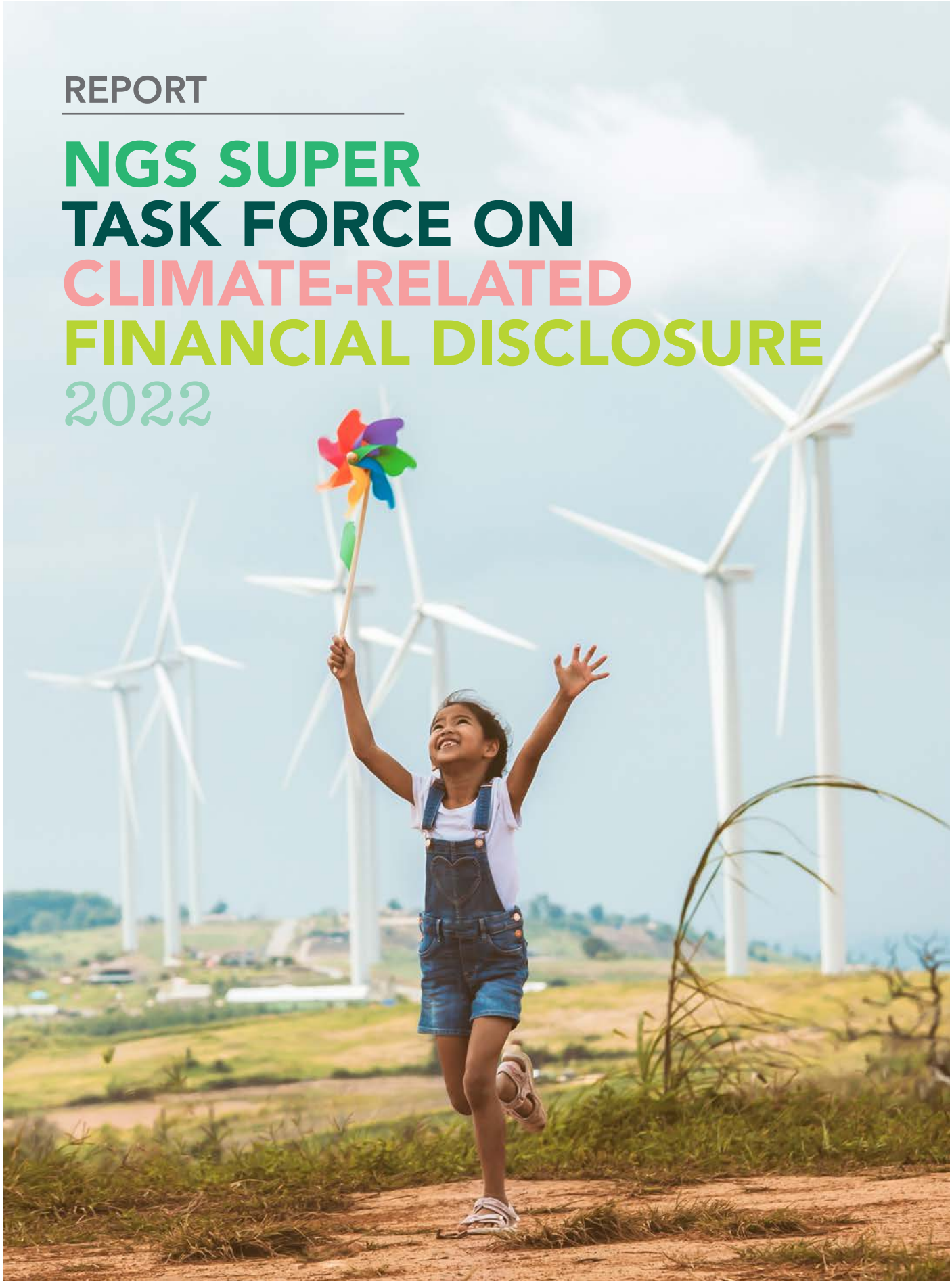
REPORT

NGS SUPER TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURE 2022



ngs Super

An Industry SuperFund

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NGS SUPER TCFD DISCLOSURE

At NGS Super we manage approximately $13.4 billion in funds on behalf of our 111,000 members. Over 30 years, we have grown to become the leading industry super fund for those in the independent education and care sectors. We represent people who care. In turn, we aspire to reflect these values in the way we run and operate the Fund.

CLIMATE-RELATED DISCLOSURE UNDER THE TASK FORCE ON 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) Task Force on Climate-related Financial Disclosure (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.

Disclose Board and executive management governance of climate related risks and opportunities

Disclose how actual and potential climate-related risks and oportunities affect strategy and financial planning

Disclose the processes used by the organisation to identify, assess and manage climate related risks

Disclose the metrics and targets used to assess and manage climate risks and opportunities

Figure 1: Four pillars of TCFD recommendations

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 second climate-related disclosure based on the TCFD framework.

In this report, we discuss our current performance against the TCFD recommendations, recognising that we are early in our TCFD journey. This report is our second evaluation of our alignment with the TCFD recommendations. We have outlined our current state of alignment with the recommendations, including the progress on our action plan[1] and, again, we have included a transparent assessment of where we need to do more to ensure complete alignment with the TCFD recommendations over time.

In line with a continuous improvement approach, we present our commitments to progressive implementation of the TCFD recommendations, with the goal of reaching full TCFD alignment in the next 2 years. Each year, we will publicly report on our progress against this plan.

1. Refer to Figure 21.

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.

> "We aspire to generate strong, long term returns for our members. This involves understanding and assessing likely material risks to our members' investments when 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

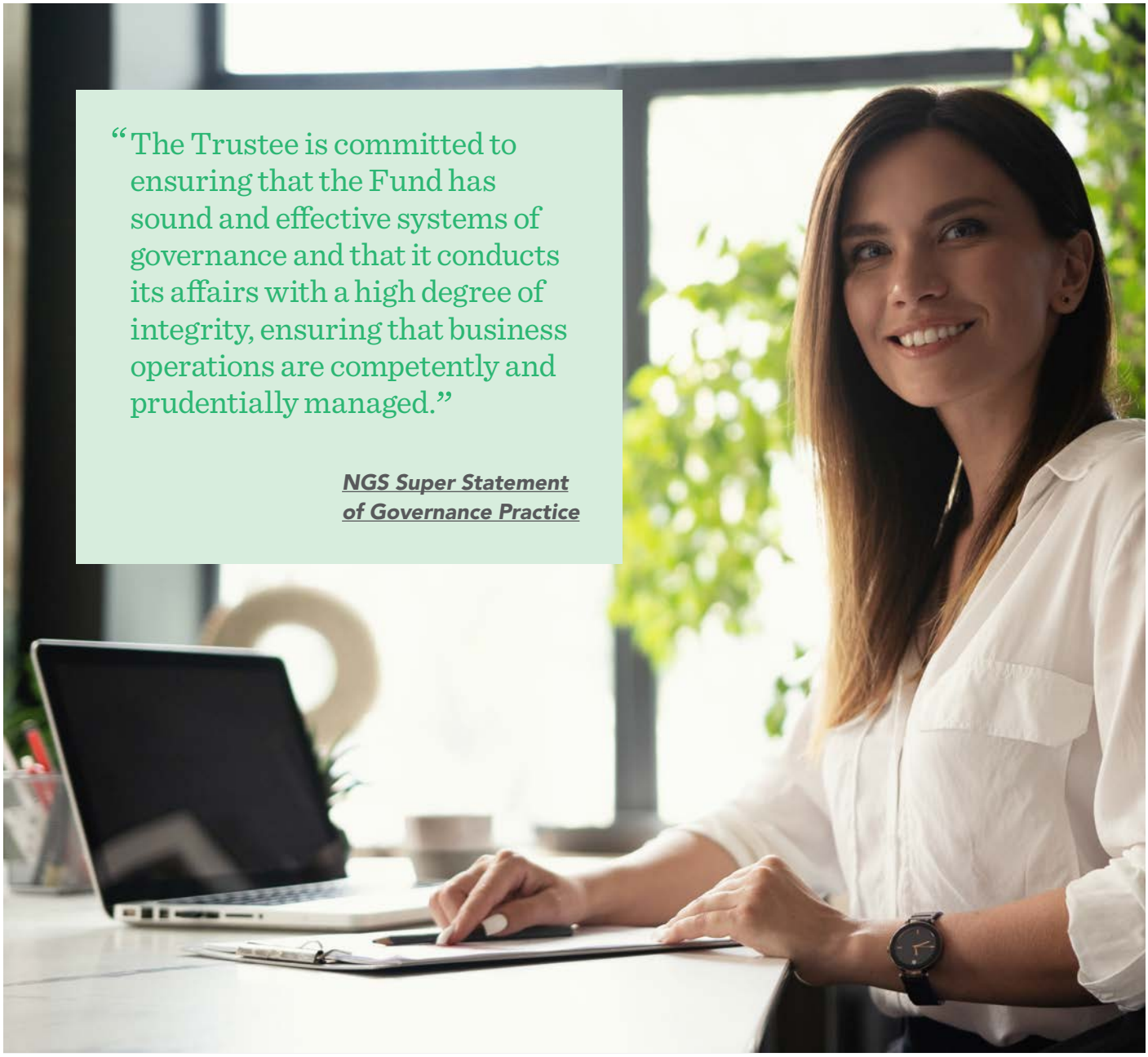
We are committed to supporting the Paris Agreement goals of limiting the global average temperature rise at the end of the century to well below 2°C and pursuing efforts to achieve a 1.5°C increase from pre-industrial levels.[2] So much so, in the past 12 months, the Fund has been working on its Carbon Neutral 2030 (CN2030) project, where we are completing analysis to make the Fund's investment portfolio[3] carbon neutral by 2030. **Figure 2** illustrates the different ways that we support the global commitment to addressing climate change.

1. Follow responsible investment	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*** on page 12.
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 12.
3. Set ambitious targets and track progress diligently	We have set an ambitious target of having a carbon neutral investment portfolio (Diversified MySuper) by 2030, and an interim target of 35% less emissions on our 30 June 2021 carbon intensity measurement by 2025.	See ***Targets*** on page 40.
4. Use exclusions, divestment, engagement and investing in carbon positive investments to effect change	The Trustee's investment maandates exclude any holdings in companies that generate more than 30% of their revenue from the extraction of and generation and distribution of power from thermal coal. This exclusion does not apply to the Indexed Growth	See ***Our position on thermal coal*** on page 12.
	By 2025, we have committed to divesting of scope III stranded assets.	See ***Targets*** on page 34.
	We utilise active ownership over our portfolio, including through direct engagement or proxy voting in line wiht our responsible investment objectives.	See ***Active Engagement and Ownership*** on page 29.

Figure 2: Different ways that 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. Diversified MySuper investment option.

1.0 GOVERNANCE



> "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 further outlines our oversight and governance structure.

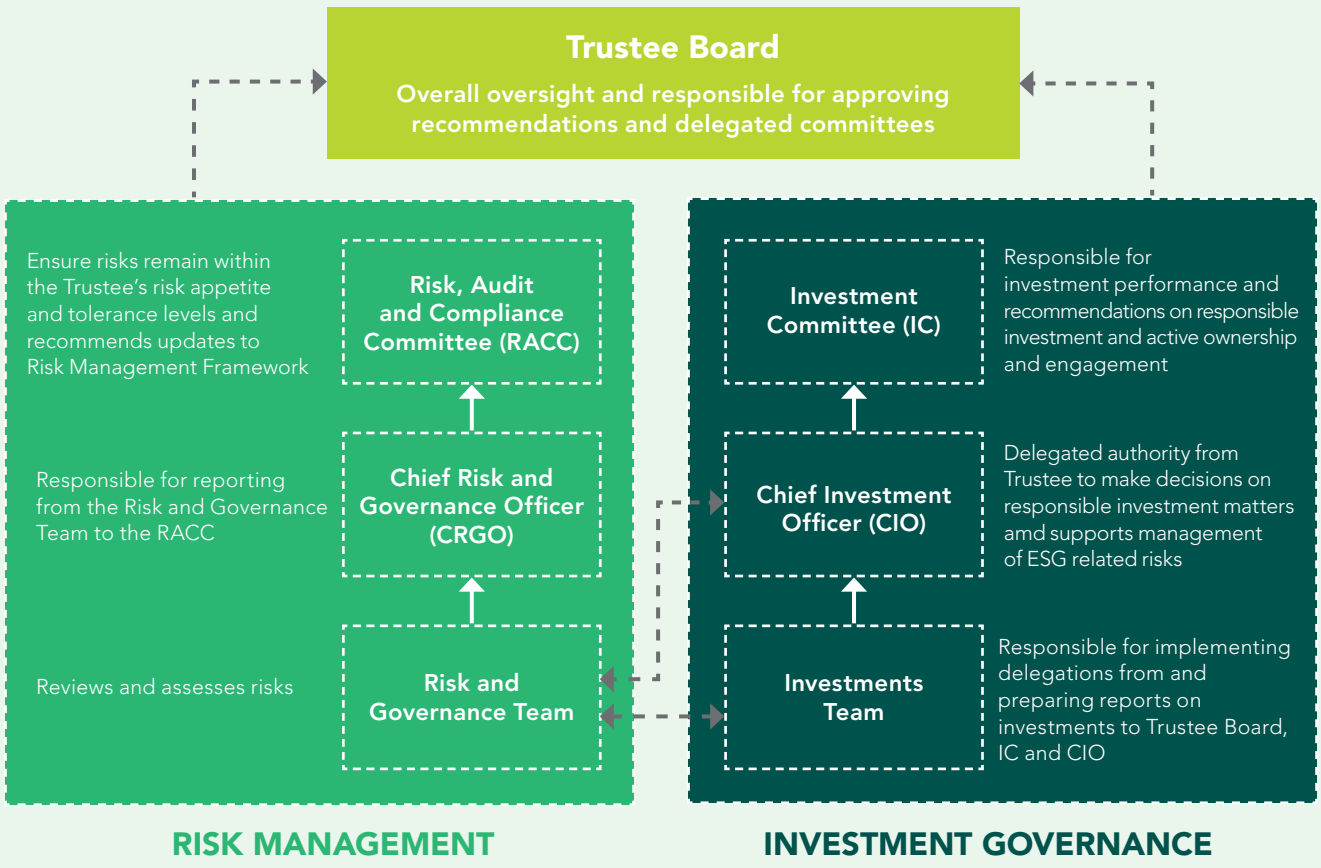


Figure 3: NGS Super's risk management and investment governance structure highlighting the nature of the Board's oversight

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 for assessing 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 SOCIALLY AND ENVIRONMENTALLY 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 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[4] level, as well as per IM.[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 2021 we estimated the carbon intensity of the whole 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 to ensure consistency in future measurement.
5. Where information is available. In some cases, estimates or assumptions were used.

1.3 PROGRESS SINCE OUR LAST DISCLOSURE

1.3.1 BUILD INTERNAL CAPACITY AND UNDERSTANDING OF TCFD

As we embarked on our CN2030 project through 2021, the Investments team has built up significant knowledge about the TCFD framework, carbon measurement and climate scenario analysis as it relates to the Fund's investment portfolio. In the spirit of sharing and keeping the entire organisation abreast of these learnings, the Investments team shared this knowledge with the entire organisation at the 2021 staff conference.

1.3.2 REVIEW AND UPDATE STRUCTURES, ROLES AND POLICIES

In the annual review of the Investment Committee and RACC Charters, we have refined roles and responsibilities including as they relate to climate risk.

Within the Fund's Investment Governance Framework, the Investments team and IC spent considerable time reviewing and refining the Fund's investment beliefs, ensuring they were fit for purpose. The ESG investment belief specifically calls out that leading in climate risk assessment is an opportunity to acquire transitional assets before others value their presence.

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 Environmental, Social and Governance (ESG) issues when evaluating investments reduces investments risk, improves investments returns, and can positively impact the future.
- **Investing well can make positive impact on society and achieve returns —** leading climate risk 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 existing ESG due diligence processes. While ESG has been imbedded in the due diligence process for some time, with more specific climate change risk and opportunity knowledge, this can be focused. Holding our IMs to account on how they assess and integrate ESG risks, including climate risk, will be key in allowing the Fund to collectively manage climate risk and work towards our CN2030 goal.

> "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 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 three 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.

OUR POSITION ON THERMAL COAL

"The Trustee's investment mandate excludes any holdings in companies that generate more than 30% of their revenue from the extraction of and generation and distribution of power from thermal coal.

In light of our CN2030 target this exclusion is under review. In February 2022, we committed to divest of all scope III stranded assets by 2025 (or sooner). As a result, over the course of the 2022 calendar year we are considering expanding this formal exclusion to include elements of oil and gas production and exploration."

The thermal coal exclusion does not apply 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 ensure 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 2021, we conducted scenario analysis with the objective of identifying key risk hotspots in our portfolio. Scenario analysis was completed separately for our listed and unlisted assets, drawing on multiple sources, including Network for Greening the Financial System (NGFS), World Resources Institute (WRI), and support and analysis from Vivid Economics and Planetrics[6]. The conclusions of the document are solely our own.

To generate climate scenario results we relied on NGFS reference scenarios[7], and used these as a basis to estimates 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 through two key channel categories:

(1) Physical impacts, including chronic risks such as extreme heat, drought and water stress and acute weather events such as wildfires, hurricane, 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.

Our climate scenario analysis for listed assets utilises a combination of six transition scenarios developed by NGFS, which align with integrated assessment models used by the Intergovernmental Panel on Climate Change (IPCC) in its fifth Assessment Report. For unlisted assets we evaluate results on a subset of these same scenarios. Below outlines a description of the six transition scenarios. 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 and 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 are investment advisers and have not provided any investment advice.
7. Scenario's include underlying assumptions including but not limited to future carbon prices, energy prices, demand for different sources of energy etc.

SCENARIO	DESCRIPTION
ORDERLY NET ZERO 2050 (LISTED & UNLISTED)	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. CDR1 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 (LISTED)	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 is deployment is relatively low. Net-zero CO^2 emissions are achieved after 2070. Physical and transition risks are both relatively low.
DIVERGENT NET ZERO (LISTED)	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 the Net Zero 2050 by assuming that climate policies are more stringent in the transportation and buildings 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 & UNLISTED)	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.
NDC'S (LISTED)	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 NDCs at the beginning of 2021 continues over the 21st century (low transition risks). Emissions decline but lead nonetheless to about 2.5°C of warming associated with moderate to severe physical risks. Transition risks are relatively low.
HOTHOUSE WORLD / CURRENT POLICIES (LISTED & UNLISTED)	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: Descriptions of different policy scenarios

2.4 LISTED ASSETS[8]

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 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.

On the other hand, climate opportunities 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.

Internally, results from all six scenarios were reviewed however, only three have been expanded upon within this TCFD report.

2.4.1 SCENARIO ANALYSIS INSIGHTS

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.

Figure 5 shows that 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 -3% by 2050. The Net Zero 2050 scenario forecasts a steep decline in earnings from now until 2030, 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 -7% by 2050. Finally, 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, a steep decline in portfolio earnings is expected as high carbon prices are abruptly introduced to curb emissions. This scenario will cause more harm to portfolio earnings longer term due to this abrupt and late change in policy.

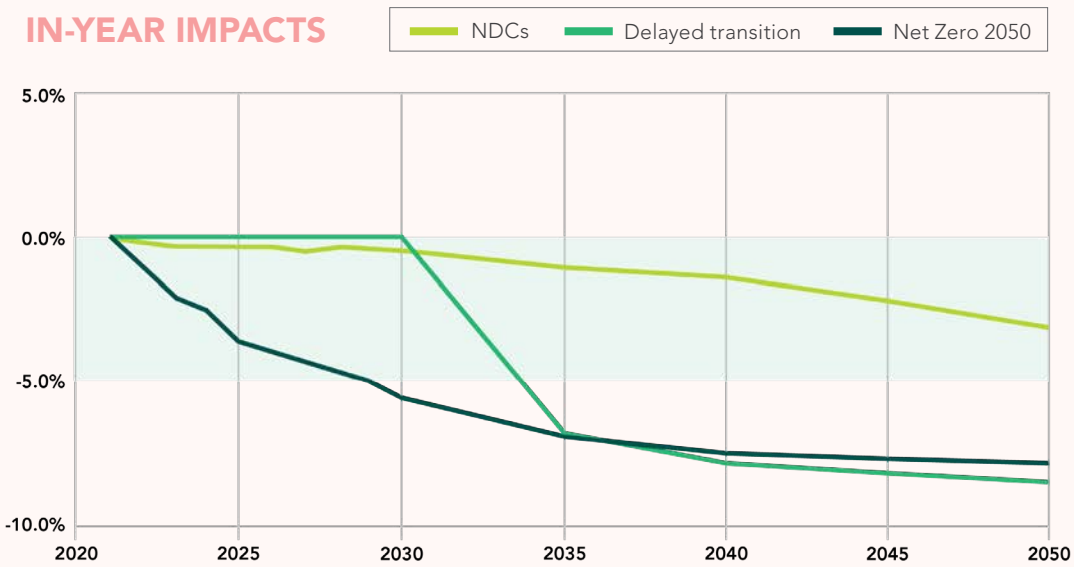


Figure 5: Australian shares expected yearly impact until 2050 under different climate change scenarios
Source: See footnote 8.

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 from Planetrics Ltd (which does not include investment advice). This report represents NGS Super's own selection of applicable scenarios selection and/or and 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. Planetrics Ltd. is not an investment adviser and has not provided any investment advice.

Figure 6 shows clearly that the energy sector has the most negative NPV impact mainly due to demand destruction for their products. On the other hand, utilities exhibit a positive impact, as the NGS Super Australian shares portfolio is overweight renewable energy utilities operating in Australia and New Zealand relative to conventional utilities relying on fossil fuels to operate.

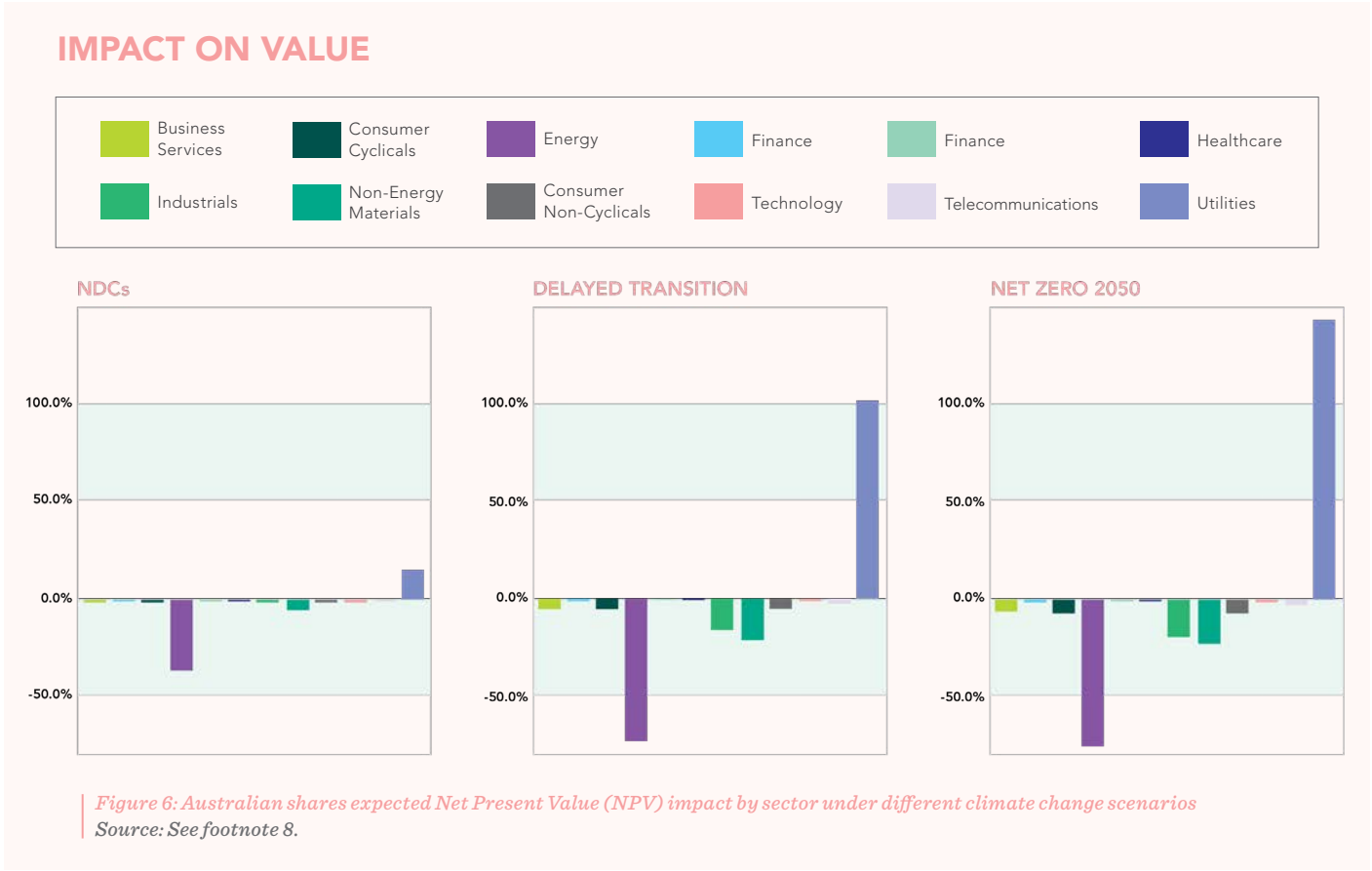


Figure 6: Australian shares expected Net Present Value (NPV) impact by sector under different climate change scenarios
Source: See footnote 8.

Figure 7 shows a similar trend for international shares as **Figure 6.** The difference here is that the magnitude of the impact is less that what is been observed for Australian shares. This is because international equities have lower exposure to high carbon intensive industries such as energy and materials. For example, the US equity market is more dominated by technology names rather than more conventional industries.

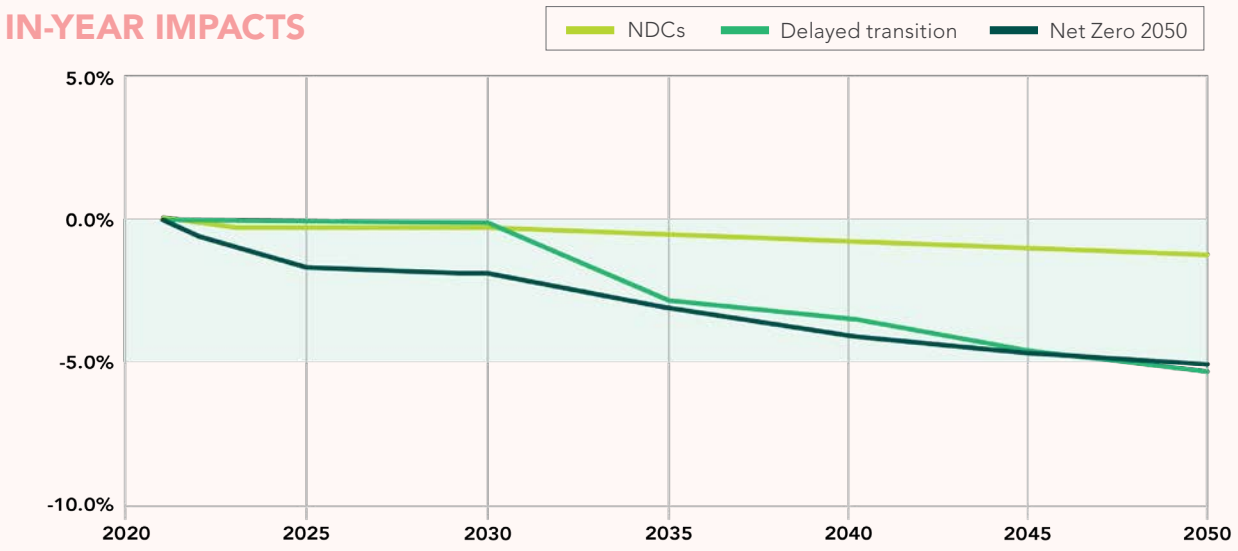


Figure 7: International shares expected yearly impact until 2050 under different climate change scenarios
Source: See footnote 8.

Figure 8 shows that international shares sector impacts are also quite like Australian shares except for utilities. In this sector, utility investments are carbon intensive and therefore have high scope 1 emissions.

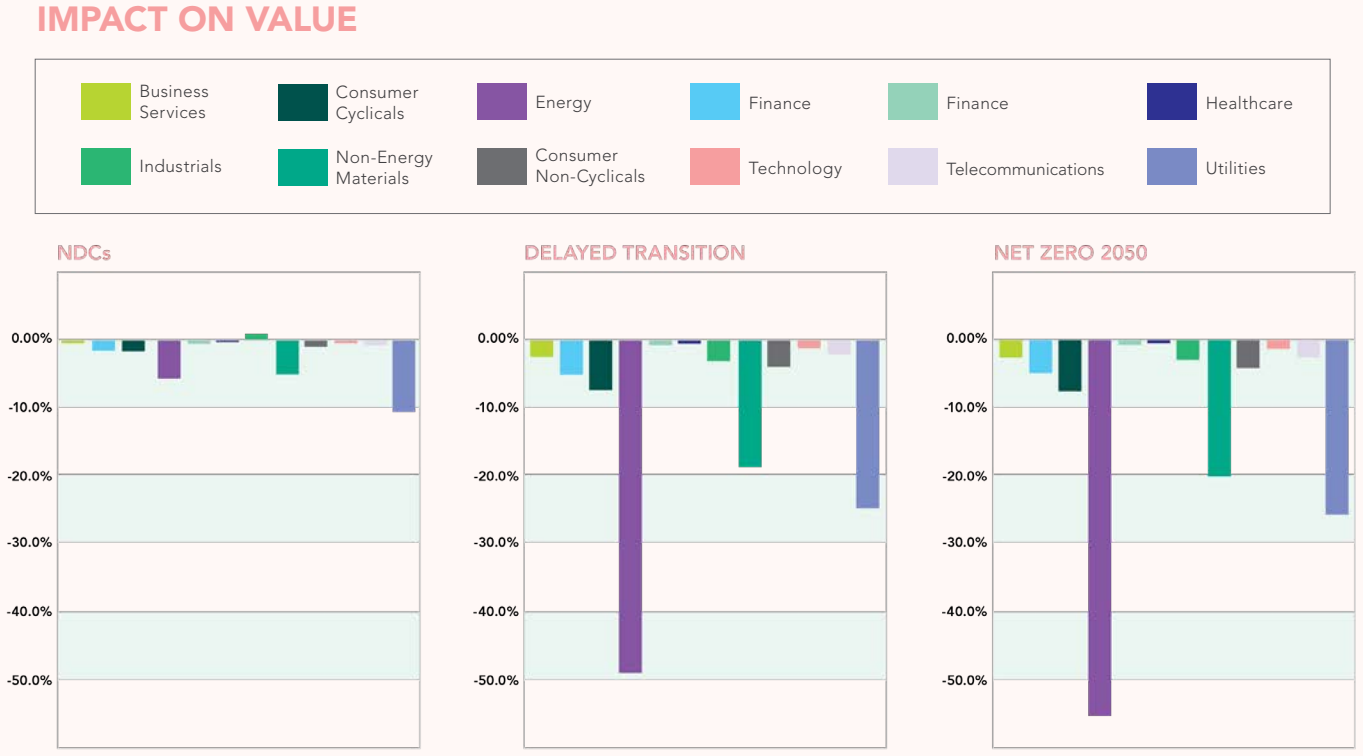


Figure 8: International shares expected NPV impact by sector under different climate change scenarios
Source: See footnote 8.

2.5 UNLISTED ASSETS[9]

Our scenario analysis of our unlisted assets 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.

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

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 three scenarios diverge very quickly in terms of transition impacts, but scenario differences in physical impacts take longer to meaningfully materialise.

9. 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.

2.5.1 TRANSITION SCENARIO ANALYSIS INSIGHTS

Figure 9 outlines the key results from our transition scenario analysis, highlighting fossil energy, airports, marine logistics and ferries, and to a lesser extent, some district heating assets as facing negative profitability during more aggressive climate transitions. Importantly, projected transition impacts vary significantly by scenario and timestep. For example, under the "Hothouse world / current policies" scenario where no new actions are taken to mitigate climate change, transition impacts, whether positive or negative, are limited. In contrast, for two thirds of NGS Super assets, the projected impacts on profits are material and often drastic by 2040 under both "Delayed Transition" and "Net zero 2050." Assets benefitting from the climate transition see increasingly bigger gains, and assets negatively affected by the transition see steadily exacerbating impacts.

HW – Hothouse world / current policies **DT** – Delayed transition **NZ** – Net zero 2050

SECTOR	2030			2040			2050		
	HW	DT	NZ	HW	DT	NZ	HW	DT	NZ
AIRPORTS									
MARINE LOGISTICS									
FOSSIL ENERGY									
ELECTRIC TRANSMISSION									
HEALTHCARE									
REAL ESTATE									
RENEWABLES									
TELECOMMUNICATIONS									
WATER UTILITIES									
FERRIES									
DISTRICT HEATING									

Figure 9: NGS Private Investment Exposure to Climate Transition Risk
Source: NGS Super based on NGFS scenarios and other data sources, including Vivid Economics and PlanetView, a Planetrics Scenario Analysis Tool.

For assets in high risk sectors, we qualitatively assessed the breakdown of the transition impact channels: demand destruction or creation (e.g. lower demand for oil, higher demand for renewable energy), direct carbon costs (costs tied to carbon taxes), abatement (potential to abate emissions rather than paying carbon costs), and market impacts (ability to pass on costs, or to gain market share for companies benefitting from inelastic demand of their products, or from having a lower emission intensity than peers).

For fossil energy, risk drivers are the projected decrease in future demand for fossil energy under "Net Zero 2050" compared to "Hot house world / current policies", as illustrated in **Table 1**. Unsurprisingly, these same risk drivers lead to a opposite and positive profitability impact for renewable energy investments, which benefit substantially from demand creation under the "Delayed transition" and "Net zero 2050."

	OIL		RENEWABLES (NON-BIOMASS)	
	Scenario "Hot house world / current policies"[10]	Scenario "Net zero 2050"[11]	"Hot house world / current policies"	"Net zero 2050"
2030	+11%	+1%	+75%	+212%
2040	+15%	-26%	+168%	+478%
2050	+0%	-55%	+273%	+635%

Table 1: Global demand projections for oil and renewables by scenario (change relative to 2021)
Source: NGS Super based on NGFS scenarios and other data sources, including Vivid Economics and PlanetView, a Planetrics Scenario Analysis Tool.

Another key risk factor is the cost of emissions ("Direct carbon costs") under increasing carbon regulation under "Net zero 2050" scenarios as shown in **Figure 10.** These costs could vary substantially depending on a company and/or asset's emissions intensity and decarbonisation performance, so these results provide an indication of risk exposure rather vulnerability of an individual asset.

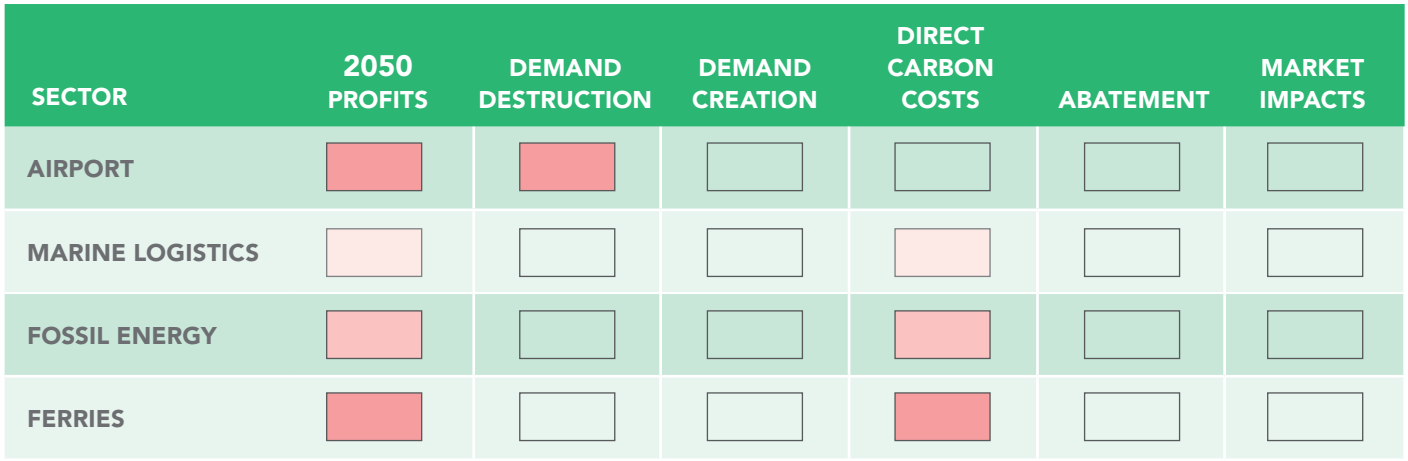


Figure 10: Drivers of transition risk for select assets under the "Net Zero 2050" scenario
Source: NGS Super based on NGFS scenarios and other data sources, including Vivid Economics and PlanetView, a Planetrics Scenario Analysis Tool.

For both marine logistics and ferries, the review of NGS Super found that the main risk driver is direct carbon costs from the emissions of vessels and equipment. High carbon costs are highly likely to impact diesel and bunker fuels, which are commonly used fuel for marine vessels. Some companies may be able to mitigate these risks by switching to alternative carbon-free fuels. Importantly, some assets within these sectors could see positive impacts from carbon costs by capturing market share from those competitors who may have higher carbon emissions per revenue and/or by passing on carbon costs to clients for those assets which our assessment considered to have a position where raising prices will not result in losing a proportionate sales volume.

10. No new policies to address climate change. See section "Approach".
11. Ambitious policies required for 1.5 degrees goal. See section "Approach".

For marine logistics, a second driver is also demand decreases driven by fossil energy companies, demonstrating the complex interplay between sectors. For instance, a rail freight services company would not only face carbon taxes for emissions of diesel locomotives but may also see fewer contracts from coal power plants.

Airport revenues stem from a mix of airline fees and from retail revenue driven by the number of passengers passing through the airport. Under aggressive climate transition scenarios, carbon taxes may lead to substantial increases in the cost of flying, which would reduce future air traffic relative to the current state as demand is relatively responsive to price changes. Airports are capital intensive and cannot easily adjust their capacity, so NGS Super found them to be among the assets most vulnerable to transition risk exposure. This may be especially relevant for airports located both in a region where carbon taxes are more likely and where alternative transportation modes such as dense railroad networks offer readily available alternatives.

While these three sectors face significant risks, NGS Super can mitigate these risks by favouring comparatively low carbon investees and by engaging with investees to abate emissions in their value chain or pursue substitute goods. For instance, assets involved in transporting and storing gas may have the choice of switching to hydrogen or other alternative fuels. Some assets may also benefit from support from the government support such as the promotion of net zero industrial clusters. Some companies are taking important steps to reduce their emission intensity, for example, upgrading propulsion systems and installing rotor sails in ferries.

2.6 PHYSICAL SCENARIO ANALYSIS INSIGHTS

NGS Super relied on a team of climate data scientists to assess high-level exposure to multiple hazards as well as vulnerability to physical risk for all assets. 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).

A high-level heatmap results of this analysis are outlined in **Figure 11.** 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 "Current Policies), commensurate with the increasing physical risk in the absence of a swift transition.

The analysis considered the following physical hazards:

- **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.
- **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.
- **Extreme precipitation,** which can cause urban flooding, excessive runoff, and infrastructure damage.
- **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.
- **Extreme heat,** which can cause droughts, loss of productivity, and health issues under certain conditions.

SECTOR	VULNERABILITY^	EXPOSURE 2030	EXPOSURE 2050	RISK X VULNERABILITY 2030	RISK X VULNERABILITY 2050
AIRPORT	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 11: Heatmap of physical risk to NGS assets
^Indicates to how many of the five assessed physical hazards this asset's location is exposed.

Among the five 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 investments are located, may see an increase of up to 15% in 2030,[12] as illustrated in **Figure 12.** While most assets are vulnerable to two or three of the assessed hazards, some assets stood out as vulnerable to all or most of the five hazards, in some cases through second order impacts. For example, certain industrial facilities in low-lying areas may become disconnected during floods or extreme precipitation events (see Figures 9 and 10), which could reduce their ability to generate or access energy. Water stress is also highly relevant to many of our assets and projected to affect several regions (see **Figure 11**) relevant to our portfolio.

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

12. As detailed on pages 11 and 12 on "Climate Scenarios", physical impacts in 2030 are comparable for all three 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 three scenarios) to 2050 impacts for the two scenarios "Delayed Transition" and "Hothouse World".

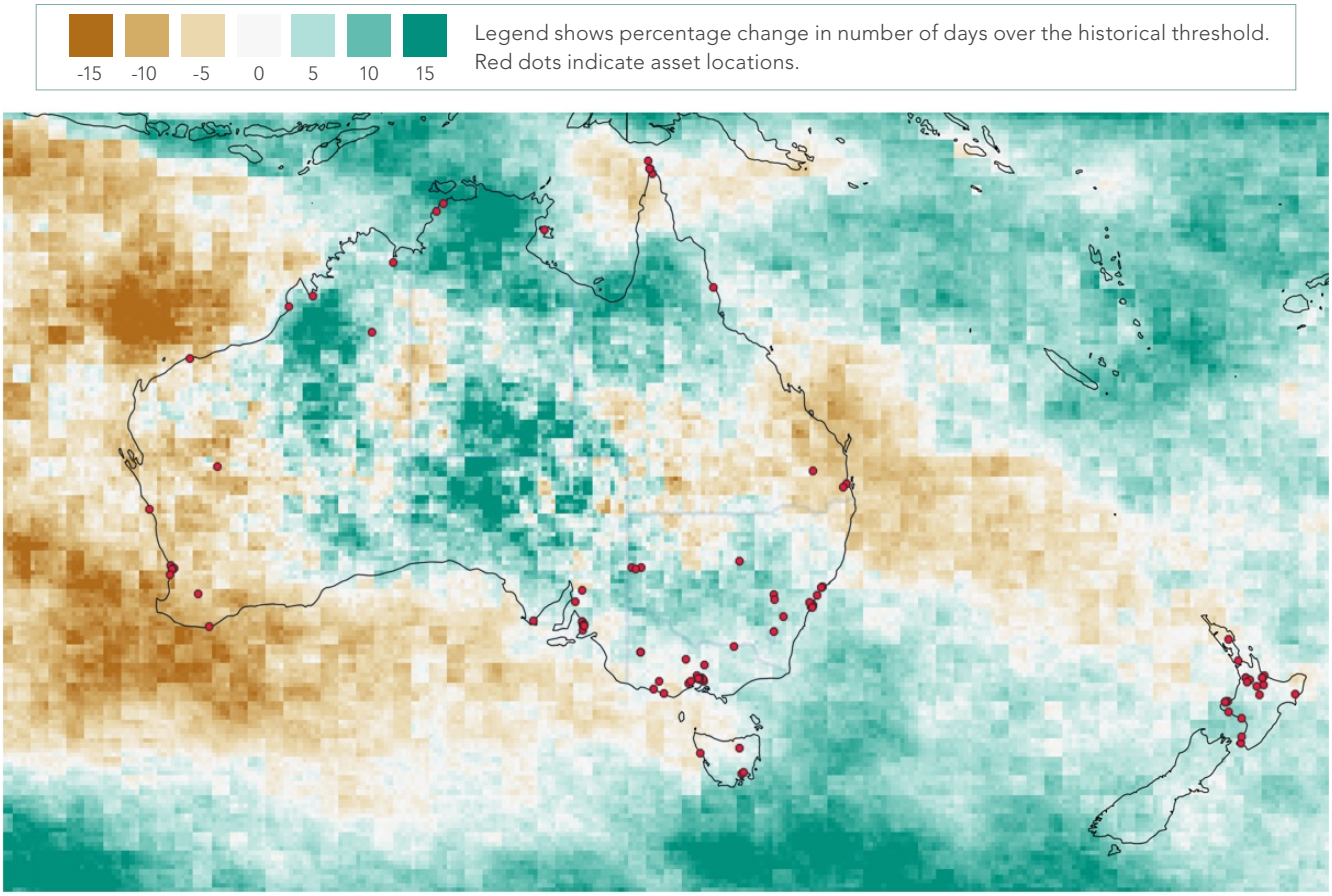


Figure 12: Projected change in frequency of extreme precipitation[13] days in 2030 for Australia
Source: NGS Super based on NASA-NEX-GDDP CMIP5 ensemble and other data and analytical sources, including Vivid Economics.

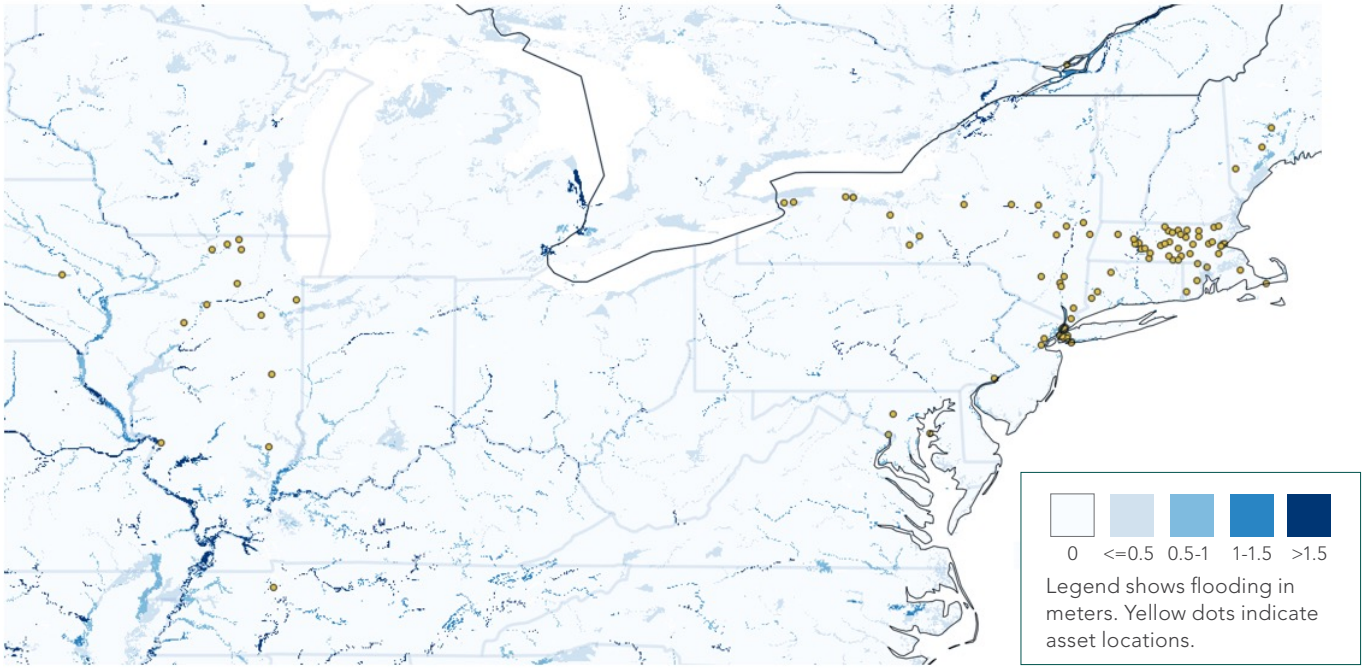


Figure 13: Riverine flooding by 2030 in the US Midwest
Source: NGS Super based on World Resources Institute and other data and analytical sources.

13. Defined as days with levels of precipitation exceeding 95 percent of all other days at that location.

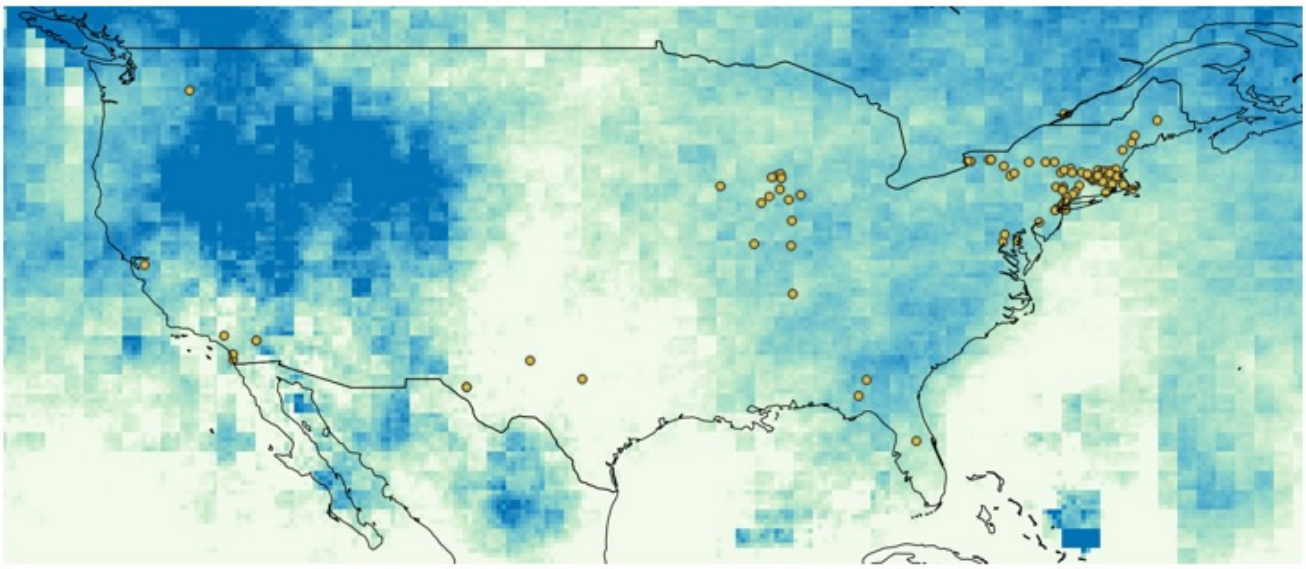


Figure 14: 2050[14] exposure to extreme precipitation for select US assets
Source: NGS Super based on NASA-NEX-GDDP CMIP5 ensemble and other data and analytical sources.

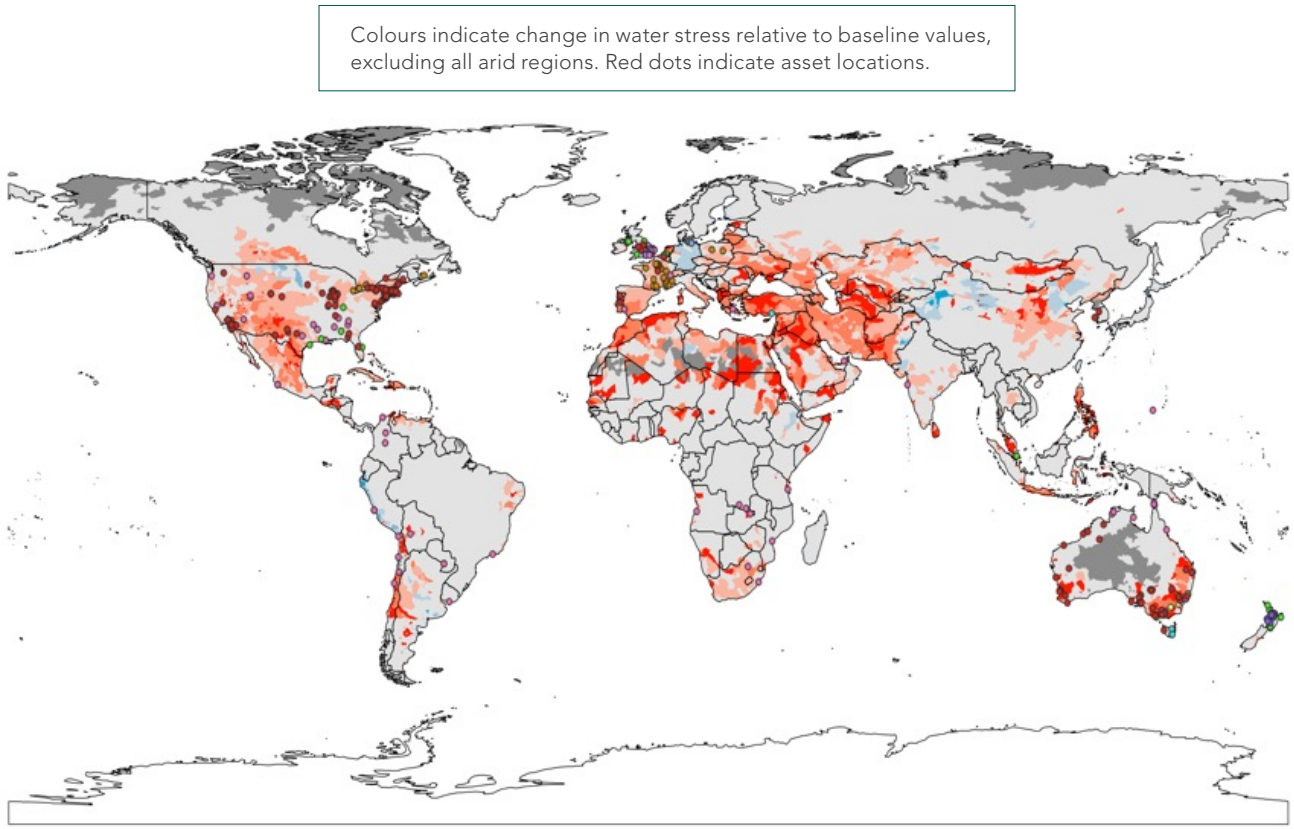


Figure 15: Water stress for 2040, overlaid with asset locations
Source: NGS Super using data from WRI

14. As discussed earlier, 2030 impacts are comparable for all three scenarios, while 2050 impacts apply to the scenarios "Delayed Transition" and "Hothouse World".

2.7 WHAT THIS MEANS FOR NGS SUPER

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

In addition, while we transition and make changes to the investment portfolio to meet these targets, the results of this scenario analysis will inform the Fund's engagement activities with current investment managers and potential new opportunities and partnerships with investment managers. It will also assist in formalising and taking action on the Fund's exclusion list.

Through this work investment opportunities in renewables, technology, and health care are providing opportunity to build resilience within our investment portfolio for climate change.

2.8 PROGRESS SINCE OUR LAST DISCLOSURE

2.8.1 KICK OFF OF THE CARBON NEUTRAL 2030 PROJECT

In 2020, we were planning to complete a research study into fossil fuels to determine their role in our investment portfolio over the short, medium and long term. However, in early 2021, we saw the need to embark on a larger piece of work which saw the kick off of the Carbon Neutral 2030 (CN2030) project.

The CN2030 project had three main streams of work:

1. obtaining a baseline measurement of the carbon intensity of our very diverse investment portfolio
2. completing scenario analysis over the listed and unlisted assets of our portfolio
3. completing a glide path analysis to model carbon reduction scenarios over time, taking into consideration risk, return and tracking error.

The outcome of this work can be found ***here***.

2.8.2 COMPLETED SCENARIO ANALYSIS

In 2021, we completed listed and unlisted scenario analysis of the Fund's listed and unlisted assets. The results of this analysis can be found in the Risk Management section of this report. This was an action for Year 2 however, we saw the need to bring this forward as it went hand in hand with setting our climate targets.

2.9 LOOKING AHEAD

2.9.1 CONTINUED 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 I, II and where possible, III). In doing this we will also monitor the carbon intensity of the portfolio's of each individual IM. This along with continual review of the scenario analysis will inform the risks and opportunities open to the Fund to ensure inclusions within the Fund's overarching investment strategy. This information will be key to tracking the Fund's progress towards their interim and end carbon neutral target (discussed in the Metrics and Targets section of this report).

2.9.2 FORMAL CLIMATE RISK ASSESSMENT AT FUND LEVEL AND INCLUSION IN OVERALL BUSINESS PLANNING

We seek to consider and incorporate climate risk assessment into the Fund's overall business planning process.

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 on at least an annual basis. 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. This is especially important as NGS Super directly selects investment managers, 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 PRI. 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 33.

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

In our equities portfolio, we have a total of 34 companies, totalling $120 million in investments, that are specifically aligned to the objectives of SDG 13. On page 36, we report on how our investments in listed companies contribute to all 17 goals.

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 engages 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 investment managers 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. 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.

We will vote in favour of proposals that:

- ✓ Increase sustainability reporting and disclosure
- ✓ Increase disclosure of environmental risk
- ✓ Develop greenhouse gas emission 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.

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 abroad.

3.5 PROGRESS SINCE OUR LAST DISCLOSURE

3.5.1 UPDATE RISK MANAGEMENT PROCESSES

NGS Super's risk management framework, and board and committees' reports have been updated to include evidence of climate risk management. They now have a clear articulation of the respective roles and responsibilities of business lines and risk functions (i.e. first line and second line of defence activities) as they relate to managing climate risks. This has also been included in necessary policies and procedures which complement the Fund's risk management framework.

3.5.2 FORMALISE INTEGRATION OF CLIMATE-RELATED RISKS BETWEEN DUAL REPORTING STRUCTURES

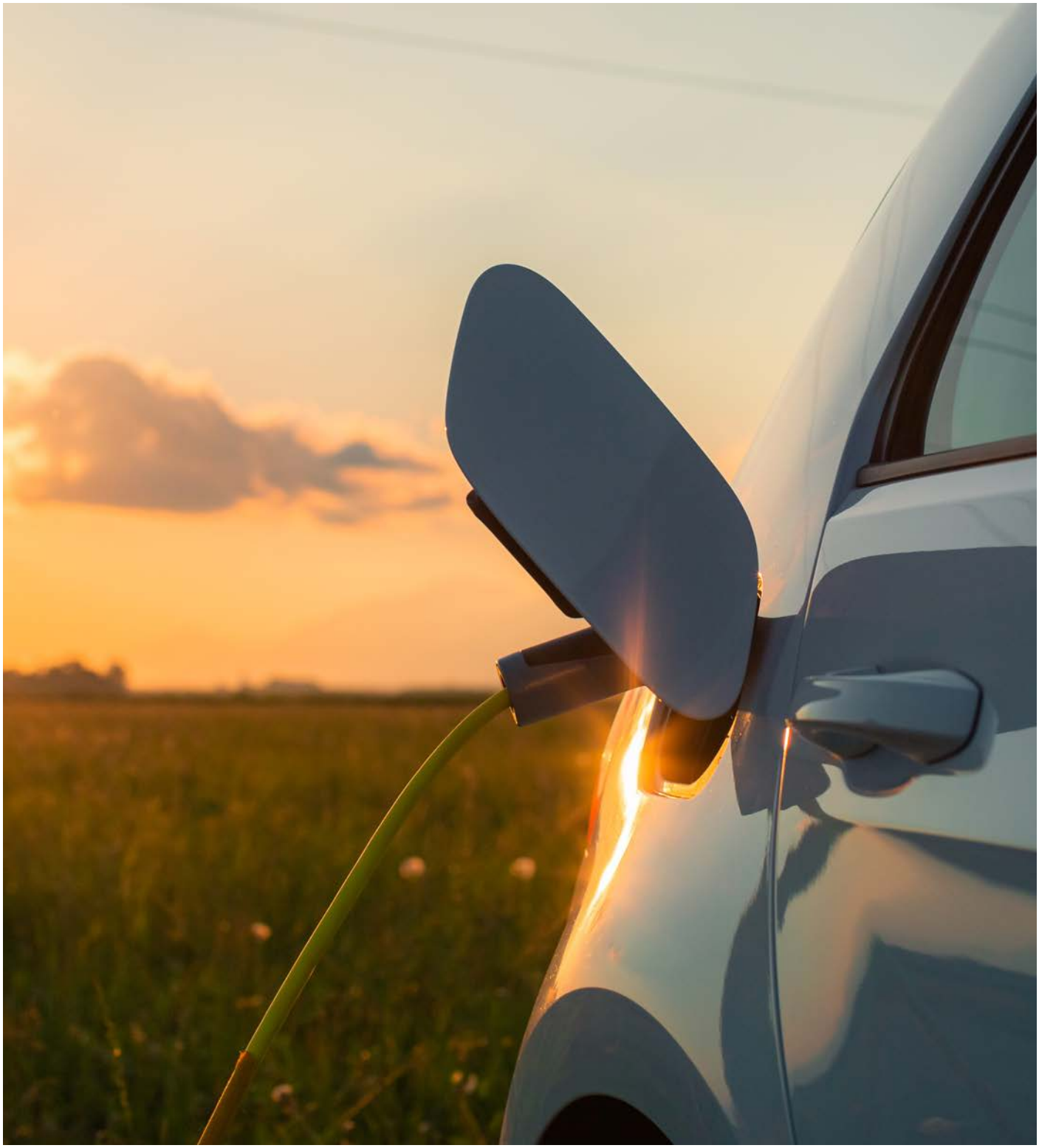
The Fund formalised roles and responsibilities as they relate to climate risk within the Fund's relevant committee charters and internal policy and procedure documents.

3.6 LOOKING AHEAD

3.6.1 CONDUCT A FORMAL RISK AND OPPORTUNITY REVIEW FOR NGS SUPER PTY LIMITED

The investments division of the Fund is well advanced in climate risk and opportunity review and assessment. Over the next 12 months this will be extended to Trustee Office considerations.

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 portfolio[15] by 2030.** We have also recently 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."

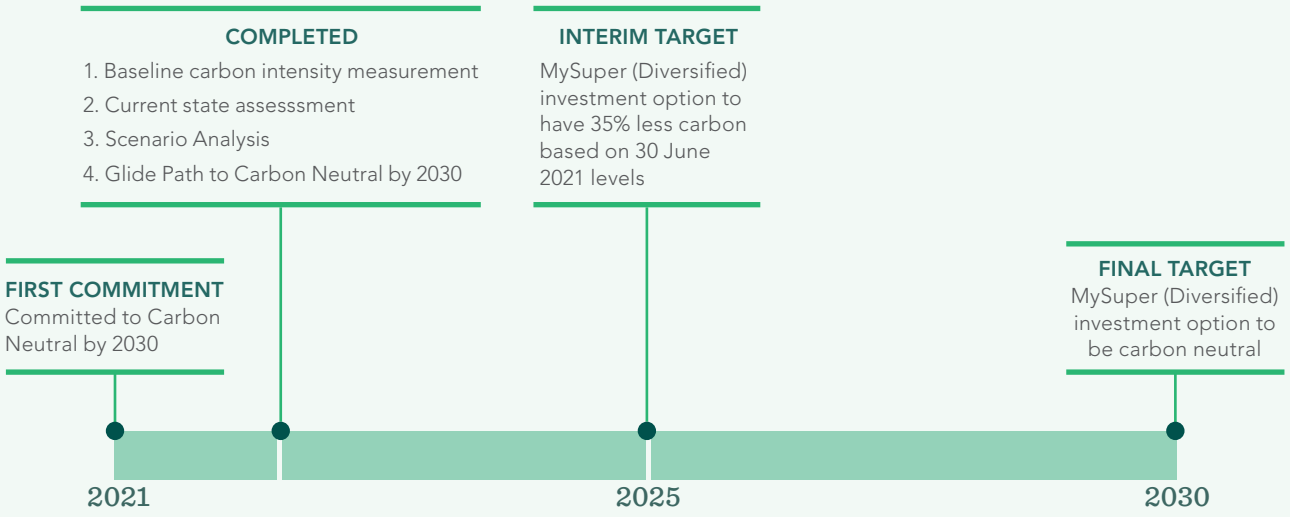


Figure 16: NGS Super decarbonisation roadmap

A COMBINATION OF THE FOLLOWING WILL BE USED:

ENGAGEMENT

DIVESTMENT

INVESTING IN CARBON POSITIVE INVESTMENTS

Figure 17: 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***.

15. Diversified (MySuper).

4.2 MEASURING THE CARBON INTENSITY OF OUR PORTFOLIO

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.

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.

Sector	Assets under management assessed ($ million)	% of sector assessed[3]	Emissions (tCO2e/year)	Emissions intensity (tCO2e/$ million invested)[5]
Australian shares[1]	3,510	100%	280,897	80
International shares[1]	3,772	100%	127,891	34
Property[2]	1,189	~96%	13,701	12
Infrastructure[2]	1,215	~99%	115,719	95
Private equity[2]	622	~28%	2,367	13
Bond alternatives[2]	871	~56%	31,659	65
Other[4]	2,065	0	0	0
Total	**13,241**		**552,904**	**48[6]**

Figure 18: Carbon intensity of NGS Super Diversified (MySuper) investment option

1. Based on internal analysis assisted by MSCI submitted to the 13 September 2021 Investment Committee meeting.
2. Based on south pole "NGS Super financed emissions" report dated 29 October 2021 and corresponding excel data file dated 28 October 2021. Total emissions for the measured unlisted portfolio as at 30/06/2021 were 163,455.
3. By value. Based on actuals and estimations (where required).
4. Other includes all other remaining sectors and derivatives.
5. Emissions intensity calculations based on the enterprise value of assets held.
6. The total emissions intensity figure is estimated for the Diversified (My Super) option based on the dynamic asset allocation (DAA) as at 30 June 2021.

~ Approximately.

Understanding our investment portfolio's carbon intensity provides us with valuable information to better analyse the resilience of the companies we invest in. Now that we have a baseline measurement, we can use this to lower the carbon intensity of the Fund working towards our interim target (2025) and end target (2030). This information also provides valuable engagement opportunities with the companies directly and, importantly, the IMs who we have appointed to manage funds on our behalf as we have a line of sight as to each individual IM's carbon intensity.

4.3 CONTRIBUTING TO THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

The Sustainable Development Goals (SDGs) are an important framework against which we choose to measure our investment impact. In FY19, for the first time, we reported on our investments in listed companies that provide products or services which support the achievement of one or more of the SDGs. Our FY21 investments are illustrated in **Figure 19.**

Table 2, on page 37, illustrates the Fund's positive contribution (per $1000 invested) to the SDGs and more specifically, climate action.

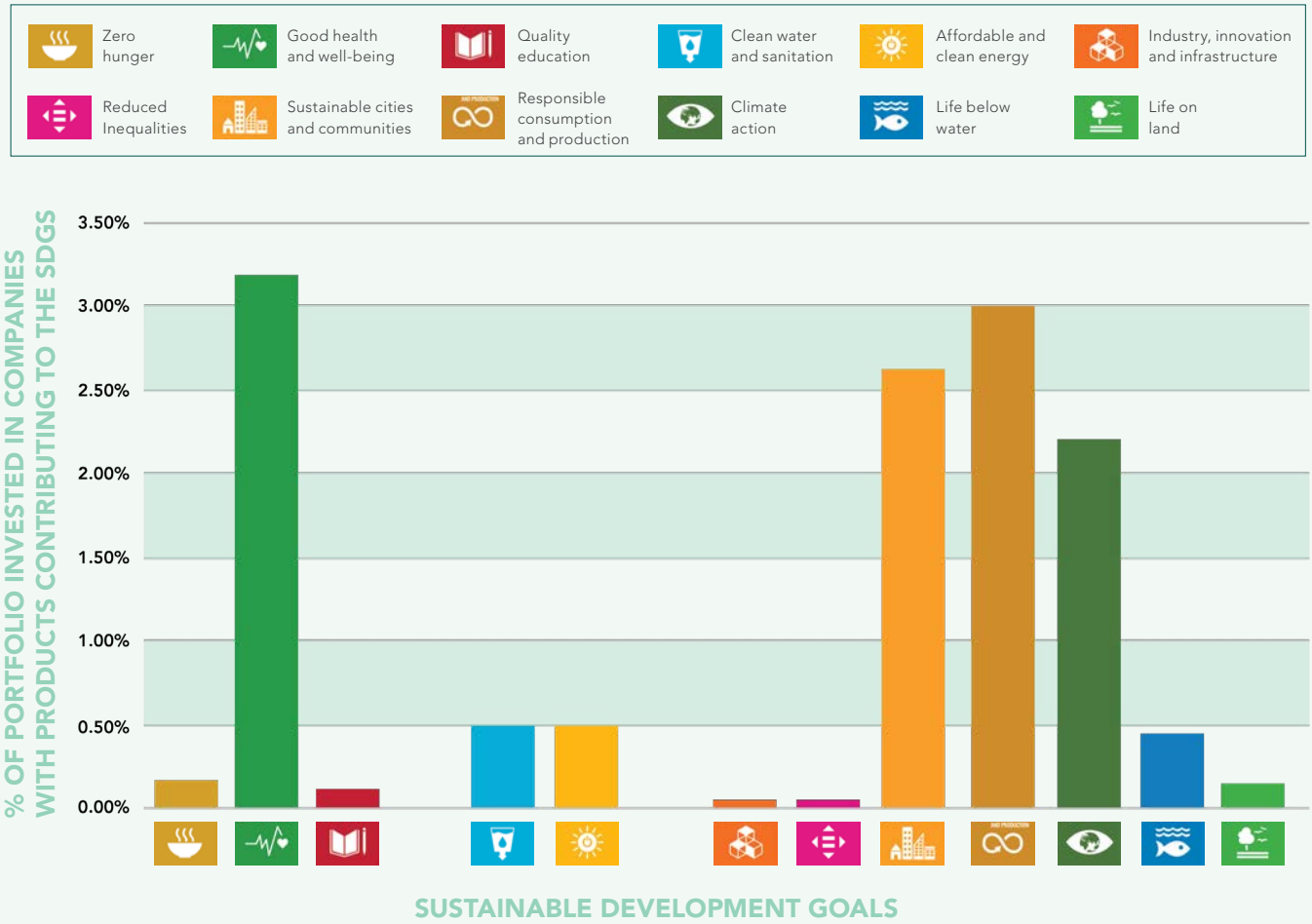


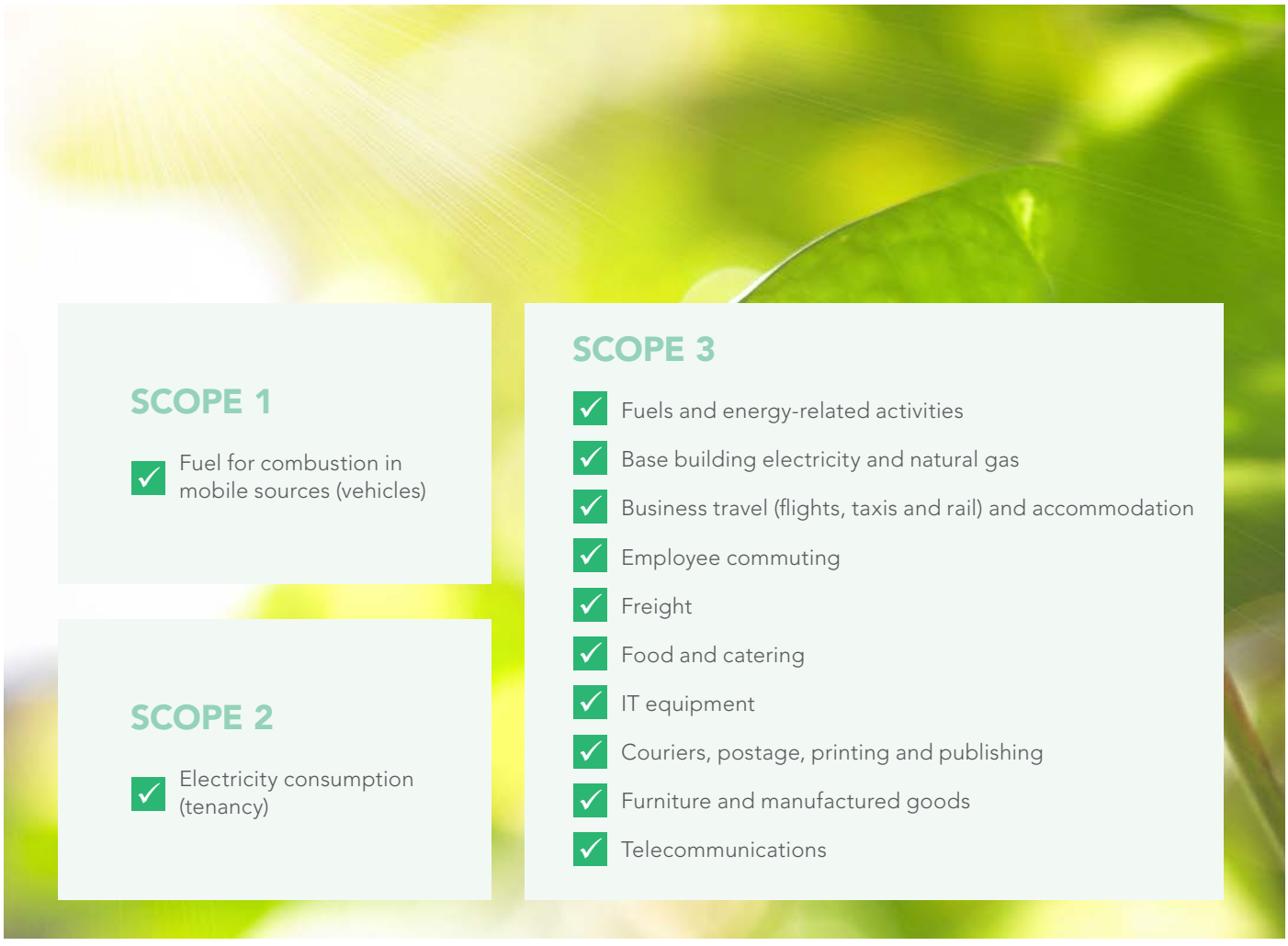
Figure 19: Dollars invested in companies contributing to the SDGs (FY21)

For every $1,000 invested in our portfolio we direct investment to:	FY20	FY21
companies that have products or services which are aligned with the SDGs	$141	$131
companies that have products or services which are aligned with SDG 13 — Climate Action	$31	$22

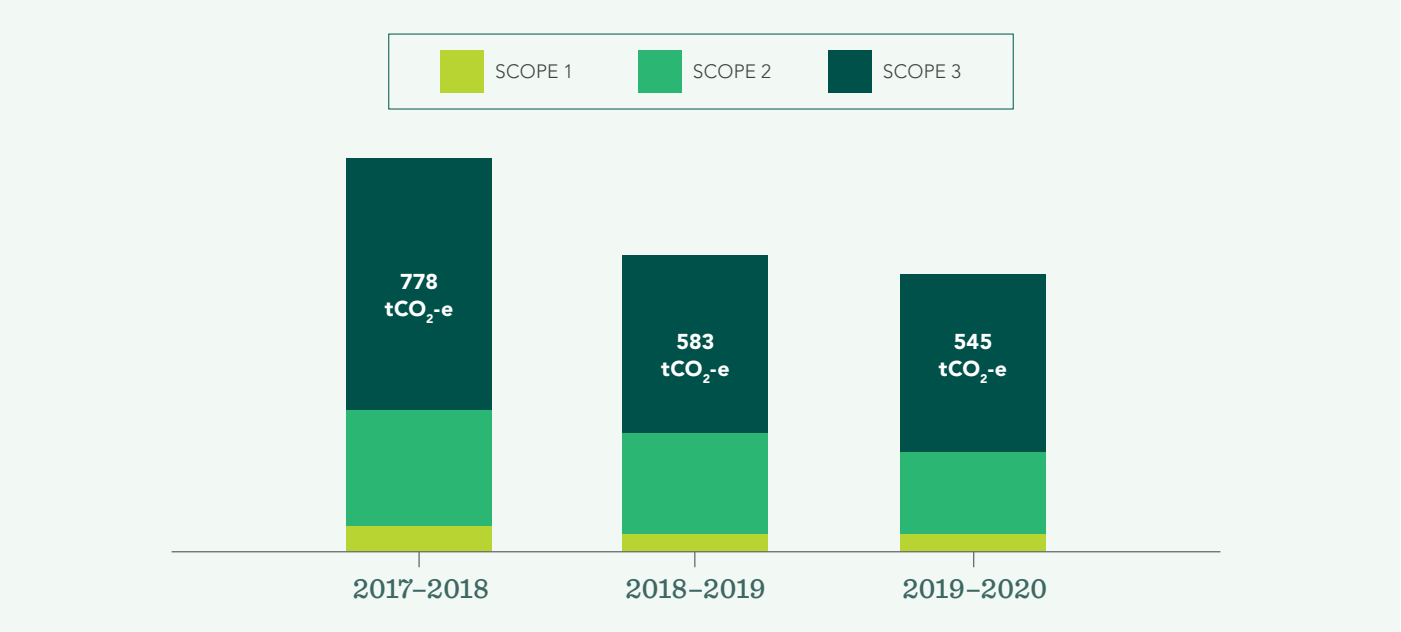
Table 2: NGS Super's positive contribution (per $1,000) invested to the SDG's (FY20 & FY21)

4.4 NGS SUPER IS CARBON NEUTRAL CERTIFIED

Shifting our focus from our investment portfolio to our operations, NGS Super is certified carbon neutral under the Climate Active scheme. 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 and FY19 are shown in **Figure 20.**[16]



16. Our FY21 assessment will only be completed in October 2022.



	2017–2018	2018–2019	2019–2020
Scope 1	39	29	25
Scope 2	236	204	172
Scope3	503	350	348
Total (tCO2-e)	778	583	545
Emissions per employee	17	9	8

Figure 20: NGS Super emissions footprint

We offset our operational emissions through purchasing credits from projects such as EcoAustralia, the Myamyn Lowland Forest Conservation Australia Project and the Changbin and Taichung bundled Wind Farms Project in Taiwan.

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 turn these cars over 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 DISCLOSURE

4.5.1 RESEARCH, UNDERSTAND AND SET CLIMATE RELATED TARGETS

Over the past 12 months, the Fund researched climate target setting frameworks. While the Fund's Trustee Office has been carbon neutral since 2017/2018, at the end of 2021, the Fund set a target to have a carbon neutral investment portfolio by 2030 as discussed within this section.

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[17], we also recognise that one of the greatest ways we can positively influence climate-related action is though 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.

Year 1:	Build internal capacity and understanding — ***Complete***
Year 2[18]:	Enhance strategy, risk management and stakeholder engagement processes
Year 3 and beyond:	Embed climate issues into strategic decision-making

17. We will report our FY20 performance against our operational targets in our next report.
18. Year 2 from 30 June 2022 to 30 June 2023.

TCFD recommendation	Year 2	Year 3	Ongoing
Governance	▪ Review how ESG factors are incorporated into due diligence assessments and questionnaires for investment managers.	▪ Ongoing review and update of structures and policies considering other recommendation outcomes.	▪ Assign climate related KPIs.
Strategy	▪ Re assess scenario analysis and reevaluate key findings (risks and opportunities) building them into investment strategy. ▪ Formally incorporate climate risk into the Fund's overall business planning activities. ▪ Review Fund exclusions.	▪ Re assess scenario analysis and reevaluate key findings (risks and opportunities) building them into investment strategy.	▪ Embed climate risk into strategy including financial planning, strategic policy development and the selection of the investment portfolio.
Risk management	▪ Complete climate risk and opportunity assessment for NGS Super Pty Ltd. ▪ Review voting frameworks. ▪ Prioritise companies for engagement based on assessment of risks and opportunities.	▪ Review engagement priorities and assess progress of engagement.	▪ Deepen stakeholder engagement including consideration of climate targets for investee companies. ▪ Ongoing review and update of structures and policies.
Metrics and targets	▪ Based on outcomes from other recommendations set relevant climate related metrics e.g. avoided emissions, green/brown measures, and high and low carbon company case studies. ▪ By the end of year 3, relevant targets should be in place.		▪ Ongoing measurement of performance.

Figure 21: Action plan towards NGS Super's progressive implementation of the TCFD recommendations

5.0 APPENDIX

5.1 APPENDIX A – SCENARIO ANALYSIS METHODOLOGIES

5.1.1 LISTED ASSETS

NGS Super's analysis of listed assets used a four-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 2021 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 two 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.

5.1.2 UNLISTED ASSETS OVERVIEW

The objective of the project was to assess climate risk exposure and potential impact associated with NGS Super's infrastructure assets portfolio, including transition risks resulting from regulatory or policy changes and shifts in consumer behaviour, as well as physical risks associated with climate change[20].

Our methodology for the transition and physical risk assessment are summarized and then detailed below.

Transition Risk: We used NGFS scenarios as a basis to derive asset impacts under three time steps: 2030, 2040 and 2050. We then refined the results based on a qualitative review of the assets with the highest transition risk profiles.

Physical Risk: We used a team of data scientists to conduct a physical risk mapping of most of NGS Super's private asset investments based on their geolocation and forecasted 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.

5.2 DETAILED APPROACH

5.2.1 TRANSITION RISK

Transition risks are business-related risks that follow from societal and economic shifts toward a low-carbon and more climate-friendly future. These risks capture how companies will be affected due to regulatory and market transitions towards a lower-emissions economy. Transition risk was modelled using the following three NGFS scenarios:

- **Hot House World:** A business as usual scenario in which policy changes and societal shifts are limited, resulting in 3+ degrees Celsius warming by 2100.
- **Delayed Transition:** A medium risk scenario that entails a slow transition response, resulting in less than 2 degrees Celsius warming by 2100.
- **Net Zero 2050:** A high-risk scenario with an immediate policy response to restrict temperature rise to 1.5 degrees Celsius by 2100.

We derived estimates of climate transition impacts based on sector-geography pairings and proxy peer comparisons under differing climate scenarios, timesteps, and impact channels to create heatmaps. Heatmaps provide a good overall picture of transition risk of the assets, however they should be used to compare the relative vulnerability of all assets rather than taken at the absolute level. Also, since the heatmap is based on the proxy sector-geography and company proxies in many cases this assessment may not fully align with the asset's activities and financial profile.

For those sector-region pairings that indicated high risk exposure, we conducted further qualitative analysis to identify sources of risk exposure along the following categories:

- **Regulatory Changes:** Recent and expected policy changes taken by governments to fight climate change. For example, we considered the United States and European Union's Global Methane Pledge, an initiative to reduce global methane emissions.
- **Indirect Impact:** Indirect impact refers to the transition risk associated with the customers of the company and its indirect impact on the company's revenues. For example, we adjusted airport risk exposure levels to reflect potential loss of passengers by airlines and from retail revenue sources.
- **Individual Company Initiatives:** Steps taken by companies to decarbonise their own operations and value chains can considerably reduce their vulnerability to risks.
- **Expert Interviews:** We consulted subject matter experts to understand global trends and second-order factors affecting assets' transition risk exposure. These interviews provided additional insights that we used to refine the transition risk and mitigation options for our assets.

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 are investment advisers and neither have provided any investment advice.

We also researched steps taken by individual companies to see how well positioned they are to reduce their risk exposure. For example, one of the assets showed high risk in the Net Zero Scenario, but a deeper dive into the asset showed that it has a very well laid out plan to transition to net zero emissions with multiple concrete initiatives taken. All these measures make the asset better prepared and more resilient to transition risks.

5.2.2 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 normalized 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 is described below.

The hazards prioritized in this study were:

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 urbanization. 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).

COOLING DEGREE DAYS

As the climate warms, the amount of energy needed to keep buildings as 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 ten 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).

EXTREME PRECIPITATION

As the climate warms, the amount of energy needed to keep buildings as 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.

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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 ten 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).

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 (e.g., Hurley et al., 2018). As the planet warms, patterns of flood risk are likely to shift (e.g., 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 World Resources Institute (WRI) Aqueduct Flood Hazards database. The World Resources Institute (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 four 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 three time periods (Baseline, 2030, and 2050) under the RCP 8.5 emissions/SSP 2 development scenario.

HAZARD INDEX CREATION

The hazard index was created by normalizing the raw hazard values based on the 2030 minimum and maximum raw hazard exposure. The data were normalized to calculate an average hazard index without weighting one hazard above the other. Averaging across the normalized hazard values for each individual asset location provides an average hazard exposure, which can be compared between asset locations, different companies or between the two scenarios (i.e., 2030 vs 2050). The 2050 hazard exposure data was also normalized using the 2030 values to better compare the two time periods given they are normalized 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 normalized 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 2022

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