price carbon risk….Virtually all financial analysts overlook carbon risk…"
- PGGM has a target to halve the carbon footprint of the portfolio and quadruple "solutions investments" by 2020. This is based on a belief about the societal impacts of climate change and linking that to members' interests.
- The UK's Environmental Agency Pension Fund has a formal belief that climate change is a key financially material risk for the fund and they have a fiduciary duty to act.

Decisions by peers and other investors are summarised in the Table below.

A small number of institutional investors have announced divestment strategies, mostly limited to listed coal companies. For the most part they are religious, academic and charitable organisations, local governments and individuals. In many cases, it is motivated on purely ethical or sustainability grounds.

The most high profile divestment action to date is Norway's Government Pension Fund (GPF). Norway's parliament rejected the advice of an independent Expert Panel - which recommended against divestment – and has directed GPF to divest from companies that generate than 30% of their output or revenues from coal-related activities. The stated rationale is that investing in coal poses both a climate risk and future economic risk, and that coal is in a class by itself among fossil fuels, as the source with the greatest responsibility for global greenhouse gas emissions.

Some investors feel they lack sufficient certainty or visibility on stranded asset risk to justify complete divestment in the short-to-medium term. Others think there are smarter ways to

reduce the portfolio's carbon footprint. For example, AP4 is applying optimised low-carbon indices to its US and EM listed equity portfolios in which the heaviest emitters in each sector are eliminated from the index. It plans to extend this to its entire equities portfolio.

Some large US pension funds are driving shareholder resolutions targeting large 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. Some resolutions seek carbon reduction targets. Iterestingly, proxy voting agencies such as ISS usually vote in favour; the large passive managers such as BlackRock and State Street often vote against.

There is also a growing number of investor-led collaborative initiatives on climate change including the Montreal Carbon Pledge, the Portfolio Decarbonization Coalition, the Carbon Asset Risk Initiative, the Climate Resilient Infrastructure Pledge (NZSF is a signatory) and the Investor Group on Climate Change (NZSF is a member).

Our engagement provider BMO is conducting two climate-change related thematic engagements targeting multiple companies. One is on stranded asset risk in the fossil fuel sector. Specifically, BMO is requesting companies in the oil and gas, mining and utilities sectors to develop clearer strategies to protect their business models against the impact of long-term demand shifts away from fossil fuels. They are also pressing companies on transparency and climate change lobbying practices.