

NGS SUPER TASKFORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES 2023

Carbon data and scenario analysis
within this report is as at 30 June 2022



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NGS SUPER TCFD DISCLOSURE

At NGS Super we manage approximately \$13.1 billion in funds on behalf of our 111,000 members.¹ Over 30 years, we have grown to become the leading industry super fund for those in the independent education and community sectors. We represent people who care. In turn, we aspire to reflect these values in the way we operate the Fund.

“Our purpose is to
help you and the world
prepare for tomorrow”

| *NGS Super Strategic Plan*

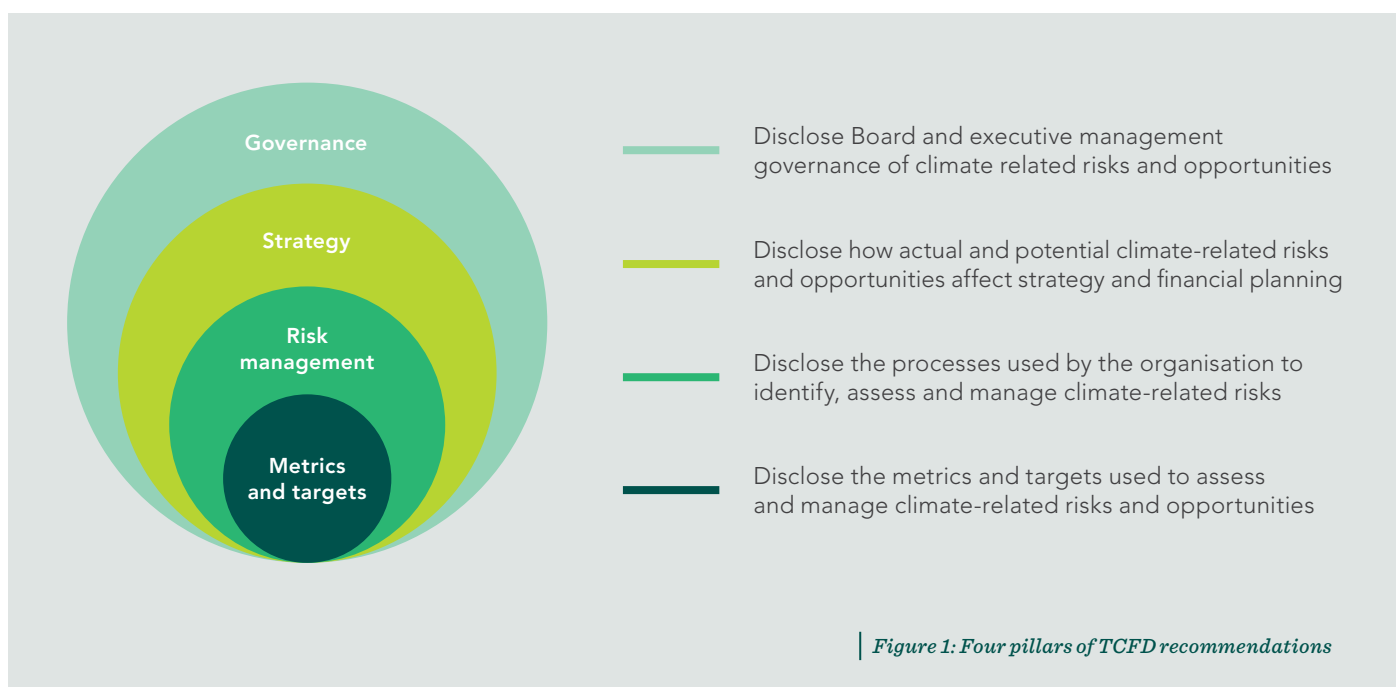


1. As at 30 June 2022: ***Annual Report***

CLIMATE-RELATED DISCLOSURE UNDER THE TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURE (TCFD) FRAMEWORK

Investors are increasingly seeking more transparency and detail in company disclosures on climate risk.

In 2017, the G20 Financial Stability Board's (FSB) TCFD released a set of recommendations for voluntary climate-related disclosure that is consistent, comparable and can provide decision-useful information to key stakeholders. The TCFD provides high-level guidance across the 4 pillars outlined in [Figure 1](#).



We are committed to protecting our members' financial interests by managing climate-related risks in our portfolio, and to positively contributing towards a more sustainable future. As part of this commitment, we are pleased to present our third climate-related disclosure based on the TCFD framework.

In this report, we discuss our current performance against the TCFD recommendations, recognising that we are still relatively early in our TCFD journey.

We have outlined our current alignment with the recommendations, including the progress on our action plan outlined in [Figure 22](#). We have again included a transparent assessment of where we think we need to do more to ensure complete alignment with the TCFD recommendations and to improve on prior efforts. Each year, we will publicly report on our progress against this plan.

OUR POSITION ON CLIMATE CHANGE

NGS Super accepts the scientific consensus that climate warming trends over the past century are extremely likely to be due to human activities. We believe that climate change poses a significant risk not only to the financial system in which we operate, but also to the environment and communities in which our members live, work and retire.

1. As at 30 June 2020: [Annual Report](#)

“Our aspiration is to generate strong long-term returns for our members. The objective is to exceed the retirement expectations of our members by generating superior returns to the competition, whilst transforming the world we live in by making our invested capital work towards improving societal outcomes. This involves understanding and assessing likely material risks to our members’ investments whilst pursuing new opportunities. One of the major risks posed to our investment portfolio is the effect of climate change.”

NGS Super Statement on Climate Change

HOW WE ARE TAKING POSITIVE CLIMATE ACTION

We are committed to supporting the Paris Agreement goals of limiting the global average temperature rise at the end of the century to well below 2°C above pre-industrial levels and pursuing efforts to achieve a 1.5°C increase above pre-industrial levels.²

In 2021 we announced that we would be working on a Carbon Neutral 2030 (CN2030) project, completing analysis and working towards making the Fund’s investment portfolio carbon neutral by 2030. **Figure 2** shows how we support the global commitment to addressing climate change.


1. Follow responsible investment principles	We are guided by our Responsible Investment Policy to ensure that ESG risks and opportunities are adequately considered as part of our investment processes.	See our Responsible Investment Policy summary on page 10 or alternatively, view our entire Responsible Investment Policy on our website .
2. Support early climate action	We support early climate action. We see the best long-term returns for our members under a scenario where decisive climate action is taken, without delay, to limit the global temperature increase.	See Climate risks and opportunities on page 10 .
3. Set ambitious targets while tracking and communicating progress	We have set an ambitious target of having a carbon neutral investment portfolio (Diversified MySuper investment option) by 2030, and an interim target of 35% less emissions on our 30 June 2021 carbon intensity measurement by 2025.	See Metrics and targets on page 31 .
4. Use exclusions, divestment, engagement and investing in carbon positive investments to effect change	Effective 1 July 2022, the Trustee enhanced the existing thermal coal exclusion to a more encompassing fossil fuel exclusion. This exclusion does not apply to the Indexed Growth investment option. This exclusion allowed us to effect our objective to divest of scope 3 stranded assets within the listed portfolio.	See Our position on fossil fuels on page 10 .
	We utilise active ownership over our portfolio, including through engagement or proxy voting in line with our responsible investment objectives.	See Active Ownership and Engagement on page 27 .
	In the private assets side of the portfolio we seek out investments that are contributing to mitigating the effects of climate change.	Each year we commit to making investments that are contributing to mitigating the effects of climate change. Progress is communicated annually.

Figure 2: How NGS Super is taking positive climate action

2. Paris Agreement, Article 2, paragraph a) https://unfccc.int/sites/default/files/english_paris_agreement.pdf

3. The Diversified (MySuper) investment option.

1.0 GOVERNANCE

A close-up photograph of several green leaves, likely from a plant like a peace lily, covered in numerous small, clear water droplets. The lighting is soft, highlighting the texture of the leaves and the glistening of the water.

“The Trustee is committed to ensuring that the Fund has sound and effective systems of governance and that it conducts its affairs with a high degree of integrity, ensuring that business operations are competently and prudentially managed.”

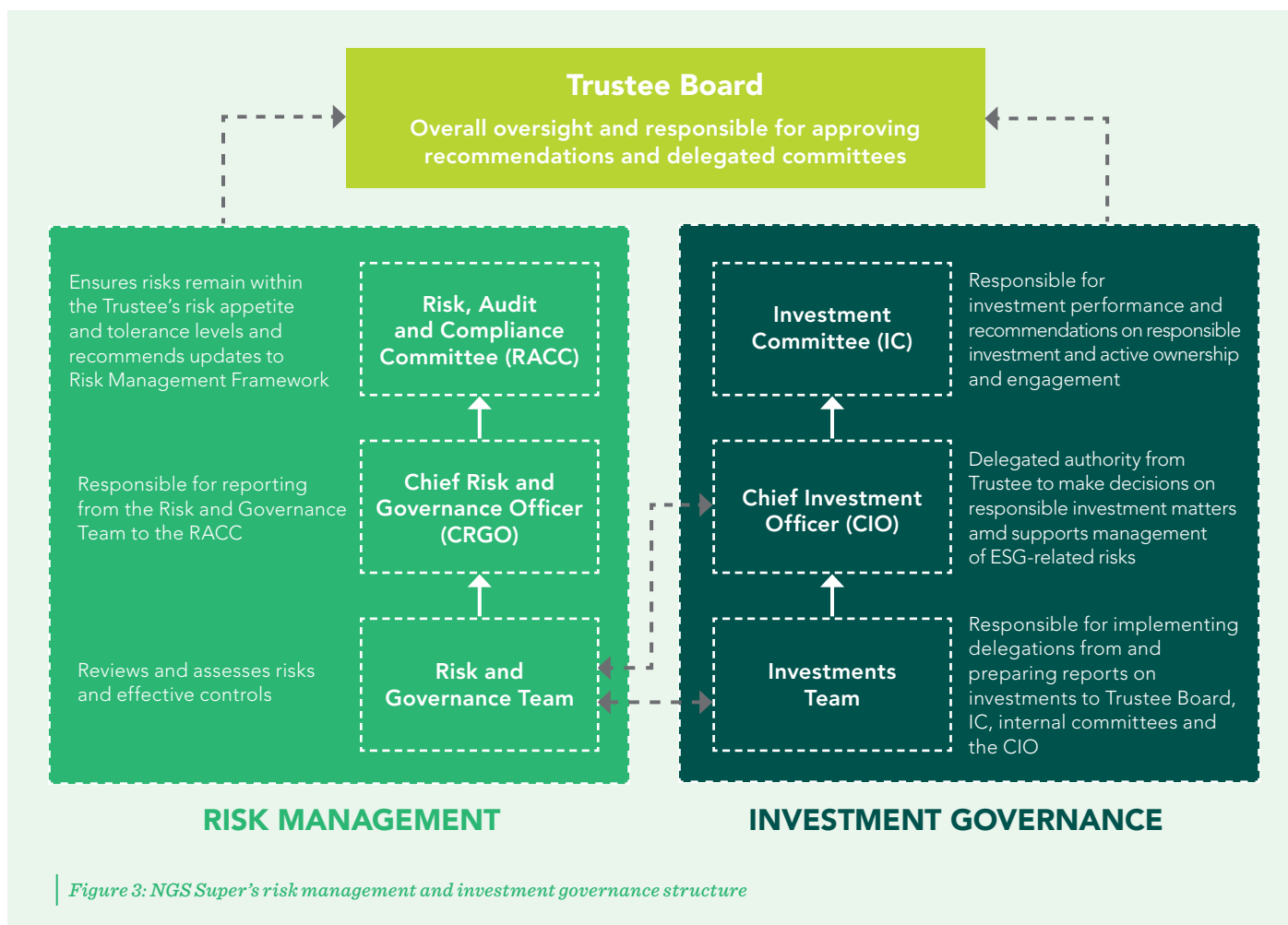
***NGS Super Statement
of Governance Practice***

At NGS Super we believe that responsible investment is everyone’s concern. Our Trustee Board (Trustee) is ultimately responsible for approving the Fund’s investment strategy, business plan and risk management framework, and has a fiduciary duty to act in the best financial interests of our members. NGS Super is an Australian Prudential Regulation Authority (APRA) regulated super fund.

The Trustee’s decision-making process is also governed by the Investment Governance Framework (IGF). Our IGF considers environmental, social and governance (ESG) factors as critical for reducing investment risk and promoting positive long-term corporate performance. Additional guidance is provided by our **[Responsible Investment Policy](#)**, **[Active Ownership and Engagement Policy](#)** and **[Stewardship Statement](#)**.

1.1 OVERSIGHT

The Trustee maintains oversight of risk management and investment governance, including climate-related issues related to our operations and our approach to assessing ESG risks associated with our investments. The Trustee has established committees to assist in the discharge of its obligations and delegates some decision-making power to other groups and individuals. **Figure 3** outlines our oversight and governance structure, highlighting the Board's oversight.



Under the risk management structure, the Risk and Governance team reviews risks and effective controls identified by the business, including inputs from the Chief Investment Officer (CIO). Via the Chief Risk and Governance Officer, the Risk, Audit and Compliance Committee (RACC) provides an objective assessment of the Fund's financial and risk management frameworks and recommends any updates to the Trustee for approval. Risks facing the Fund are continually monitored and reviewed, with a formal review conducted at least annually.

Considering investment governance, the Investments team is responsible for determining suitable ways to assess climate-related risks to the investment portfolio.

The team also engages with the Risk and Governance team to ensure that risks are assessed against the Fund's risk appetite and incorporated into the Risk Management Framework. The Investments team reports to the CIO and Investment Committee (IC) on ESG, climate change and responsible investment matters. The IC meets at least 5 times per year and provides recommendations on the Climate Change Statement, Responsible Investment Policy and Active Ownership and Engagement Policy for the Trustee's approval.

There is common membership across the RACC and IC which enhances information-sharing and continuity between the work completed by both committees.

1.2 ENSURING RESPONSIBLE INVESTMENT

We require our investment managers (IMs) to demonstrate alignment with our ESG position. We complete due diligence on all new IMs, including on their approach to ESG matters, and track this through questionnaires twice a year and hold regular portfolio meetings. We also regularly run our share portfolio holdings through an ESG screening platform to help us better engage with IMs on their holdings and independently assess their ESG performance. We review the carbon intensity of our investments at portfolio level,⁴ as well as per IM where possible.⁵ All members of our team are encouraged to obtain training and professional development on responsible investment and topical ESG matters.



What is NGS Super's ESG position?

We believe that to give members the best retirement outcome, our investment approach needs to be one that is focused on sustainable long-term investment outcomes. This means investing in companies that are sustainable. We are committed to following our Responsible Investment Policy which shapes the Fund's approach to managing ESG issues.

Responsible Investment Policy

4. As at 30 June 2022 we estimated the carbon intensity of the portfolio. In prior years, smaller percentages of the portfolio were measured. In the measurement of the carbon intensity of the portfolio, estimates and assumptions were required. The Fund has documented these.

5. In some cases, estimates or assumptions were used.

1.3 PROGRESS SINCE OUR LAST DISCLOSURE

1.3.1 REVIEW INCORPORATION OF ESG FACTORS INTO DUE DILIGENCE ASSESSMENTS AND INVESTMENT MANAGER QUESTIONNAIRES

During 2022 we enhanced the ESG due diligence process for new or potential IMs. NGS now has a formalised ESG review process conducted by the ESG and Responsible Investment team in addition to the investment-focused ESG review completed by the front office investment team.

This improved due diligence process has a dedicated section on climate and factors relevant to our Carbon Neutral 2030 target. All recommendations to the Trustee for new IM appointments contain confirmation of the scope and outcome of the ESG due diligence.



WHEN EVERY STAKEHOLDER IN THE PROCESS CARES ABOUT ESG, IT IS BETTER FOR LONG-TERM RETURNS

- **Responsible investing is in our culture and everything we do** – integration of ESG issues when evaluating investments reduces investment risk, improves investment returns, and can positively impact the future.
- **Investing well can make positive impacts on society and achieve returns** – leading [in climate risk and opportunity assessment] is an opportunity to acquire transitional assets before others value their presence.

*Investment Governance Framework:
Extract from investment beliefs*

1.4 LOOKING AHEAD

The focus for our next phase of continuous improvement will be strengthening our ongoing monitoring of our IMs' ESG posture on a rolling annual basis. We will be designing a process to assess our IMs on both their ESG posture and their alignment to our target of becoming carbon neutral by 2030.

We will also look for opportunities to enhance our overall policies and structures if it becomes clear that improvements can be made.

“NGS Super supports the objectives of the Paris Agreement and the transition to a low carbon world.”



2.0 STRATEGY

The Trustee, on recommendation from the IC, sets and approves our investment strategy. While recognising the importance of short-term context and returns, superannuation is a long-term investment and it is important to view investment returns with a long-term outlook. This is particularly relevant when considering climate change, where some risks and opportunities may only present in the medium to long term. There is both great opportunity and great responsibility for superannuation funds to advocate for company planning and risk management over a longer time horizon, and to invest in assets which are well positioned to prosper in a low-carbon future.



2.1 OUR RESPONSIBLE INVESTMENT POLICY

NGS Super's [*Responsible Investment Policy*](#) guides the assessment of long-term risks and opportunities that may fall outside of the immediate focus of IMs, such as in the equity asset classes where time horizons are typically one to 3 years. As part of our assessment of ESG issues across all our investment portfolios, we expressly consider climate change as an environmental risk. We believe that the potential impact of ESG factors on an entity's performance should be disclosed and that investment analysis should incorporate ESG factors to the extent that they affect long-term risk and return.

WE RESTRICT HOLDINGS WITH COMPANIES:

- that generate more than 30% of their revenue from the distribution, power generation, or extraction of thermal coal
- who are in the oil and gas production and exploration sector

This exclusion was reviewed and amended in 2022 in consideration of our CN2030 target. This exclusion now considers the 3 main forms of fossil fuels to be coal, oil and gas.

*Please see the [*Responsible Investment Policy*](#) for more specifics on how this exclusion is applied. This exclusion is not applied to the Indexed Growth investment option.*

2.2 CLIMATE RISKS AND OPPORTUNITIES

Climate change poses a material risk to our members and, therefore, our business. NGS Super's climate risks are assessed within our existing structure, which includes the Board-approved risk appetite statement, risk management strategy, and business plan. NGS Super ensures that its systems for identifying, measuring, monitoring, managing and reporting on its climate risk exposure are tailored to its size, business mix, and complexity of operations.

2.2.1 ASSESSING RISKS UNDER DIFFERENT SCENARIOS

Over the course of 2022, we reviewed our scenario analysis ([see Figure 4 on the next page](#)) with the objective of identifying key risk hotspots in selected elements of our portfolio. We complete scenario analysis separately for our listed and unlisted assets, drawing on multiple sources, including the Network for Greening the Financial System (NGFS), World Resources Institute (WRI), and support and analysis from Vivid Economics and Planetrics.⁶

The conclusions within this document are solely our own.

Vivid Economics completed a physical and transition risk assessment for the Fund's Infrastructure portfolio in 2021, which was provided in the Fund's 2021 TCFD Report. As the assets have not materially changed, this analysis is still being relied upon for physical risks in 2022. The economic impact of physical and transition risks for the property and infrastructure assets have been assessed using proxy data via the Planetrics platform.

To generate climate scenario results we relied on NGFS reference scenarios,⁷ and used these as a basis for estimating physical and transition impacts on companies' profits. Our analysis considered factors such as future carbon costs, emissions abatement options, demand creation and destruction, and cost pass-through, among other impact channels. Detailed scenario analysis methods covering both listed and unlisted assets are provided in [Appendix A](#) of this report.

2.3 CLIMATE SCENARIOS

Climate change can materially impact our investments in 2 key ways:

- (1) physical impacts, including chronic risks such as extreme heat, drought and water stress and acute weather events such as wildfires, hurricanes and flooding and
- (2) transition impacts — that is, impacts resulting from society's response to climate change including policy and legal changes (for example, carbon regulations), technology developments, market shifts and reputational risk.

In 2022 we focused our climate scenario analysis for listed assets on 3 of the 6 transition scenarios developed by NGFS, which align with integrated assessment models used by the Intergovernmental Panel on Climate Change (IPCC) in its sixth Assessment Report. [Figure 4](#) on the next page describes the 6 transition scenarios and which scenarios we have focused on for the 2022 analysis. We have included a summary of the results within this TCFD report.



6. This report has been created by NGS Super drawing on selected data and analysis provided from Planetrics and Vivid Economics. This report represents NGS Super's own selection of applicable scenarios selection and/or its own portfolio data. NGS Super is solely responsible for (and this report represents) such scenario selection, all assumptions underlying such selection, and all resulting findings, and conclusions and decisions. Neither Planetrics Ltd nor Vivid Economics is an investment adviser and neither has provided any investment advice.

7. Scenarios include underlying assumptions, including but not limited to, future carbon prices, energy prices, demand for different sources of energy, etc.

SCENARIO		NGS USE	DESCRIPTION
ORDERLY	Net Zero 2050	Listed physical and transitional Unlisted physical Unlisted transitional (via listed proxy)	Net Zero 2050 is an ambitious scenario that limits global warming to 1.5°C through stringent climate policies and innovation, reaching Net Zero CO ₂ emissions around 2050. Some jurisdictions such as the US, EU and Japan reach Net Zero for all greenhouse gases by this point. This scenario assumes that ambitious climate policies are introduced immediately. Carbon dioxide removal (CDR) is used to accelerate the decarbonisation but kept to the minimum possible and broadly in line with sustainable levels of bioenergy production. Net CO ₂ emissions reach zero around 2050, giving at least a 50% chance of limiting global warming to below 1.5°C by the end of the century, with no or low overshoot (< 0.1°C) of 1.5°C in earlier years. Physical risks are relatively low but transition risks are high.
	Below 2 Degrees	Not a focus in 2022	Below 2°C gradually increases the stringency of climate policies, giving a 67% chance of limiting global warming to below 2°C. This scenario assumes that climate policies are introduced immediately and become gradually more stringent though not as high as in Net Zero 2050. CDR deployment is relatively low. Net Zero CO ₂ emissions are achieved after 2070. Physical and transition risks are both relatively low.
DISORDERLY	Divergent Net Zero	Not a focus in 2022	Divergent Net Zero reaches net zero by 2050 but with higher costs due to divergent policies introduced across sectors and a quicker phase-out of fossil fuels. This scenario differentiates itself from Net Zero 2050 by assuming that climate policies are more stringent in the transportation and building sectors. This mimics a situation where the failure to coordinate policy stringency across sectors results in a high burden on consumers, while decarbonisation of energy supply and industry is less stringent. Furthermore, the availability of CDR technologies is assumed to be lower than in Net Zero 2050. Emissions are in line with a climate goal giving at least a 50% chance of limiting global warming to below 1.5°C by the end of the century, with no or low overshoot (<0.1°C) of 1.5°C in earlier years. This leads to considerably higher transition risks than Net Zero 2050 but overall the lowest physical risks of the 6 NGFS scenarios.
	Delayed Transition	Listed physical and transitional Unlisted physical Unlisted transitional (via listed proxy)	Delayed Transition assumes global annual emissions do not decrease until 2030. Strong policies are then needed to limit warming to below 2°C. Negative emissions are limited. This scenario assumes new climate policies are not introduced until 2030 and the level of action differs across countries and regions based on currently implemented policies, leading to a “fossil recovery” out of the economic crisis brought about by COVID-19. The availability of CDR technologies is assumed to be low, pushing carbon prices higher than in Net Zero 2050. As a result, emissions exceed the carbon budget temporarily and decline more rapidly than in Well-below 2°C after 2030 to ensure a 67 % chance of limiting global warming to below 2°C. This leads to both higher transition and physical risks than the Net Zero 2050 and Below 2°C scenarios.
Hot House World	NDCs	Listed physical and transitional Unlisted transitional (via listed proxy)	Nationally Determined Contributions (NDCs) includes all pledged policies even if not yet implemented. This scenario assumes that the moderate and heterogeneous climate ambition reflected in the conditional NDCs at the beginning of 2021 continues over the 21st century (low transition risks). Emissions decline but lead nonetheless to 2.6°C of warming associated with moderate to severe physical risks. Transition risks are relatively low.
	Current Policies	Unlisted physical	Current Policies assumes that only currently implemented policies are preserved, leading to high physical risks. Emissions grow until 2080 leading to about 3°C of warming and severe physical risks. This includes irreversible changes like higher sea level rise. This scenario can help central banks and supervisors consider the long-term physical risks to the economy and financial system if we continue on our current path to a “Hot House World”.

| Figure 4: Policy scenarios

2.4 LISTED ASSETS⁸

For equities, the biggest transition risk lies in oil/gas and coal producers (high scope 3 assets) due to expected destruction of demand for fossil fuels. Generally, high emitting sectors (high scope 1 and 2 assets), such as materials and utilities, score poorly under more aggressive climate scenarios. This is because of the expected high costs due to their direct carbon emissions (assuming they need to pay a carbon price for their emissions). However, renewable energy utilities and mining companies exposed to green minerals are expected to benefit from climate action, which should reflect positively on their valuation.

Climate opportunities, on the other hand, are mainly around green minerals, renewable electricity generation, and production of electric vehicles (EVs). Finally, regions with a higher exposure to carbon emissions, such as emerging markets and Australia, also exhibit more negative valuation impacts.



8. This report, including all charts and figures within the “Listed Assets” section of the scenario analysis, has been created by NGS Super drawing on selected data provided by Planetrics Ltd (which does not include investment advice). This report represents NGS Super’s own selection of applicable scenarios and/or its own portfolio data. NGS Super is solely responsible for, and this report represents, such scenario selection, all assumptions underlying such selection, and all resulting findings, conclusions and decisions. Planetrics Ltd is not an investment adviser and has not provided any investment advice.

2.4.1 SCENARIO ANALYSIS INSIGHTS (AUSTRALIAN AND INTERNATIONAL SHARES)

The figures that follow within this section show the impact of physical and transition risks combined. Physical risks alone are not that material for most companies being assessed, unless they operate in industries such as real estate or agriculture.

IN-YEAR IMPACTS: AUSTRALIAN SHARES

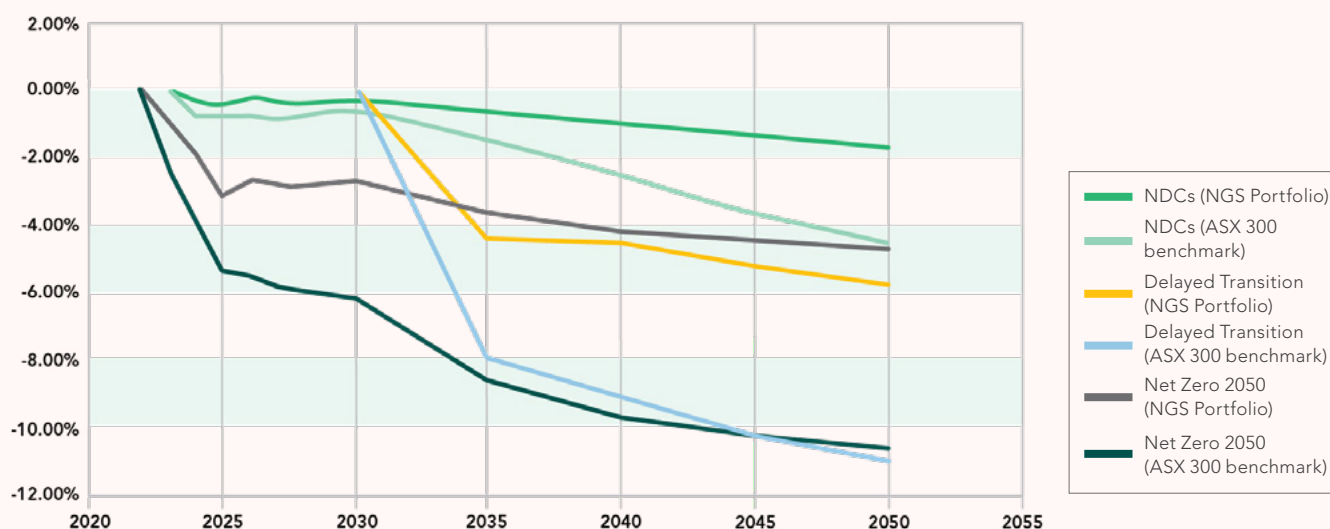


Figure 5: Expected yearly impact to 2050: NGS Australian shares v ASX 300

Figure 5 shows projected impacts for the NDCs scenario, the Delayed Transition scenario and the Net Zero scenario. Under the NDCs scenario, the Australian shares portfolio is expected to suffer from slight earnings loss from now until 2030. After 2030, the expected loss in earnings steepens further until it reaches around -1.67% by 2050. However, if you compare this to the results of the benchmark (ASX300), the NGS Australian shares portfolio suffers less, with the benchmark suffering earnings loss of -4.45% by 2050.

The Delayed Transition scenario forecasts no change to portfolio net earnings by 2030 as climate change policies are not even introduced till then. However, after 2030 (through to 2050), the NGS Australian shares portfolio suffers a decline in portfolio earnings of approximately -5.78%. Again, when compared to the decline in portfolio earnings of the benchmark (ASX300), the NGS Australian shares portfolio suffers less, with the benchmark predicted to decline -11.01%. Under this scenario, high carbon prices are abruptly introduced to curb emissions, causing more harm to portfolio earnings longer term due to the abrupt and late change in policy.

Finally, the Net Zero 2050 scenario forecasts a sharper decline in earnings from now until 2025, as policymakers act immediately to curb emissions and introduce significant carbon prices. After 2030, the steepness of the loss curve flattens until it reaches around -4.64% for the NGS Australian shares portfolio and -10.61% for the benchmark (ASX 300) by 2050.

As you can see from the scenario analysis, the NGS Australian shares portfolio is relatively protected from the loss of portfolio earnings under the NDCs, Delayed Transition and Net Zero 2050 scenarios. This is largely due to the actions we have taken over the last 12 months in removing our exposure to oil and gas exploration and production companies⁹ and starting to introduce low-carbon investment strategies.

9. As defined by the Global Industry Classification Standard (GICS) subindustry "Oil and Gas Exploration and Production".

IMPACT ON VALUE: AUSTRALIAN SHARES



Figure 6 shows the impact on Net Present Value (NPV) by sector for both the NGS Australian shares portfolio and the benchmark (ASX 300). The clear outlier in this analysis is the benchmark's loss from the energy sector across all 3 scenarios, mainly due to demand destruction. Last year when we reviewed this analysis the results were not dissimilar for the NGS Australian shares portfolio. Again, the actions we have taken over the last 12 months in removing our exposure to oil and gas exploration and production companies¹⁰ and starting to introduce low-carbon investment strategies have added climate risk protection to the NGS Australian shares portfolio under these 3 scenarios. The utilities sector is also set to be a good performer under all scenarios.



10. As defined by the Global Industry Classification Standard (GICS) subindustry "Oil and Gas Exploration and Production".

IN-YEAR IMPACTS: INTERNATIONAL SHARES

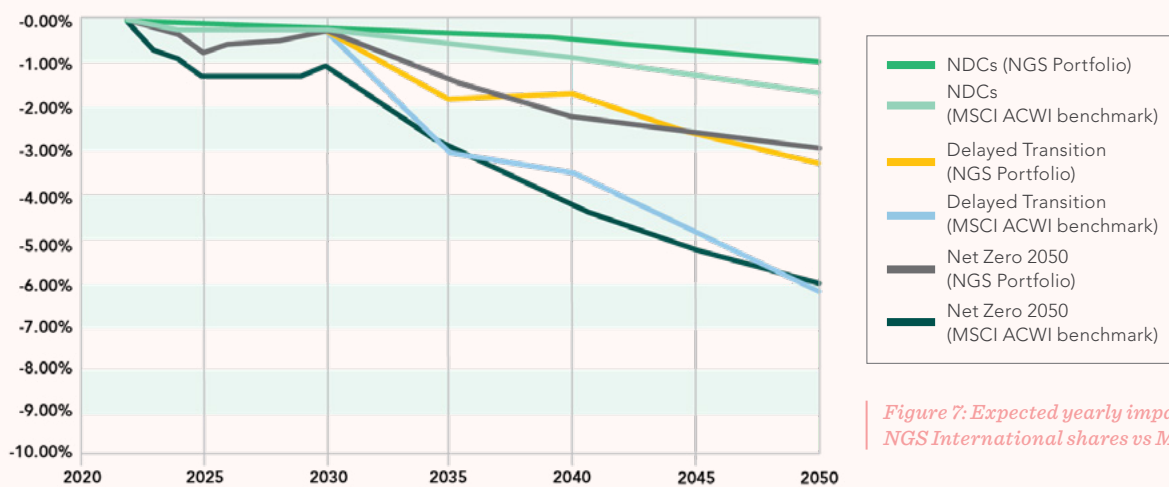


Figure 7 shows a similar trend for International shares, but the magnitude of the impact is less than for Australian shares. This is because international shares have lower exposure to high carbon intensive industries such as energy and materials. For example, the US equity market is more dominated by technology rather than more conventional industries.

IMPACT ON VALUE: INTERNATIONAL SHARES

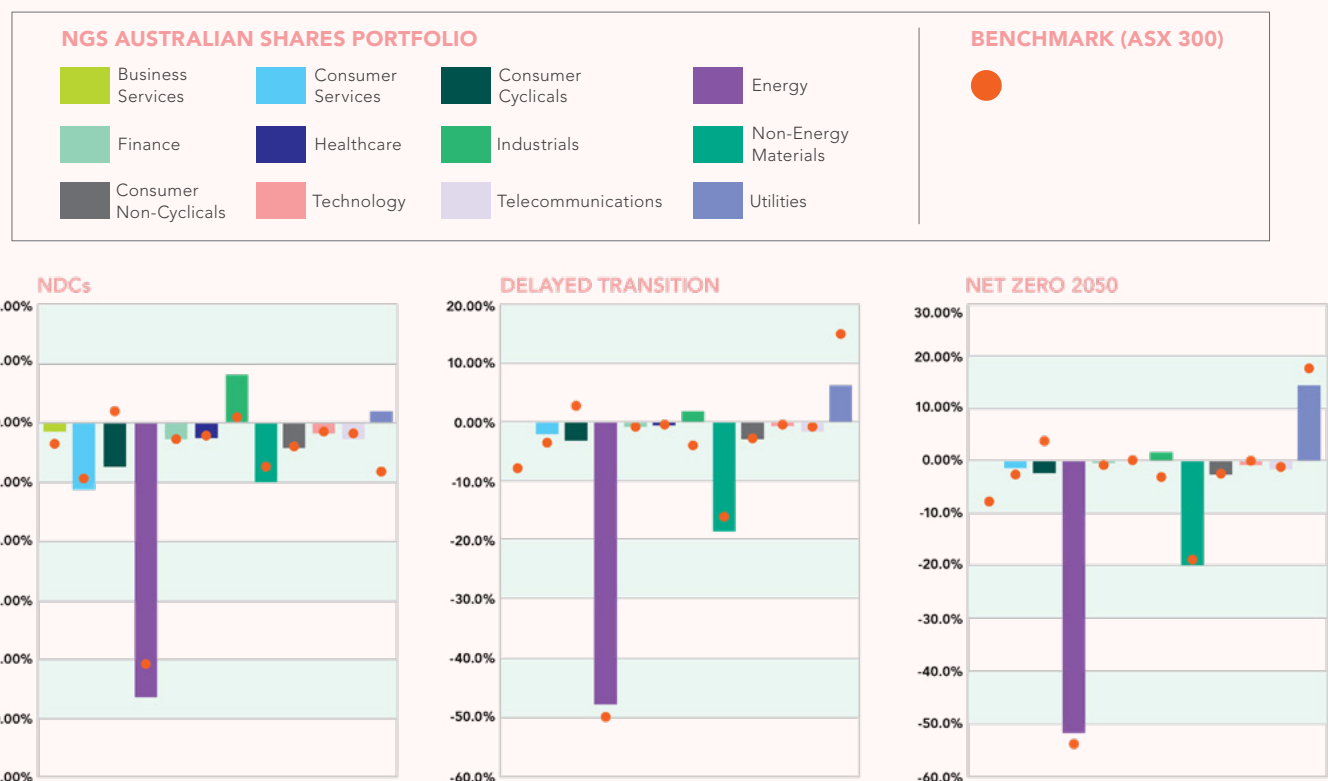


Figure 8 shows the impact on NPV by sector for the NGS International shares portfolio and the benchmark (MSCI ACWI). Across sectors there is not much difference between the International shares portfolio and the benchmark. The International shares portfolio fares slightly better across energy, industrials, business services and consumer services. It performs better in aggregate when compared to the benchmark because it is underweight in sectors/companies with high transition and/or physical risks.



2.5 UNLISTED ASSETS¹¹

Our unlisted scenario analysis focused on infrastructure, property and private equity in varying degrees, using a combination of proxies and actual NGS Super asset information.

2.5.1 SCENARIO ANALYSIS INSIGHTS (INFRASTRUCTURE, PROPERTY AND PRIVATE EQUITY)

Within this section we assess the economic impact pertaining to transition and physical risk impacts under varying scenarios. The results within this section have been derived using listed proxies rather than NGS Super portfolio assets.

11. This report's analysis of unlisted assets was produced by NGS Super. It draws on multiple sources, including NFGS, WRI, and support and analysis from Vivid Economics. However, the conclusions of the document are solely those of NGS Super.

IN-YEAR IMPACTS: INFRASTRUCTURE

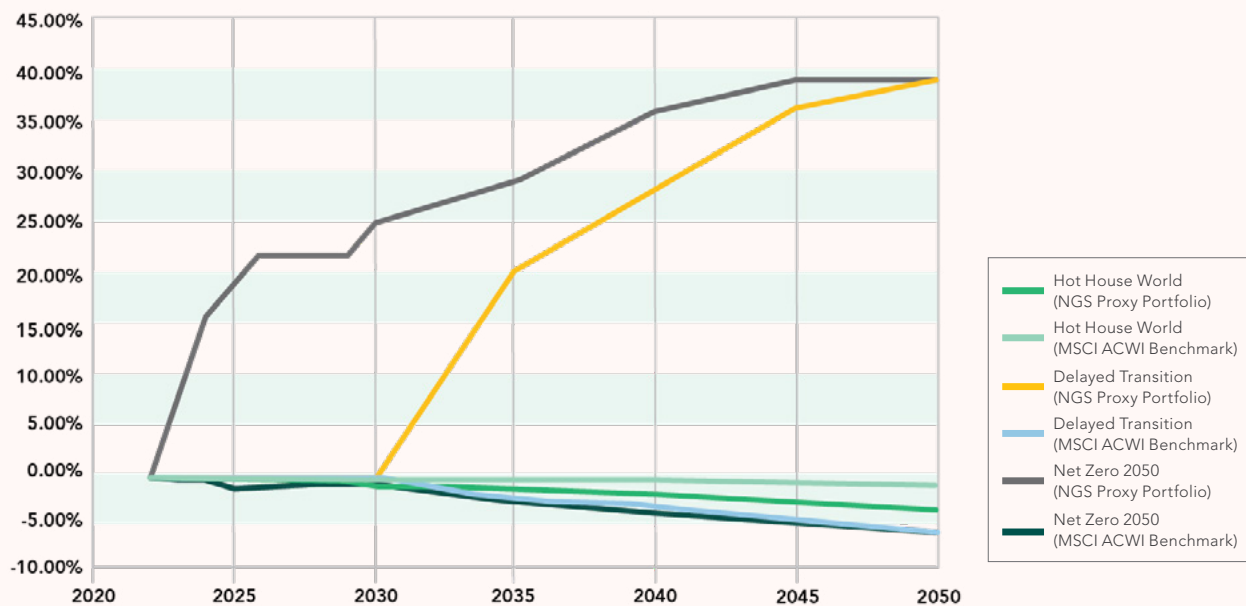


Figure 9: Expected yearly impact to 2050: Infrastructure proxy vs MSCI ACWI

Figure 9 shows that infrastructure assets should benefit (in terms of valuation) from the transition to a greener economy. This is because approximately 25% of the infrastructure sector is exposed to renewable energy generation and electric utilities. This exposure positively impacts valuations, and more than offsets the negative impacts from other conventional infrastructure assets such as pipelines and gas terminals. It is important to note that this is based on listed proxies which may not be a direct reflection of our portfolio.

IN-YEAR IMPACTS: PROPERTY

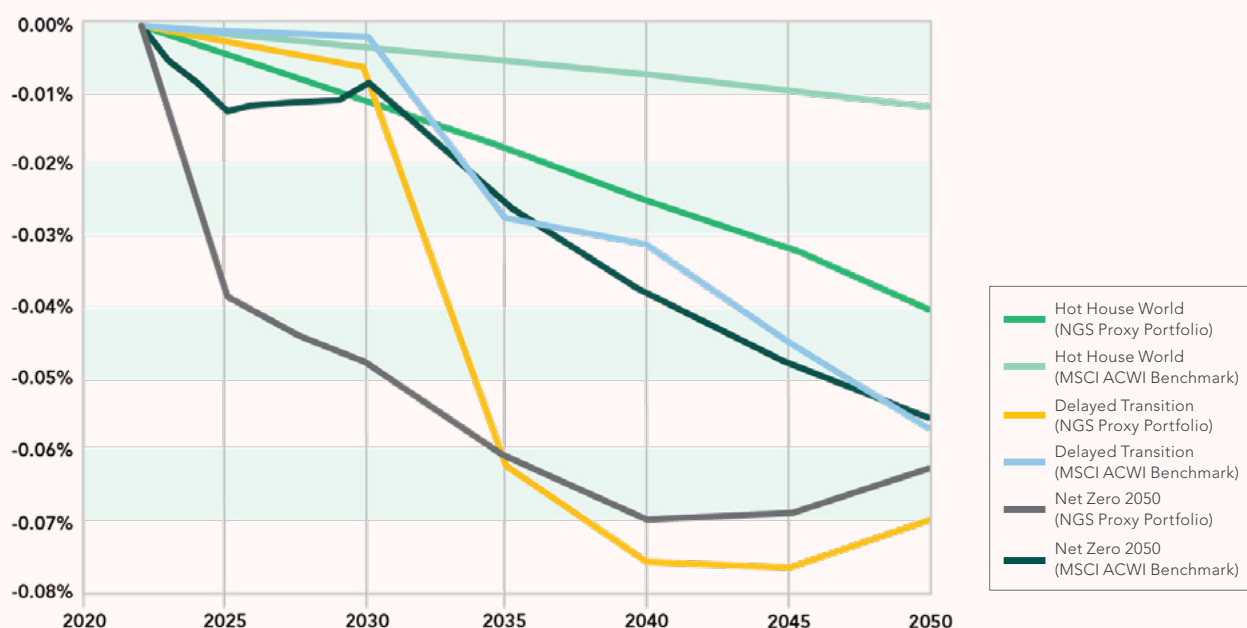


Figure 10: Expected yearly impact to 2050: Property proxy vs MSCI ACWI

Figure 10 shows that real estate assets are more prone to climate risk (compared to the international equity benchmark), especially from the physical side which is economically modelled via an increase in insurance premiums. From the transition side, a carbon cost from energy use would negatively impact valuations, especially under a Net Zero 2050 scenario. It is important to note that this is based on listed proxies which may not be a direct reflection of our portfolio.

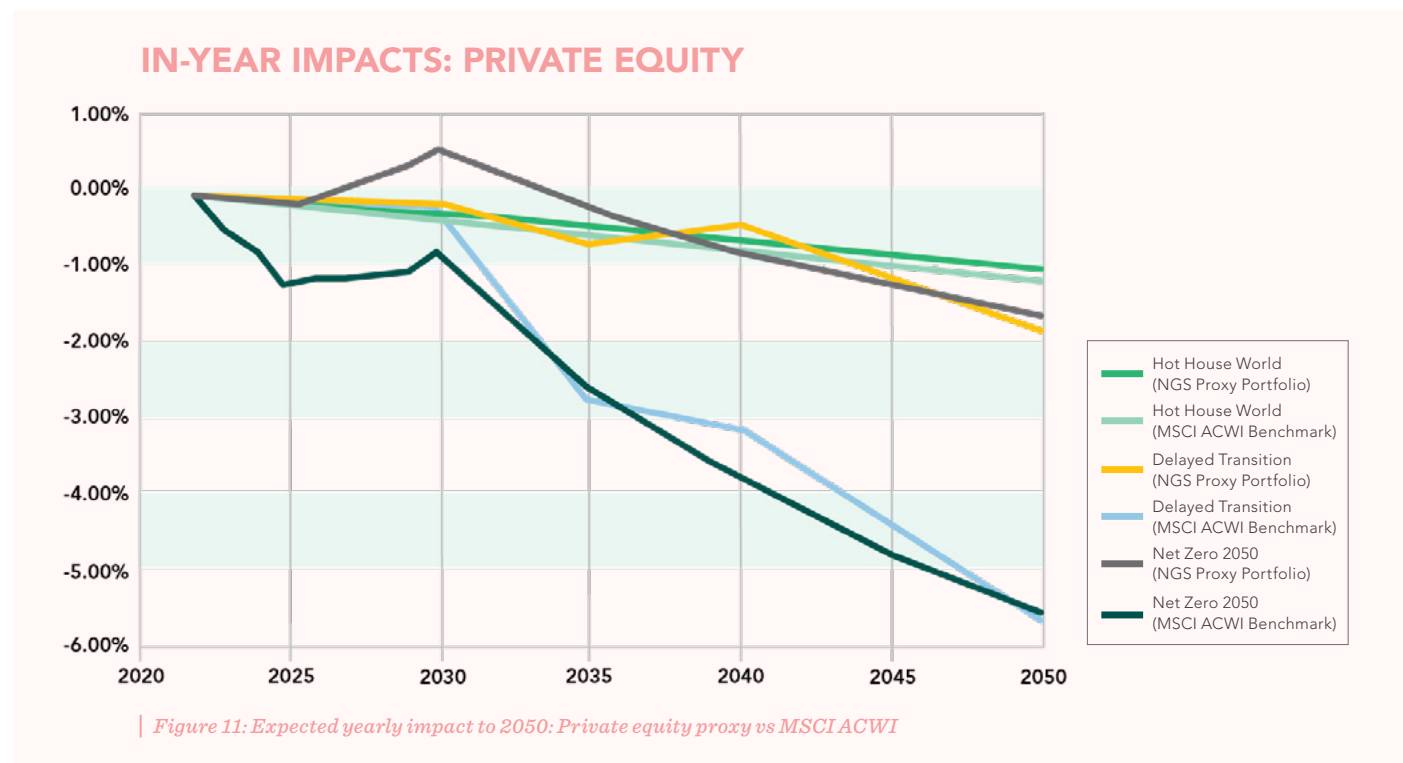


Figure 11 shows that private equity assets are minimally affected by climate change (compared to the international equity benchmark), as most of the private equity assets are exposed to the technology and healthcare sectors.

2.5.2 PHYSICAL RISK SPOTLIGHT (INFRASTRUCTURE)

In 2021, NGS Super commissioned a team of climate data scientists to assess high-level exposure to multiple hazards as well as vulnerability to physical risk for all infrastructure assets. The physical scenario analysis within this section was completed in 2021.¹² Our physical risk assessments are also aligned with these scenarios but are compared across fewer timesteps (2030 and 2050) relative to our transition risk assessments (2030, 2040 and 2050). This is because the 3 scenarios diverge very quickly in terms of transition impacts, but scenario differences in physical impacts take longer to meaningfully materialise. Exposure refers to whether a physical hazard is present at the specific locations of an asset and is assessed based on asset location and climate models. Vulnerability is defined as whether a physical hazard would impact the asset and is determined in this case based on a general understanding of business activities within a sector (rather than asset-specific activities).

Our scenario analysis found that the oil and gas, marine logistics, and airports sectors face higher risk exposure should society move quickly to decarbonise. Several of our airport assets also face growing disruptions from physical climate impacts, particularly from riverine flooding and extreme precipitation.

We also found that in some scenarios, and for some assets, climate impacts can create competitive advantages or new value pools for the Fund and its investments. For example, renewable energy and district heating investments are expected to benefit from aggressive climate transitions relative to a business-as-usual scenario as carbon emissions are regulated and/or priced.

12. The physical risk analysis completed in 2021 was bespoke consultancy work. As the portfolio has not changed materially since that time, we continue to rely on this analysis. We will be looking to reassess this position in 2023.

Over the next few years, NGS Super plans to work with our managers to better understand each of their assets' vulnerability to climate risks, and how best to mitigate these risks at the asset and portfolio level, as well as identify emerging value pools under climate transitions.

A high-level heatmap of this analysis is provided in **Figure 12**. Combining exposure and vulnerability showed a significant increase in risk when comparing 2030 (equal for all scenarios) and 2050 (relevant for scenarios "Delayed Transition" and "Hot House World"), commensurate with the increasing physical risk in the absence of a swift transition.

The analysis considered the following physical hazards:

- 1. Water stress**, a widespread problem that occurs when water withdrawals exceed supply and replenishment. The analysis accounts for climatic and socioeconomic factors to determine the balances between baseline and future supply and withdrawals.
- 2. Riverine flooding**, which can disrupt travel and supply chains, damage homes and infrastructure, and potentially lead to fatalities in extreme cases, due to drowning and other higher-order impacts such as contamination of drinking water sources.
- 3. Extreme precipitation**, which can cause urban flooding, excessive runoff, and infrastructure damage.
- 4. Cooling degree days** — as the climate warms, the amount of energy needed to keep buildings as a "liveable" temperature is likely to increase, leading to potential increases in assets' operational costs and capital expenditure.
- 5. Extreme heat**, which can cause droughts, loss of productivity, and health issues under certain conditions.

SECTOR	VULNERABILITY ¹	EXPOSURE		RISK x VULNERABILITY	
		2030	2050	2030	2050
AIRPORTS	3				
MARINE LOGISTICS	1.14				
FOSSIL ENERGY	1.06				
ELECTRIC TRANSMISSIONS	-				
HEALTHCARE	4				
REAL ESTATE	0				
RENEWABLES	3.10				
TELECOMMUNICATIONS	0				
WATER UTILITIES	2.67				
FERRIES	1				
DISTRICT HEATING	2.09				

Figure 12: Heatmap of physical risk to NGS assets

¹ Indicates to how many of the 5 assessed physical hazards this asset's location is exposed.

Among the 5 hazards considered, riverine flooding and extreme precipitation were found to create the most significant exposure to NGS Super's assets. Extreme precipitation in Australia, for example, where many of NGS Super's infrastructure investments are located, may see an increase of up to 15% in 2030¹³, as illustrated in [Figure 13](#). While most assets are vulnerable to 2 or 3 of the assessed hazards, some assets stood out as vulnerable to all or most of the 5 hazards, in some cases through second-order impacts. Water stress is also highly relevant to many of our assets and projected to affect several regions (see [Figure 12](#)) relevant to our portfolio.

A meaningful portion of our portfolio — 8 out of 40 analysed — also showed limited impact from physical risks, including within the fossil energy, marine logistics and telecommunications sectors.



13. As detailed in the "Climate scenarios" section of this report, physical impacts in 2030 are comparable for all 3 scenarios, and physical impacts in 2050 are comparable for the scenarios "Delayed Transition" and "Hothouse world". The physical risk assessment therefore compares 2030 impacts (which are the same for all 3 scenarios) to 2050 impacts for the 2 scenarios "Delayed Transition" and "Hothouse world".

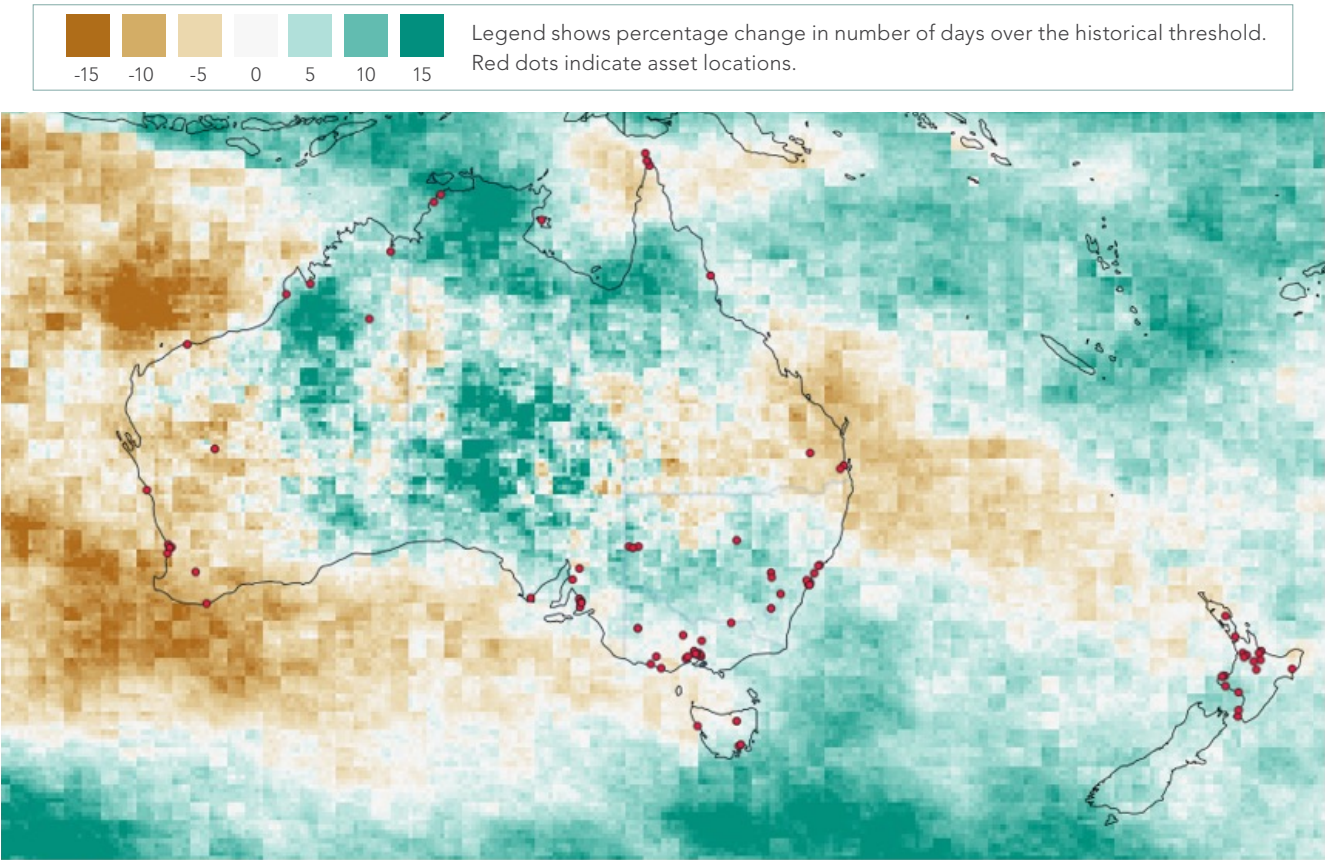


Figure 13: Projected change in frequency of extreme precipitation days in 2030 for Australia



Figure 14: Riverine flooding by 2030 in the US Midwest

14. Defined as days with levels of precipitation exceeding 95% of all other days at that location.

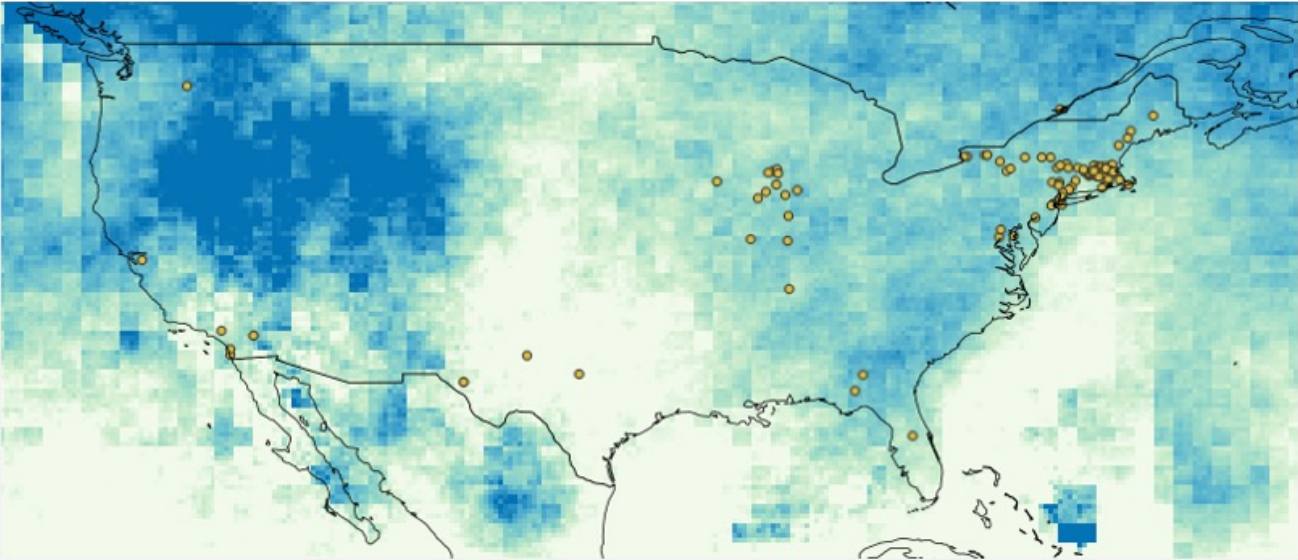
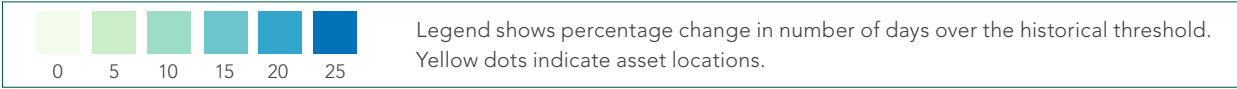


Figure 15: 2050¹⁵ exposure to extreme precipitation for select US assets

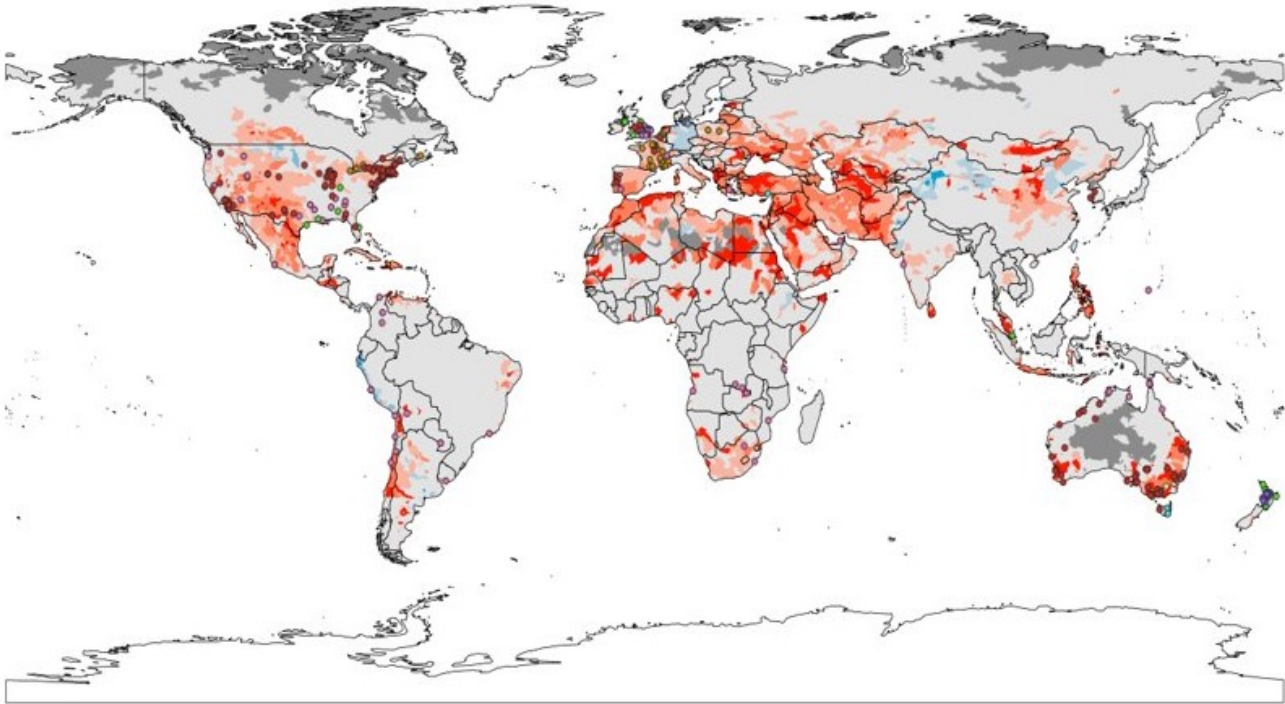
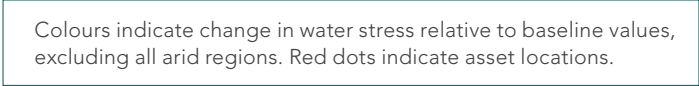


Figure 16: Water stress for 2040, overlaid with asset locations

15. As discussed earlier, 2030 impacts are comparable for all 3 scenarios, while 2050 impacts apply to the scenarios “Delayed Transition” and “Hothouse world”.

2.6 WHAT THIS MEANS FOR NGS SUPER

The results of the 2021 scenario analysis have provided a deeper understanding of individual asset and sector value destruction under the various climate scenarios. This knowledge in turn informs the decisions on our long-term and interim targets as outlined in this report.

In addition, while we transition and make changes to the investment portfolio in the pursuit of our targets, the results of this scenario analysis will inform the Fund's engagement activities with current IMs and potential new opportunities and partnerships with IMs. It will also assist in monitoring the readiness of the Fund's investments to transition to the low-carbon economy.

This work also highlights investment opportunities in the renewables, technology, minerals and metals required for the green energy transition and health care sectors, providing opportunity to build resilience within our investment portfolio.

2.7 PROGRESS SINCE OUR LAST DISCLOSURE

2.7.1 REASSESS SCENARIO ANALYSIS

Our 2021 TCFD report included our first scenario analysis of transitional and physical risks within our equities (listed) and infrastructure (unlisted). This year we reassessed the transitional and physical risk assessment within equities using updated scenario analysis, contained in this report. We also internally reviewed the physical and transitional risks of property as an asset class using listed proxy data (not NGS Super-specific data) to begin to understand the risks facing the asset class. We also re-reviewed the 2021 transitional and physical risk analysis, also included in this report.

2.7.2 FORMALLY INCORPORATE CLIMATE RISK INTO THE FUND'S OVERALL BUSINESS PLANNING

In 2022 we formally introduced climate risk and opportunity into the overarching NGS strategic plan. NGS Super is committed to an ESG-led investment strategy with a key part of this strategy being to take a leading position in responding to climate change.

The Trustee office is also committed to continuing to support the existing **Climate Active** carbon-neutral operations and our ESG-focused investment strategy. Formal planning of operational ESG initiatives will be documented internally.

2.7.3 REVIEW THE FUND EXCLUSIONS

Effective 1 July 2022 we completed a review of the Fund's exclusion policy. This review resulted in the amendment of all 3 of the Fund's exclusions relating to tobacco, controversial weapons and thermal coal, providing more clarity and specifics on what we intend to exclude and how we are effecting these exclusions. Providing this transparency to members was important to the Fund. The revised exclusions can be found in our **Responsible Investment Policy**. Specific to climate, we enhanced the thermal coal exclusion to a more robust fossil fuels exclusion that considers exclusions of not only thermal coal but also oil and gas exploration and production, covering all the 3 major forms of fossil fuels.

NGS SUPER'S FOSSIL FUELS EXCLUSION

We restrict holdings with companies:

- that generate more than 30% of their revenue from the distribution, power generation, or extraction of thermal coal
- who are in the oil and gas production and exploration sector.

Please refer to the **Responsible Investment Policy** for more details on this exclusion.

2.8 LOOKING AHEAD

2.8.1 CONTINUED COMMITMENT TO CN2030 AND SCENARIO ANALYSIS

We will continue to evaluate climate risks and opportunities within the Fund's investment portfolio via the ongoing work required by the CN2030 project. Each year, we will assess the Fund's carbon intensity (scope 1, 2 and, where possible, 3). In doing this we will also monitor the carbon intensity of the portfolios of each individual IM. This, along with continual review of the scenario analysis, will inform the risks and opportunities open to the Fund for consideration within the Fund's overarching investment strategy. This information will be key to tracking the Fund's progress towards our interim and end carbon-neutral target (see the Metrics and Targets section of this report).

We are also investigating ways to broaden our scenario analysis capabilities to allow for more frequent, internally commissioned scenario analysis for the infrastructure and property sectors.



CONTRIBUTING TO STRATEGY AT A SECTORAL LEVEL

NGS Super is a signatory to the Principles for Responsible Investment (PRI). As a signatory, we are committed to contributing to a more sustainable global financial system that is aligned with broader ESG objectives. We are also members of the Responsible Investment Association Australasia (RIAA), who encourage government policies and investment practices that address the risks and opportunities of climate change. Through these partnerships we are committed to establishing best practice for factoring climate-related risks and opportunities into investment strategies.

3.0 RISK MANAGEMENT

Risk is managed by the Fund's Risk Management Framework. In addition, we use our Active Ownership and Engagement Policy to shape our engagement with climate-related issues within our broader sphere of influence.



3.1 RISK MANAGEMENT FRAMEWORK

The processes for identifying, assessing, mitigating and monitoring material risks are governed by our Risk Management Framework.

Possible risk events are identified by senior management and the Trustee during the strategic planning process. Drawing upon our team's experience and using insights from external sources, we consider the likelihood of a risk eventuating and the severity of its consequences both before and after applying mitigation actions. Material risks are monitored and reviewed on a continual basis, with a formal review undertaken at least annually. Senior managers monitor climate-related risks on a quarterly basis and any elevation in risk is escalated to the Trustee. Our risk assessment is currently focused on ensuring climate-related issues are included in our governance, management and strategic processes.

3.1.1 ENGAGING WITH OUR INVESTMENT MANAGERS

Our due diligence processes for new IMs includes an evaluation of their ESG positioning and values-alignment. In 2022 we enhanced this process to be asset class specific and independent of the front office Investments team. The result of ESG due diligence is reported to the Trustee when making recommendations to appoint IMs, along with the results of investment due diligence. This is especially important as NGS Super directly selects IMs, not stocks or specific investments. We follow this with questionnaires covering ESG matters, issued twice a year, and regular portfolio review meetings to ensure an ongoing dialogue with our IMs.

3.2 ACTIVE OWNERSHIP AND ENGAGEMENT

NGS Super has an active ownership obligation under the [*UN Principles for Responsible Investment*](#). With our [*Active Ownership and Engagement Policy*](#) as our framework, we use the United Nations Sustainable Development Goals (SDGs) to focus our objectives. This is one of the reasons we measure our contribution to the SDGs, discussed further under Metrics and Targets on [*page 31*](#).



WHAT ARE THE SDGs?

The 17 United Nations SDGs aim to ensure a more sustainable future for all people globally. The UN has called on all signatory countries to commit to the bid to overcome poverty, inequality, the climate crisis and environmental degradation, and improve prosperity, peace and justice.

SPOTLIGHT ON SDG 13 – CLIMATE ACTION

As at 30 June 2022, when reviewing our Australian and international dollar holdings our investment contribution and detractor from the achievement of SDG 13 'Climate Action' is as follows (amounts are in Australian dollars).

	APPROXIMATE AMOUNT INVESTED IN COMPANIES DEEMED TO BE ALIGNED / STRONGLY ALIGNED TO THE ACHIEVEMENT OF SDG 13 (AS DEFINED BY MSCI)	APPROXIMATE AMOUNT INVESTED IN COMPANIES DEEMED TO BE MISALIGNED / STRONGLY MISALIGNED TO THE ACHIEVEMENT OF SDG 13 (AS DEFINED BY MSCI)	NET ALIGNMENT
NGS Super Australian and International equities	\$52 million	(\$441 million)	(\$389 million)
50/50 ASX300 and MSCI ACWI	\$73 million	(\$800 million)	(\$727 million)

For SDG 13 our negative contribution is 46% lower than the benchmark.

3.3 ENGAGING WITH OUR INVESTMENT COMPANIES

NGS Super has a variety of ways of responding to issues, regardless of whether these fall within or outside of our investment objectives.

DIRECT ENGAGEMENT	COLLABORATIVE ENGAGEMENT	INVESTMENT MANAGER ENGAGEMENT	SPECIALIST EXTERNAL ENGAGEMENT
Our staff engage on a specific issue/matter with our investment managers or the management of companies in which we are invested.	Completed with other like-minded investors and/or stakeholders to enable unified communication on particular issues or matters.	A result of the Fund empowering our appointed IMs to engage with companies on the Fund's behalf.	Conducted by service providers like the Australian Council of Superannuation Investors (ACSI), Hermes EOS or Glass Lewis on NGS Super's behalf. This usually occurs where they have a mandate or direction to engage with companies on the Fund's behalf.

3.4 PROXY VOTING

At NGS Super, we rely on proxy voting through Glass Lewis. While Glass Lewis has the delegated authority to cast all our proxy voting, we have access to the proxy voting portal so the internal Investments team can review and, if necessary, amend the Glass Lewis voting recommendations prior to the voting deadline. We have instructed Glass Lewis to apply an additional ESG policy overlay that is aligned with our active ownership objectives when making recommendations on proxy voting. We publish our real-time interactive proxy voting history, including the name of the company, the meeting date, country where the vote took place, the nature of the resolutions and how the Fund voted on our website.

Under our proxy voting policy, we are likely to vote in favour of proposals that:

- ✓ Increase sustainability reporting and disclosure
- ✓ Increase disclosure of environmental risk
- ✓ Develop greenhouse gas emissions reduction goals, recycling programs and other proactive means to manage environmental footprints
- ✓ Disclose or adopt policies for guidelines that relate to the mitigation of climate change related risks
- ✓ Consider energy efficiency and renewable energy sources in project development or overall business strategy.

When voting on director elections we also consider ESG disclosure and sustainable business practices.

“In FY 21/22 we voted in line with our Responsible Investment Policy 99.9% of the time.”



The Fund also partners with specialist external providers such as ACSI and Hermes EOS to collectively advocate on behalf of members and influence laws, standards, regulation or guidelines both in Australia and overseas.

3.5 PROGRESS SINCE OUR LAST DISCLOSURE

3.5.1 COMPLETE CLIMATE RISK AND OPPORTUNITY ASSESSMENT FOR NGS SUPER PTY LTD

Over the course of 2022 and into 2023, formal consideration of climate risk has been undertaken at the Trustee office level. The outcomes will be incorporated into the reviewed Risk Management Framework which is set to be finalised in the first half of 2023.

3.5.2 REVIEW VOTING FRAMEWORKS

The Fund annually reviews our approach to proxy voting and the policy which we apply to ensure we are voting in line with our goals and intentions as an active owner. The review in 2022 confirmed there was no material change required to our proxy voting framework or overarching policy applied.

3.5.3 PRIORITISE COMPANIES FOR ENGAGEMENT BASED ON CLIMATE RISK

In 2022 the Fund created 2 new internal committees who are responsible for prioritising and implementing engagement. These are the Liquid Assets Engagement Committee (LAEC) and the Unlisted Assets Engagement Committee (UAEC). When these committees meet to prioritise engagement priorities and objectives, climate is a key pillar of consideration. Specifically, we consider engagement with companies and/or assets we hold that have high scope 1 and/or 2 emissions and/or are displaying at risk transitional and/or physical scenario analysis results. The goal of these engagements is to understand their climate transition action plan to transition to the low-carbon economy while protecting investor or shareholder value.

3.6 LOOKING AHEAD

3.6.1 REVIEW ENGAGEMENT PRIORITIES AND ASSESS PROGRESS OF ENGAGEMENT

Towards the end of 2023, the effectiveness of the engagement process and progress of the LAEC and UAEC will be assessed and, if necessary, amended to ensure efficacy of understanding and mitigating climate risk as well as capitalising on climate opportunities.



4.0 METRICS AND TARGETS



4.1 CARBON NEUTRAL BY 2030

As a result of the extensive work completed in 2021 in the CN2030 project, the Fund has set a target to deliver a **carbon-neutral investment portfolio¹⁶ by 2030**. In 2022, we also set an **interim target of 35% less scope 1 and 2 carbon emissions on 2021 levels by 2025**.

“We seek to achieve these goals through a combination of engagement, divestment and investing in carbon positive investments.”

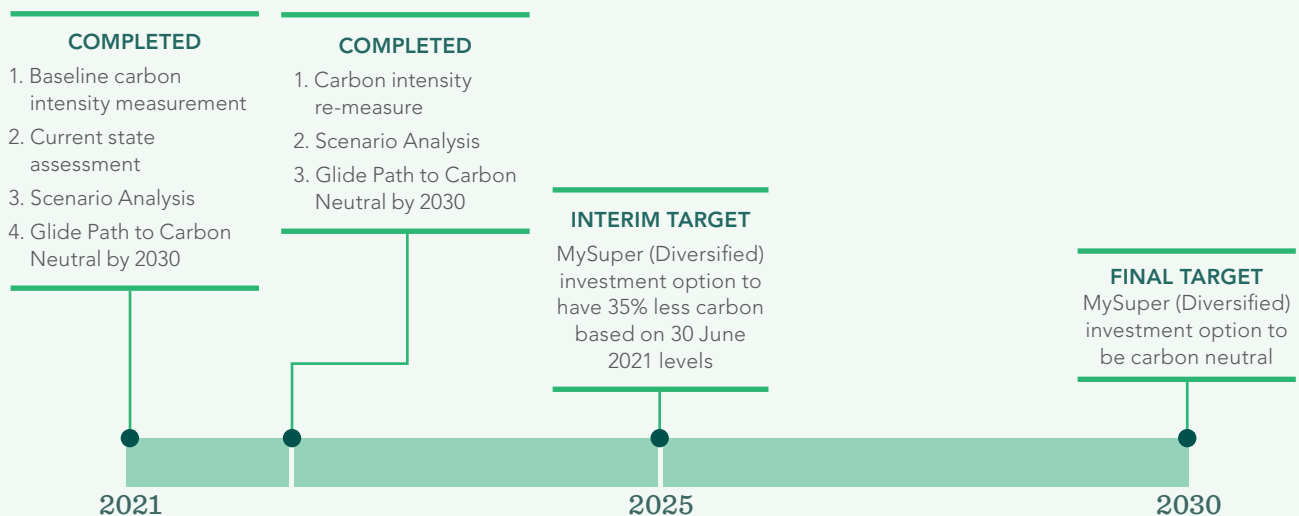


Figure 17: NGS Super decarbonisation roadmap

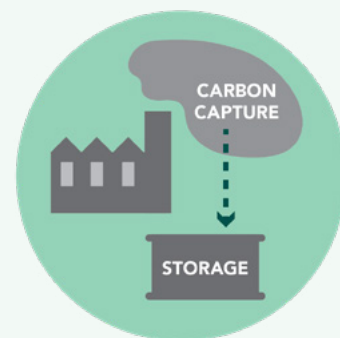
A COMBINATION OF THE FOLLOWING WILL BE USED:



ENGAGEMENT



DIVESTMENT



INVESTING IN CARBON POSITIVE INVESTMENTS

Figure 18: NGS Super decarbonisation levers

Each year, we will report on our progress towards our goal. You can read more about the CN2030 project, activities and outcomes [here](#).

16. At the Diversified (MySuper) investment option level.

4.2 MEASURING THE CARBON INTENSITY OF OUR PORTFOLIO¹⁷

In 2021 we measured the carbon intensity of our entire portfolio for the first time. Prior to this we had only measured the carbon intensity of our Australian and International shares portfolios. This measurement was imperative to us setting our carbon-neutral target of 2030 and interim target of 2025.

4.2.1 EXPLAINING OUR CARBON INTENSITY MEASURE

This is a measure of the amount of greenhouse gases released into the atmosphere per dollars invested in companies in which the Fund invests.

We acknowledge that the data available to measure carbon emissions is not perfect and it is an evolving area. Estimates, proxies and assumptions across asset classes are required to arrive at a carbon intensity figure that is representative of the portfolio. You can read more about how we calculate the carbon in our portfolio [here](#).



17. Throughout this section 'our portfolio' refers to the Diversified (MySuper) investment option.

Sector	Assets under management assessed (\$ million)	Total emissions (tCO ₂ e/year) ⁵	Emissions intensity (tCO ₂ e / \$ million invested) ⁶	Dynamic Asset Allocation (DAA) of Diversified (MySuper) at 30 June 2022	Emissions intensity multiplied by DAA
Australian shares ¹	3,039	247,648	80.7	26%	20.98
International shares ¹	3,361	76,674	22.8	28%	6.38
Property ²	1,413	11,648	7	10.6% ⁸	0.74
Infrastructure ²	1,305	77,908	59.7	9.55%	5.7
Private assets ³	953	18,585	19.5	7.60%	1.48
Bond alternatives ³	918	27,457	29.9	7.30%	2.18
Corporate bonds ¹	362	6,122	16.9	2.15%	0.36
Other ⁴	1,585	0	0	8.80%	0
Total	12,936	466,042			37.8⁷

Figure 19: Carbon intensity of NGS Super Diversified (MySuper) investment option

Notes to Figure 19

1. Based on internal analysis assisted by MSCI.
2. Based on manager surveys and where answers not provided, an estimate based on the type of asset. Estimates were derived from either an average of the survey responses from comparable assets (where adequate data was received) or a proxy from listed markets (MSCI).
3. Based on listed sector proxies from assets assessed in the South Pole "NGS Super financed emissions" report dated 29 October 2021 are used. Updates were made to the total emissions figure to reflect the size of the sector.
4. Other includes all other remaining sectors.
5. By value. Based on actuals and estimations (where required).
6. Emissions intensity calculations based on the enterprise value of assets held.
7. The total emissions intensity figure is estimated for the Diversified (My Super) option based on the dynamic asset allocation (DAA) as at 30 June 2022.
8. This includes Property and Property Growth.

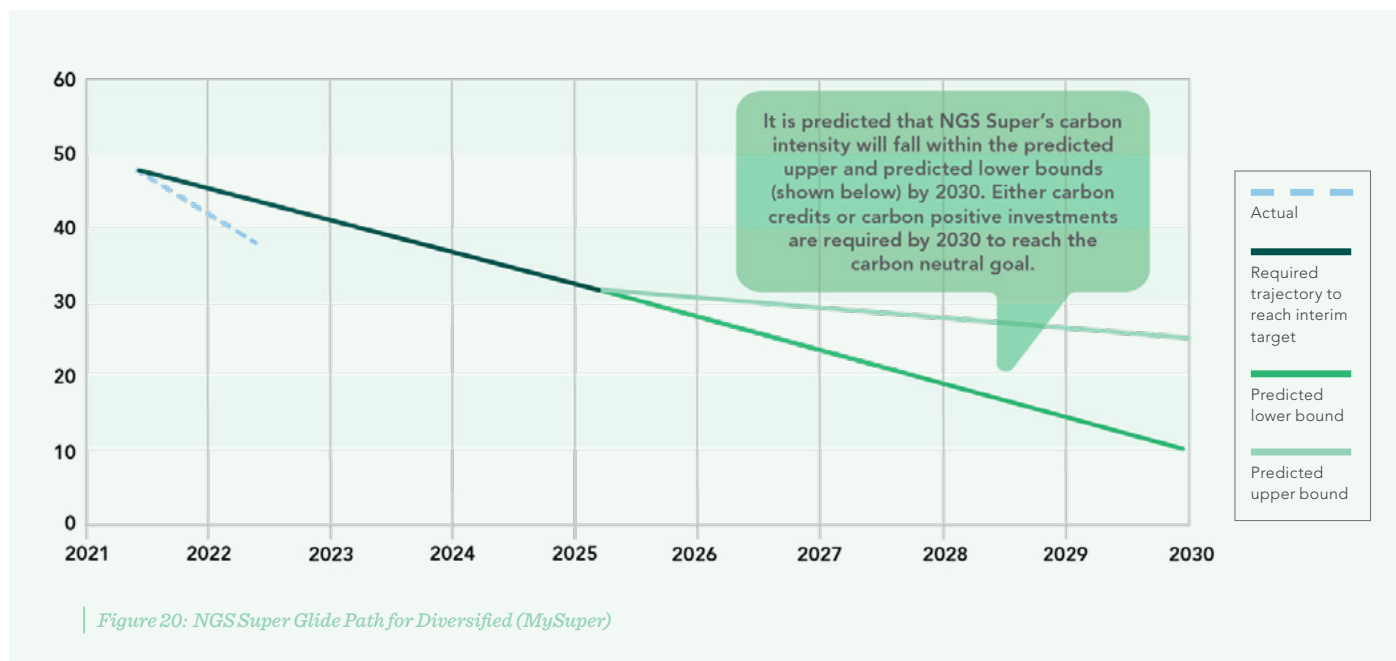
Interpretation guidance

1. All sectors in the whole fund (column 1).
2. The total assets under management by sector for the whole fund (column 2).
3. Scope 1 and 2 emissions for each sector (column 3).
4. Scope 1 and 2 carbon intensity for each sector (column 4).
5. Dynamic asset allocation (DAA) for each sector applicable for the Diversified (MySuper) investment option as at 30 June 2022 (column 5).
6. Emissions intensity (column 4) multiplied by DAA of each sector (column 5) equals (column 6).

Understanding our investment portfolio's carbon intensity provides us with valuable information to better analyse the resilience of the companies we invest in. Having a baseline measurement of carbon intensity is imperative to measure progress towards our interim target (2025) and end target (2030). Information about the carbon intensity of each of our IMs also provides valuable engagement opportunities.

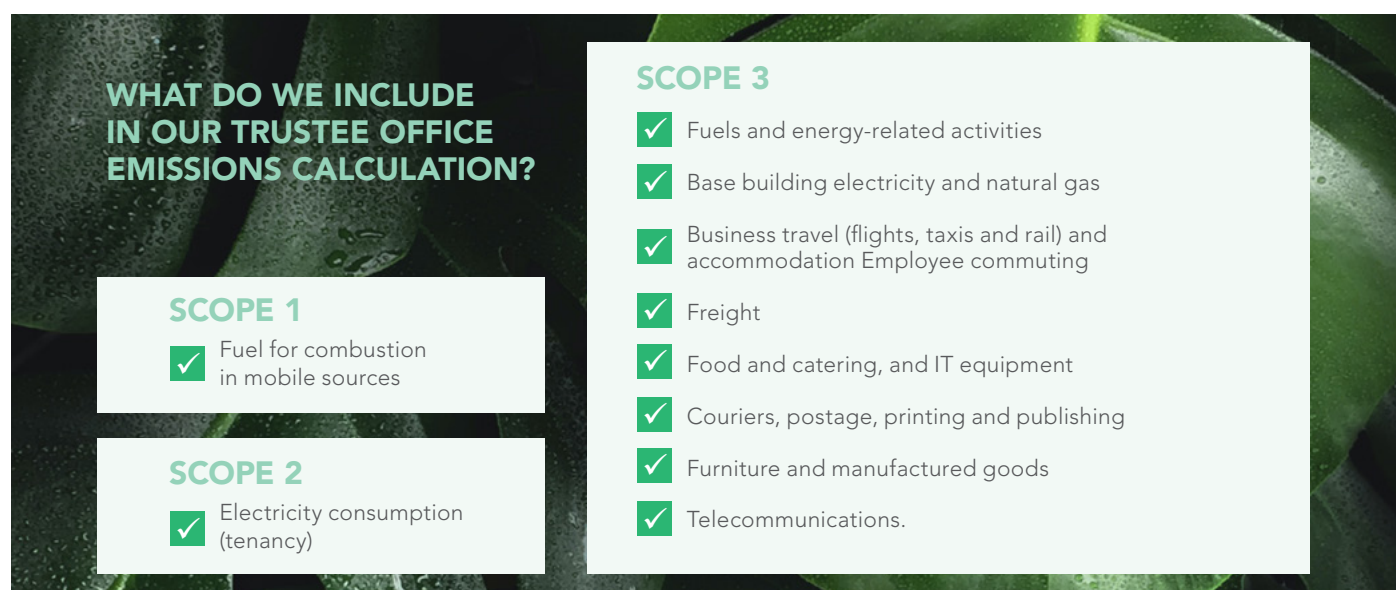
4.3 HOW WE ARE TRACKING TOWARDS OUR INTERIM 2025 AND END 2030 TARGETS

The emissions intensity for the Diversified (My Super) option for 2022 is approximately 38 tCO₂e/\$AU million invested. The 30 June 2021 figure was approximately 48 tCO₂e/\$AU million invested. That equates to an approximate 20% reduction in carbon intensity from 30 June 2021 to 30 June 2022.

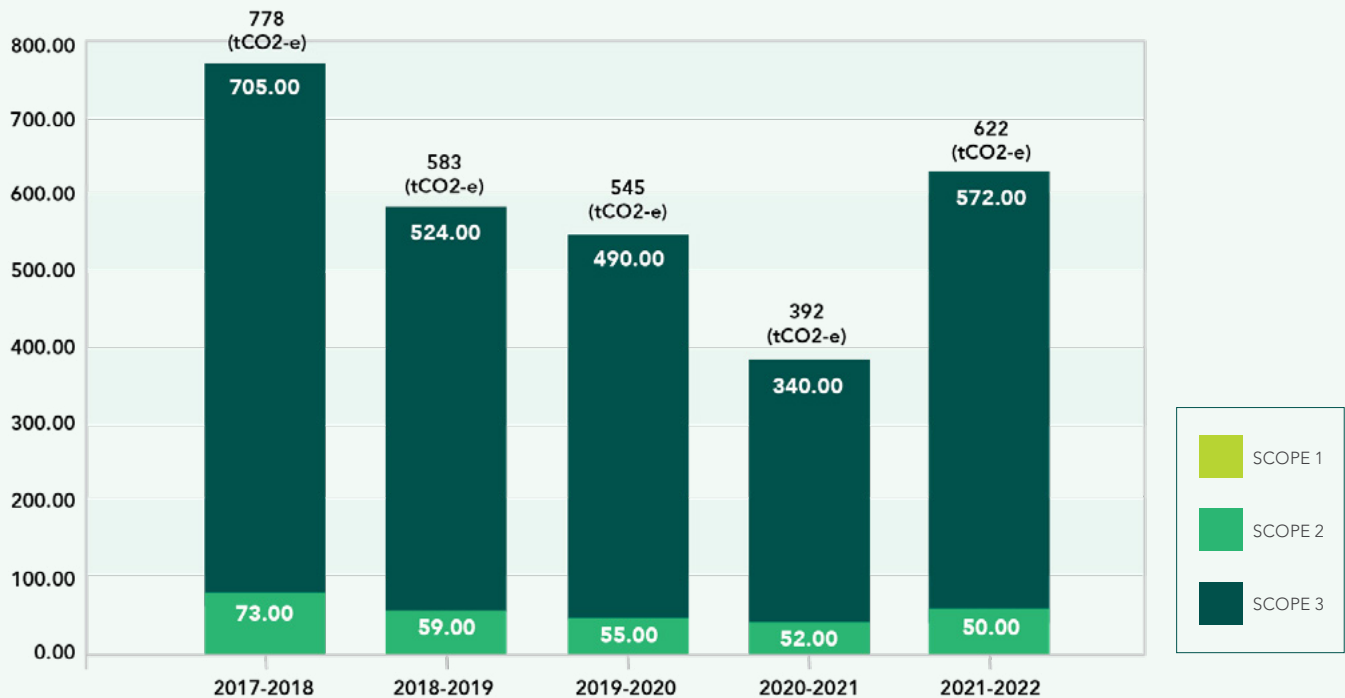


4.4 NGS SUPER IS CARBON NEUTRAL CERTIFIED

Shifting the focus from our investment portfolio to our operations, NGS Super is carbon neutral under the Climate Active certification. We include all direct (scope 1) and indirect (scope 2) emissions sources in our greenhouse gas emissions inventory. We also include a selection of emissions sources that result indirectly from the operations of our business (scope 3). Our emissions for FY18 to FY22 are shown in [Figure 21](#).



Some changes to the interpretations applied in relation to emissions scopes have occurred over the years and thus some reclassifications have been made for comparability. There have been no changes to total emissions reported.



	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Scope 1	0	0	0	0	0
Scope 2	73	59	55	52	50
Scope 3	705	524	490	340	572
Total (tCO2-e)	778	583	545	392	622
Emissions per employee	17	9	8	5	8

Figure 21: NGS Super emissions footprint

We also reduce our emissions by incorporating the following into our everyday practices:

- ✓ reducing air travel and using video/teleconference instead of flying
- ✓ leasing hybrid cars for road staff, we aim to upgrade our cars every 4 years to follow technology improvements
- ✓ encouraging staff to car-pool when travelling for business engagements
- ✓ focusing on purchasing sustainably produced and responsibly sourced items.

4.5 PROGRESS SINCE OUR LAST REPORT

4.5.1 Climate-related targets

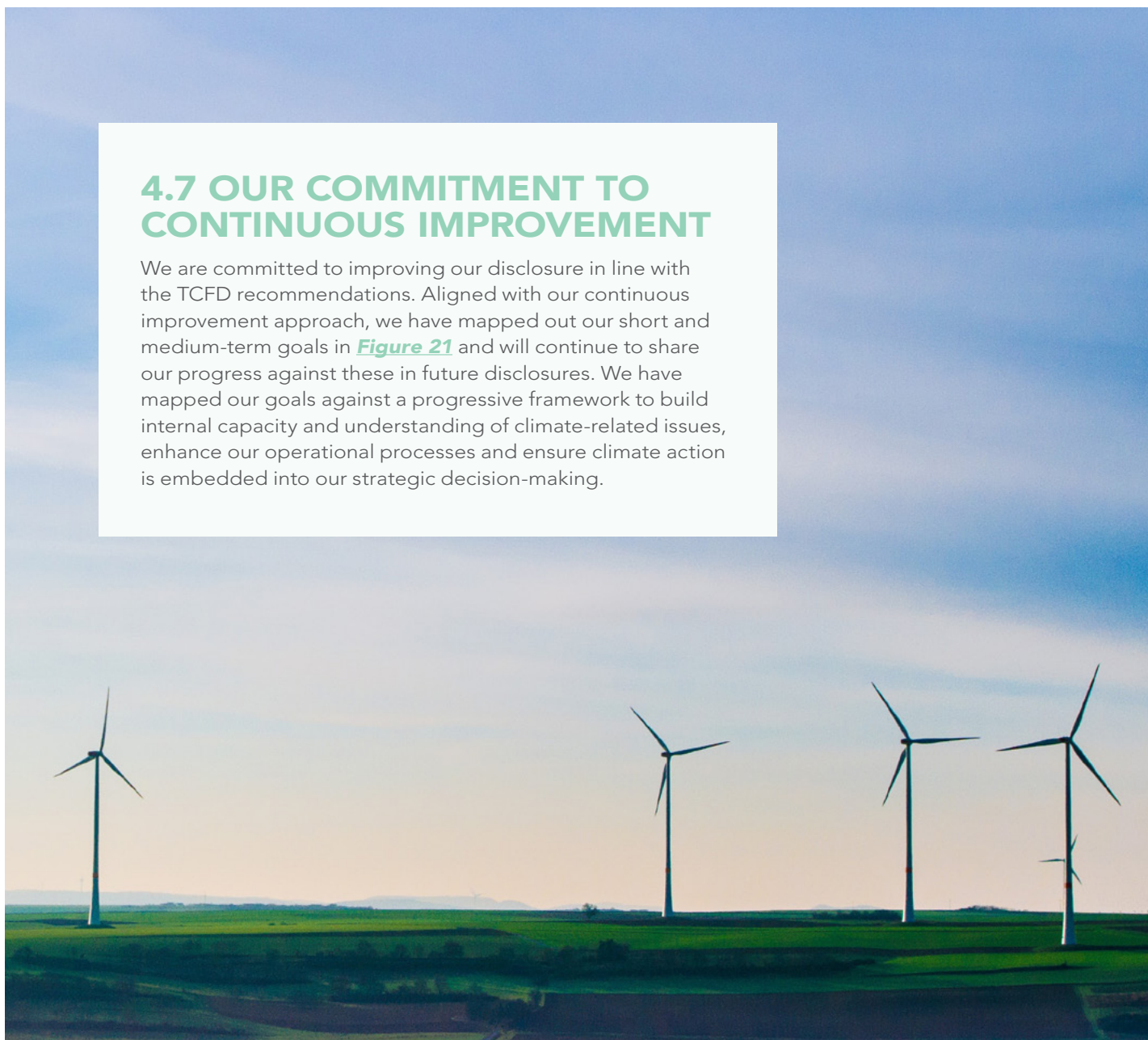
The Investments team will continue to work towards the 2025 interim and 2030 targets as outlined within this report.

4.6 LOOKING AHEAD

We will continue to measure and report our performance against the metrics we have presented in this report. While we will continue to be a carbon-neutral business, the Trustee office is working on formalising an emissions reduction strategy. We recognise that the most significant way we can positively influence climate-related action is through our investment holdings and we are committed to progressing towards our interim and end targets as stated in this report.

4.7 OUR COMMITMENT TO CONTINUOUS IMPROVEMENT

We are committed to improving our disclosure in line with the TCFD recommendations. Aligned with our continuous improvement approach, we have mapped out our short and medium-term goals in [Figure 21](#) and will continue to share our progress against these in future disclosures. We have mapped our goals against a progressive framework to build internal capacity and understanding of climate-related issues, enhance our operational processes and ensure climate action is embedded into our strategic decision-making.



TCFD recommendation	Year 3 ¹⁸	Ongoing
Governance	<ul style="list-style-type: none"> ▪ Ongoing review and update of structures and policies considering other recommendation outcomes. ▪ Implement an enhanced process to monitor the ESG posture of our investment managers on a rolling annual basis. 	<ul style="list-style-type: none"> ▪ Assign climate-related KPIs.
Strategy	<ul style="list-style-type: none"> ▪ Re-assess scenario analysis and re-evaluate key findings (risks and opportunities) building them into investment strategy. ▪ Look to broaden scenario analysis capabilities to allow for more frequent internal review of the property and infrastructure sectors. 	<ul style="list-style-type: none"> ▪ Embed climate risk into Fund strategy, strategic policy development and the selection of the investment portfolio.
Risk management	<ul style="list-style-type: none"> ▪ Review engagement priorities and assess progress of engagement. 	<ul style="list-style-type: none"> ▪ Deepen stakeholder engagement including consideration of climate targets for investee companies. ▪ Ongoing review and update of structures and policies.
Metrics and targets	<ul style="list-style-type: none"> ▪ Based on outcomes from other recommendations, set relevant climate-related metrics e.g. avoid emissions, green/brown measures, and high and low carbon company case studies. ▪ By the end of year 3, relevant targets should be in place. 	<ul style="list-style-type: none"> ▪ Ongoing measurement of performance.

Figure 22: Action plan: NGS Super's progressive implementation of the TCFD recommendations



18. Period ending 31 December 2023.

5.0 APPENDIX



5.1 APPENDIX A - SCENARIO ANALYSIS METHODOLOGIES

Australian shares, international shares, infrastructure (listed proxy), property (listed proxy) and private equity (listed proxy)

NGS Super's analysis of listed assets uses a 4-step framework that translates climate scenario inputs into financial impacts:¹⁹

- 1. Scenario pathways:** NGFS scenarios provide the economic, energy system and climate variables needed for the subsequent steps in the modelling process. The timeframe modelled is from 2022 to 2050.
- 2. Economic shocks:** This component of the model translates transition and physical outputs from the scenario pathways into real economic shocks, which can be divided into 2 types: direct and indirect. Direct shocks are those that inflict immediate costs on companies, such as carbon costs on company emissions or damages from extreme weather events. Indirect shocks affect companies' revenues through secondary channels, such as changes in demand for their products.
- 3. Asset value streams:** The asset-level modelling component calculates the impacts of transition and physical shocks on assets. The approach first identifies an asset's exposure to different types of shock: for example, a company's carbon intensity will determine the increase in carbon costs it experiences in each scenario. The next step models company response to shocks, including implementation of economically optimal abatement actions to reduce exposure to carbon costs. Finally, the model captures competition dynamics such as reallocation of market share, firm exit, and cost pass-through to consumers. The outputs of this step are annual changes in company costs and revenues to 2050.



19. This report was derived from multiple sources, including data and analysis from Planetrics. We are solely responsible for this report's scenario selection, underlying assumptions, and underlying findings, conclusions and decisions. Planetrics is not an investment adviser and has not provided any investment advice.

The model captures the key risk channels faced by corporates for both physical and transition risks:

Risk type	Impact channel	Description of risks modelled
Transition risks	Demand destruction	Reduction in demand for carbon-intensive products (such as fossil fuels and internal combustion engine vehicles) resulting from changes in consumption patterns as the energy system decarbonises.
	Demand creation	Increase in demand for low-carbon products (such as renewable electricity, electric vehicles and metals required for low-carbon technologies) that are driven by changes in consumption patterns as the energy system decarbonises.
	Direct carbon costs	Direct carbon costs on a company's scope 1 and 2 emissions relating to its operations. Emissions intensive companies are most exposed to the increase in production costs from carbon pricing.
	Abatement	The ability of a company to reduce its emissions and mitigate carbon costs through investment in emissions reduction or zero-emission technologies.
	Competition	The ability of a company to pass through rising production costs to consumers, depending on the structure of the market and how exposed a company is to climate impacts compared to competitors.
Physical risks	Acute impacts	Rising temperatures lead to changes in severity and frequency of extreme weather events including river flood, coastal flood, tropical cyclone and European windstorms.
	Chronic impacts	Rising temperatures lead to long-term effects such as heat waves and changes in precipitation, which impact labour productivity and agricultural yields.
	Adaptation	The ability of companies to reduce exposure to physical risks by taking actions to mitigate the impacts of more extreme weather and higher temperatures, such as flood defences.

4. Financial impacts: The final modelling component consolidates annual impacts from the asset-level modelling into financial value impacts using a discounted cash flow approach.

5.1.1 INFRASTRUCTURE PHYSICAL RISK

The objective is to assess the climate physical risk exposure associated with climate change.²⁰

We used a team of data scientists to conduct a physical risk mapping of most of NGS Super's infrastructure asset investments based on their geolocation and forecast hazards (extreme precipitation, riverine flooding, water stress, heat and cooling degree days). We then evaluated the vulnerability of each asset to these physical risk hazards, and finally generated a heatmap based on a combination of physical risk exposure and vulnerability.

5.1.2 PHYSICAL RISK

To assess physical risk vulnerabilities within the portfolio, hazard values were extracted at each asset's location from a set of key climate hazards. Then these hazard values were normalised and multiplied by a vulnerability index to create a view on the materiality of physical impacts. The methodology and hazards used to derive this index are described below. The hazards prioritised in this study were:

5.1.3 WATER STRESS

Water scarcity is a widespread problem that occurs when water withdrawals exceed supply and replenishment.

This analysis accounts for climatic and socioeconomic factors to determine the balances between baseline and future supply and withdrawals.

We used water stress data from the WRI Aqueduct Water Stress Projections dataset (Luck et al., 2015), considering output from 1950–2010 (baseline), 2030 and 2040. Projections were forced by the RCP8.5 emissions scenario and the SSP2 shared socioeconomic pathway. Water stress was modelled in each of ~15,000 hydrological catchments as the ratio of water demand (in cm/year) to water supply (in cm/year).

Water demand was measured as water withdrawals from agriculture, industry and domestic households (Luck et al., 2015). Projections were based on country-level regressions of historical withdrawal estimates against GDP, population and urbanisation. Water supply was considered the available blue water (renewable surface water), calculated as the flow-accumulated runoff minus upstream consumptive use. Projections were based on runoff values extracted from an ensemble mean of 6 CMIP5 GCMs, each of which had multiple ensemble members: CCSM4, CNRM-CM5, GFDL-ESM2M, INM-CM4, MPI-ESM-LR and MRI-CGCM3 (Luck et al., 2015). Models were bias-corrected against annual runoff observations from the Global Land Data Assimilation System Version 2 (GLDAS-2; Rodell et al., 2004). Bias-correction was performed using quantile-quantile mapping, following Mason, 2008. Following WRI, we did not assess regions that were both arid and low water use, defined as less than 0.03 cm/year supply and less than 0.012 cm/year withdrawal, respectively (Luck et al., 2015).

5.1.4 COOLING DEGREE DAYS

As the climate warms, the amount of energy needed to keep buildings at a "liveable" temperature is likely to increase. To measure the amount of relative energy needed to keep a building cool during warm days, the unit of "cooling degree days" (CDDs) is used. A CDD is equal to a degree Fahrenheit above 65F. To calculate the number of CDDs in a day, the difference between the maximum temperature of the day and 65F is found. If the high temperature is less than 65F, no CDDs exist for that day. For example, if the high temperature is 75F, there are 10 CDDs that day. Over a full year, CDDs are summed to determine the amount of relative energy needed to keep a building cool that year. A normal range for CDDs in mid-latitude locations is 1000–2500.

For this analysis, the annual average number of CDDs was found for the historical, 2030 and 2050 time periods. To calculate this, an ensemble mean of 10 25-km downscaled CMIP5 models from the RCP 8.5 emissions scenario were used, developed through the NASA Earth Exchange (NEX) project: ACCESS1-0, bcc-csm1-1, BNU-ESM, CanESM2, CESM1-BGC, CNRM-CM5, GFDL-ESM2G, inmcm4, MPI-ESM-MR and NorESM1-MR. We assessed the temporal averages of 2021–2040 and 2041–2060 to be sufficient approximations of 2030 and 2050, with a baseline historical reference period spanning 1986–2005 (the historical baseline for the models that were used).

20. This report was derived from multiple sources, including data and analysis from Planetrics and Vivid Economics. We are solely responsible for this report's scenario selection, underlying assumptions and underlying findings, conclusions and decisions. Neither Planetrics nor Vivid Economics is an investment adviser and neither has provided any investment advice.

5.1.5 EXTREME PRECIPITATION

As the climate warms, the amount of energy needed to keep buildings at a “liveable” temperature is likely to increase. To measure the amount of relative energy needed to keep a building cool during warm days, the unit of “cooling degree days” (CDDs) is used. A CDD is equal to a degree Fahrenheit above 65F. To calculate the number of CDDs in a day, the difference between the maximum temperature of the day and 65F is found. If the high temperature is less than 65F, no CDDs exist for that day. For example, if the high temperature is 75F, there are 10 CDDs that day. Over a full year, CDDs are summed to determine the amount of relative energy needed to keep a building cool that year. A normal range for CDDs in mid-latitude locations is 1000–2500.

For this analysis, the annual average number of CDDs was found for the historical, 2030, and 2050 time periods. To calculate this, an ensemble mean of 10 25-km downscaled CMIP5 models from the RCP 8.5 emissions scenario were used, developed through the NASA Earth Exchange (NEX) project: ACCESS1-0, bcc-csm1-1, BNU-ESM, CanESM2, CESM1-BGC, CNRM-CM5, GFDL-ESM2G, Inmcm4, MPI-ESM-MR, and NorESM1-MR. We assessed the temporal averages of 2021–2040 and 2041–2060 to be sufficient approximations of 2030 and 2050, with a baseline historical reference period spanning 1986–2005 (the historical baseline for the models that were used).

5.1.6 EXTREME TEMPERATURE

Extreme temperatures can cause droughts, loss of productivity, and health issues under the right conditions. As the climate warms, more extremes are likely. In order to assess changes in extreme temperatures, the change in the number of days above the historical 98th percentile of daily maximum temperatures was calculated for 2030 and 2050.

To do this, an ensemble mean of 10 25-km downscaled CMIP5 models from the RCP 8.5 emissions scenario was used, developed through the NASA Earth Exchange (NEX) project: ACCESS1-0, bcc-csm1-1, BNU-ESM, CanESM2, CESM1-BGC, CNRM-CM5, GFDL-ESM2G, Inmcm4, MPI-ESM-MR and NorESM1-MR. We assessed the temporal averages of 2021–2040 and 2041–2060 to be sufficient approximations of 2030 and 2050, with a baseline historical reference period spanning 1986–2005 (the historical baseline for the models that were used).



5.1.7 RIVERINE FLOODING

Riverine floods can disrupt travel and supply chains, damage homes and infrastructure, and potentially lead to fatalities in extreme cases, due to drowning and other higher-order impacts such as contamination of drinking water sources (eg Hurley et al., 2018). As the planet warms, patterns of flood risk are likely to shift (eg O'Donnell & Thorne, 2020). This could lead to reductions in hazard in some regions and increases beyond the capacity of existing defences in others.

Data is sourced from the WRI Aqueduct Flood Hazards database. The WRI estimates flood depths associated with flooding events of varying sizes for both historical and future time periods using a variety of data sources and robust modelling approaches.

Flood depths associated with historical riverine flooding events are calculated using a global water balance model coupled with a river and floodplain routing scheme which quantifies inflows (i.e. water volumes associated with precipitation events) and outflows (i.e. evapotranspiration, streamflow, changes in storage (soil or groundwater), and water demand from human populations) into a specified area based on factors such as elevation, land surface, drainage, etc. to determine the volume of excess water that could contribute to surface flooding.

WRI uses precipitation, temperature and reference evaporation values from bias-corrected climate model outputs from 4 different Global Climate Models (GCMs; GFDL-ESM2M, HadGEM2-ES, IPSL-CM5A-LR, and NorESM1-M) participating in the Inter-sectoral Impact Model Inter-Comparison Project (ISI-MIP) as meteorological forcing input for future model runs (2010–2099).

We take the ensemble mean of the flood model outputs from each GCM-driven model run for the 1-in-100 year (1% annual probability) return period to get a flood depth for each 1-km grid cell that effectively captures the spread of potential outcomes from different climate models for each of the 3 time periods (Baseline, 2030, and 2050) under the RCP 8.5 emissions/SSP 2 development scenario.

5.1.8 HAZARD INDEX CREATION

The hazard index was created by normalising the raw hazard values based on the 2030 minimum and maximum raw hazard exposure. The data were normalised to calculate an average hazard index without weighting one hazard above the other. Averaging across the normalised hazard values for each individual asset location provides an average hazard exposure, which can be compared between asset locations, different companies or between the 2 scenarios (i.e. 2030 vs 2050). The 2050 hazard exposure data was also normalised using the 2030 values to better compare the 2 time periods, given they are normalised using the same range of exposure. Average hazard exposure is presented for all asset locations, assets and sectors analysed. The average hazard exposure is classified as mild if the normalised average is less than 0.25, as moderate if between 0.25–0.75 or severe if greater than 0.75.

REPORT

NGS SUPER TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURE 2023

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