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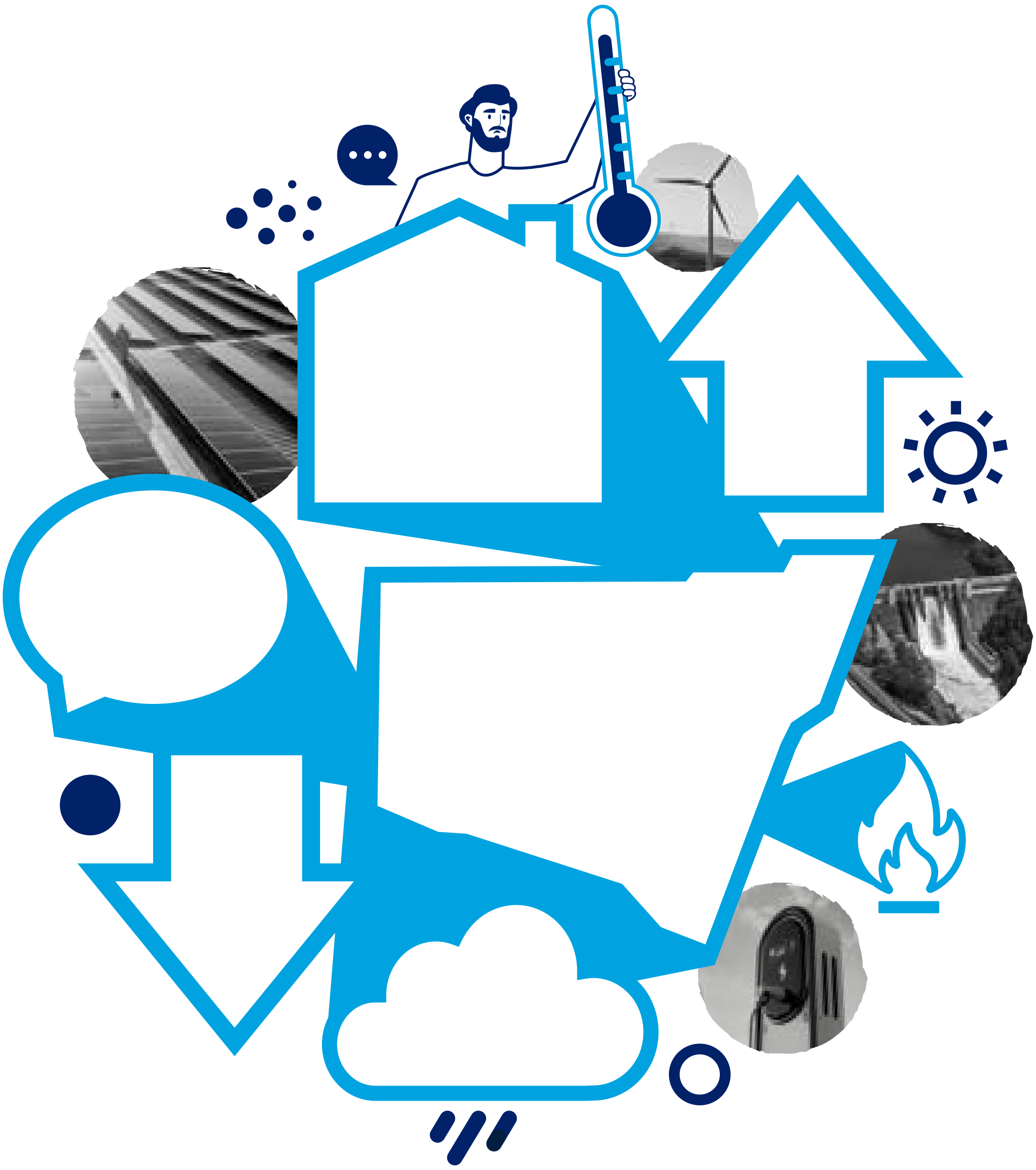


Technical Report

Economic impacts on the New South Wales economy from climate change

October 2025

Deloitte
Access Economics

Contents

Frequently Asked **Questions**

1. What does the economic costs of climate change actually mean?

In the context of this report the economic cost of climate change refers to the impact that changes in the climate will have on the productive potential of the NSW economy. It will be harder for workers to do their jobs, and crops and agricultural yields will fall, for example. These impacts, and many others, will mean that the NSW economy grows more slowly than would otherwise be the case, and there will be fewer job opportunities.

2. What counts as a "cost"?

Lost economic production (GDP) and employment are the two most cited economic costs in this type of analysis. But other costs such as reduced industry output, less tax revenue available to governments and lower returns to Australian exports, for example, are all impacts from climate change.

3. How do you actually measure the "cost" of climate change?

The cost of climate change is measured by looking at a view of the long-term economic outlook without climate change costs. This is a view of how population, participation and productivity will evolve in the long-run. This outlook is compared to other economic outlooks where climate change damages are imposed – like increased heat-stress impacting workers – to determine the cost of these impacts unfolding (compared to no climate change). The difference between these outlooks represents the cost.

4. Are these predictions certain, or just one possible future?

This analysis presents climate scenarios which are a "what if" analytical tool. Scenarios are estimates of possible futures, but not a projection of what will happen. The analysis presents sensitivities of key variables to understand the further potential drivers of uncertainty beyond these core scenarios.

5. Explanation of the sectors used and why they're different from the Commission's standard 8 sectors (energy and electricity, transport, industry, waste, agriculture, land, the built environment and resources.

D.Climate is based on the Global Trade Analysis Project (GTAP) database, specifically GTAP 11. The 75 sectors presented in the GTAP-Power database are aggregated into 22 sectors to ensure the model is tractable. The decision of how sectors are grouped is based on likeness (i.e. heavy manufacturing sectors are grouped together) and importance to representing climate impacts and decarbonisation. For most sectors there is a direct mapping between these two groupings in both emissions and economic activity. The built environment is an exception, as it includes a range of activities that spans many economic sectors and is therefore disaggregated in the D.Climate model.

6. What models are used to estimate results? What is an integrated assessment model? What is a CGE model?

The main model used in this work is D.Climate. D.Climate is Deloitte Access Economics' in-house climate-integrated computable general equilibrium (CGE) and integrated assessment model (IAM). This type of model can be used to quantify the economic impact of climate change, by creating a link between emissions level, global average temperature, and how this will damage different parts of the economy (such as labour productivity or capital stock). Together, these models integrate a view of climate-economy relationships and impacts.

7. Is adaptation incorporated into the model? If so, how?

D.Climate allows for agents within the economy to change (or adapt) their behaviour based on shifts in relative prices. For example, agricultural producers can shift to more mechanised modes of production over time in response to heat-stress induced decline in labour productivity. This represents a form of adaptation.

Specific measures of adaption can be modelled but are not included in this exercise. For example, while agricultural producers can shift production in the way described above, they cannot shift in response to declining agricultural yields from rising temperatures unless specified as a policy response in the model. In reality, investments in climate resistant crop-variants may result in lesser impact. As such technological and policy responses are better defined and demonstrated overtime, they can be included in this type of modelling.

8. What happens if we do nothing?

NSW represents the largest state economy in Australia. It's progress on decarbonisation and adaptation are an important signal to firms, households, other Australian jurisdictions and global peers on the possibilities and benefits of climate action. Continued NSW climate action supports delivering a lower overall cost of transition to net zero for Australia and can support increasing adaptation efforts. For NSW to take no further action to limit emissions and increase adaptation, it risks increasing the cost of decarbonisation and climate change impacts to industry, households and communities.

9. How do the costs of climate change compare to the costs of taking action to stop it?

This report has not quantified the economic implications of transition risks and opportunities for NSW. However, previous work by Deloitte Access Economics and others has found that, while there are temporary transition costs for Australia and NSW, there is eventually a "turning point" where the emissions reductions in existing industries, the emergence of new low-emissions industries and avoided climate change damages mean that action on climate change provides net economic benefits.

The timing of these costs is important. The costs of taking action to avoid climate change are short term and temporary. The costs of climate change will emerge particularly after 2040, will continue to accelerate and will be largely permanent.

In this report, the Lower Climate Cost scenario costs the NSW economy $0.7 trillion out to 2070 while the High Climate Cost scenario costs $1.5 trillion in Gross State Product (GSP). The lower cost scenario represents greater climate action and achieving global net zero by 2050, demonstrating significant benefits of climate action.

10. What is a damage function? How do you make them specific to NSW?

A damage function is a method for translating a change in a climactic outcome, like temperature or precipitation, into an economic impact. In the example of agriculture damage, the damage function translates the change in both temperature and emissions concentrations (as both play a role) and translates these into changes in the headline output of the agricultural sector. This is based on the latest available evidence, although it is constantly evolving.

They are made specific to NSW both through regionalised climate data and by the economic response of NSW and each region, which differs according to the industry structure of each region. For example, the response of the agriculture damage in NSW and its subregions differs according to the size of the industry in that economy, its cost structure, its labour intensity among other factors.

This report uses D.Climate's default damage functions which are designed to provide a consistent integrated assessment framework for analysing climate impacts not just in NSW, but in all regions. All regions experience the economic costs of climate change and so it is important to capture these effects when considering the impacts for NSW. The development of NSW-specific climate risks and damage shocks, such as were developed for the NSW IGR, were not in the scope of this analysis.

11. How do these findings compare with other studies?

There is a wide range of estimates of the relationship between climate change and economic outcomes. Consensus has formed, however, around a negative relationship between global GDP and more than 2°C of warming. This negative relationship also holds for most regions in the world, while some regions (e.g., the Asia Pacific and Africa) are likely to be more negatively affected than others (e.g., Europe).

The estimated climate damages in this report sit well within the range of published estimates both for global, Australian and, to the extent they are available, NSW impacts. The estimates in this report are significantly larger, however, than the previously estimated NSW IGR. This report builds on this study with which included a wider range of climate risks, the inclusion of global damage flowing through to NSW exports and investment and more recent economic data. Please see Technical Report for detailed comparison of impacts to other reported estimates.

12. What is an RCP and an SSP? How are these used in producing estimate for this work?

Representative Concentration Pathways (RCPs) are scenarios for how the concentration of greenhouse gases might evolve over time. They range in severity with higher RCPs like RCP8.5 representing a world in which little to no action is taken to reduce emissions, resulting in a large increase in the concentration of greenhouse gases which in turn causes large shift in the climate. Shared Socioeconomic Pathways (SSPs) build on the RCPs providing more detail regarding the evolution of economic and societal variables like population growth and consumption patterns.

This work defines scenarios which are aligned to widely adopted climate scenarios including SSP-RCP scenarios, particularly in the GDP, population and emissions pathways that are calibrated in the “assumed growth” (no climate change) baseline.

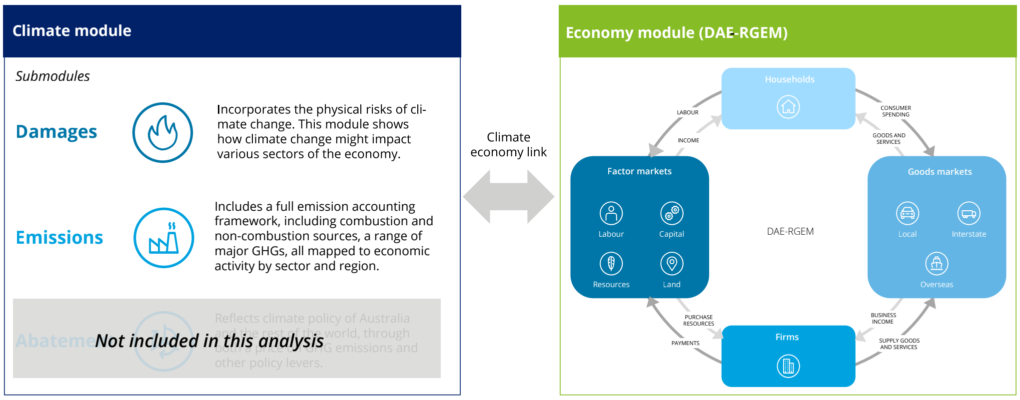
13. What is an RCP and an SSP? How are these used in producing estimate for this work?

Global temperature increase is the primary global climate variable which drives the damage functions and the impacts on the NSW economy. This driver affects the NSW in two ways 1) directly through the effect that this global variable has on the damage shocks to NSW’s factors of production and 2) indirectly via the impact that this global variable has on other economies who purchase the output of the NSW economy.

D.Climate **model**

D.Climate is Deloitte Access Economics' in-house climate-integrated computable general equilibrium (CGE) and integrated assessment model (IAM). It combines emissions, abatement, and climate damages with an economic module to represent the implications of the latest climate science and climate policy on economic activity (Figure 1.1 and Figure 1.2). In doing so, this model can capture the national and global picture of climate change policy, accounting for global trends in emissions reduction, technological development and changes in public policy to reflect the physical and transitional costs associated with different abatement pathways.

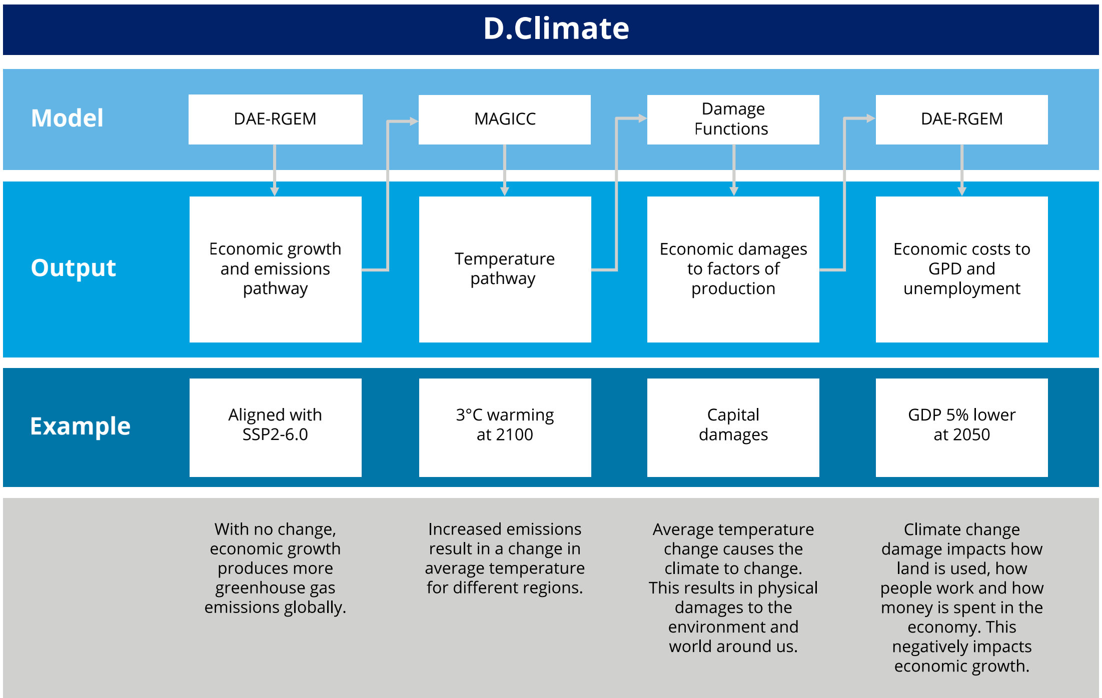
Figure 1.1 D.Climate modelling framework



Source: Deloitte Access Economics (2025).

To model the physical impacts of climate change, emissions trajectories are used to project future temperature changes. The damages module translates these temperature changes and other climate outcomes into monetised economic costs associated with physical impacts of the emissions trajectory specified. The emissions and abatement module link economic activity to emissions, enabling sectors to respond to factors influencing the notional price of carbon (for example, changes in national and global climate policies, ambition for decarbonisation, and the rate of technological development) (Figure 1.2).

Figure 1.2: Climate-economy link



Source: Deloitte Access Economics (2025).

Results from D.Climate provide a "top down" order-of-magnitude estimate of the impact of climate change on economic outcomes such as gross domestic product (GDP), employment, and industry value added at the industry and regional level. These outputs can be used to provide insights into which industries, jobs and economic activity have the most to lose—or gain—from different decarbonisation trajectories. Further insights include which local economies are impacted the most by the choices being made, the costs and benefits of different options for decarbonisation, and by how much any degree of climate change will impact the economy and organisations. To this end, the core function of D.Climate is to provide an economic analysis tool that can be used to answer a variety of questions relating to the economic impacts of a changing climate and evolving policy landscape.

Importantly, results from D.Climate should not be interpreted as forecasts or "most likely" estimates of climate-change or net-zero policy impacts. The scenario analysis and modelling framework instead provides a consistent lens through which to understand the economic difference between possible future worlds, enabling us to draw conclusions about trade-offs and the direction of change in industries, and regional economic outcomes.

To this end, the primary objective of D.Climate is to utilise a clear and transparent modelling framework that relies on the best-available economic evidence to model the inter-relationships between the climate, emissions and economic activity. In doing so, D.Climate seeks to provide a more complete framework through which to analyse the impacts of climate change on the economy.

D.Climate **database**

2.1 D.Climate database construction

The core economic data underpinning D.Climate—the social account matrix (SAM)—is sourced from the Global Trade Analysis Project (GTAP) database.[1] In this instance, that economic data is supplemented with specific data on electricity differentiated by power generation type (i.e., coal, gas, solar etc.,) from the GTAP satellite database GTAP-Power as well as CO2 and non-CO2 emissions data.[2]

The behavioural parameters are also sourced from GTAP with some exceptions discussed below.

2.2 Regional aggregation

D.Climate is a global model that can be tailored to a specific regional concordance in line with the GTAP 11 database. Deloitte has modelled 17 regions, including 15 Australian sub-regions, to allow for nuanced insights for the Australian economy.

Results for New South Wales will be reported on at the sub-state level defined below. In addition, 12 other Australian sub-regions are isolated within the model to allow for more detailed analysis (Table 2.1).

Table 2.1 D.Climate regional definitions

Modelled region	Definition
Sydney	Central Coast, Sydney - Baulkham Hills and Hawkesbury, Sydney - Blacktown, Sydney - City and Inner South, Sydney - Eastern Suburbs, Sydney - Inner South West, Sydney - Inner West, Sydney - North Sydney and Hornsby, Sydney - Northern Beaches, Sydney - Outer South West, Sydney - Outer West and Blue Mountains, Sydney - Parramatta, Sydney - Ryde, Sydney - South West, Sydney - Sutherland
Northern New South Wales	Central West, Coffs Harbour - Grafton, Far West and Orana, Mid North Coast, New England and North West, Newcastle and Lake Macquarie, Richmond - Tweed
Southern New South Wales	Capital Region, Illawarra, Murray, Riverina, Southern Highlands and Shoalhaven, ACT
Rest of Australia	All other Australian regions excluding NSW.
Asia Pacific	All Asia Pacific countries excluding Australia
Rest of the world	Aggregation of the remaining global regions.

2.3 Sectoral aggregation

The industries covered in this report are defined in Table 2.2 below. These industry aggregations are based on specified sectoral concordance in line with the GTAP 11 database.

Reported	Industry	Definition
Agriculture, land, and food	Agricultural and Forestry Products	Paddy rice, Wheat, Cereal grains nec, Vegetables, fruit, nuts, Oil seeds, Sugar cane, sugar beet, Plant-based fibers, Crops nec, Bovine cattle, sheep and goats, Animal products nec, Raw milk, Wool, silk-worm cocoons, Forestry, Fishing
Resources	Coal Extraction	Coal
Resources	Oil and gas extraction	Oil, gas
Resources	Other mining	Other Mining Extraction: mining of metal ores; other mining and quarrying – largely iron ore
Resources	Critical minerals mining	Critical minerals mining based on IEA's definition of critical minerals
Industry	Other manufacturing	Bovine meat products, Meat products nec, Vegetable oils and fats, Dairy products, Processed rice, Sugar, Food products nec, Beverages and tobacco products, Textiles, Wearing apparel, Leather products, Wood products, Paper products, publishing
Resources	Petroleum and coal products	Petroleum, coal products
Industry	Chemical manufacturing	Chemical products, Basic pharmaceutical products, Rubber and plastic products
Industry	Metals manufacturing	Mineral products nec, Ferrous metals, and metal products manufacturing
Industry	Critical minerals manufacturing	Non-Ferrous Metals: production and casting of copper, aluminium, zinc, lead, gold, and silver
Industry	Other heavy manufacturing	Computer, electronic and optic, Electrical equipment, Machinery and equipment nec, Motor vehicles and parts, Transport equipment nec, Manufactures nec
Energy + Utilities	Electricity Transmission	Electricity Transmission
Energy + Utilities	Clean electricity	Hydro base load, Hydro peak load; Wind base load; Solar peak load, solar base load
Energy + Utilities	Hydrogen	Production and use of zero emissions hydrogen
Energy + Utilities	Energy – fossil fuel intensive	Coal, gas and oil peak load and base load
Resources	Gas manufacture, distribution	Gas manufacture, distribution
Energy + Utilities	Water and waste	Water
Construction	Construction	Construction
Trade	Retail trade	Trade, Accommodation, Food and service
Transport	Transport	Transport nec, Water transport, Air transport, Warehousing and support activities
Services	Private services	Communication, Financial services nec, Insurance, Real estate activities, Business services nec, Recreational and other service.
Government Services	Government services	Public Administration and defence, Human health and social work., and Education

Baseline economic **assumptions**

In the baseline, a set of assumptions have been applied for macroeconomic growth rates and technological improvements over the period 2025 to 2070. These key variables have been calibrated drawing on historical and forecast timeseries from reputable sources.

3.1 Macroeconomic variables

Macroeconomic variables including GDP, population, and labour supply are calibrated for each region and each year over the model period, 2025 to 2070. For Australian regions, these variables are based on Deloitte Access Economics' regional (SA4) forecast models, for the period between 2025 and 2054. A rolling five-year average of this data was used to forecast these variables out to 2070.

For the rest of the world, other data sources are used. Growth rates for GDP are calibrated drawing on data from the International Monetary Fund's (IMF) World Economic Outlook Database that provides historical and forecast GDP growth over the period 1980 to 2025.[3] These growth rates are extrapolated to 2070 using historical growth rates and assuming a degree of convergence over the long-run.

Population growth rates are calibrated using the total population trajectories of the Shared Socioeconomic Pathways made available by the International Institute for Applied Systems Analysis (IIASA). Changes to labour supply are estimated by employing a similar approach and are assumed to broadly reflect trends in population growth.

3.2 Scenario assumptions

There are three scenarios analysed using the D.Climate model:

- **Assumed growth baseline:** "Assumed growth" reflects a set of economic projections that do not account for the impact of climate change on the NSW economy and is as the baseline outlook in the D.Climate model. This outlook is the basis to test climate change scenarios against.

- **Lower Climate Cost:** climate change stabilises at well below 2°C: This economic path aligns to rapid and coordinated global action to limit warming of global temperatures. This limits warming to ~1.4°C above pre-industrial levels by 2100. The pathway achieves global net zero by 2050 and minimises the economic damages of climate change for NSW, Australia and the rest of the world.

- **Higher Climate Cost:** continued warming to over 2.6°C: This economic path aligns to delayed global action to limit warming of global temperatures. Global emissions are gradually lowered, in line with the current policies of many major economies. This pathway leads to an increase of approximately 2.6°C above pre-industrial levels by 2100.

These scenarios include the impacts of physical risks only and do not include the costs and benefits of transition and emissions reductions.

By doing so, these scenarios reflect the cost of climate change to the New South Wales economy, without modelling the economic opportunity of decarbonisation or industrial transformation in the state.

These scenarios are described in more detail in Chapter 5.

Costs of **climate change**

4.1 Temperature as the fundamental driver of damages

The damages component of the D.Climate model links emissions and a changing climate to economic outcomes. The fundamental "driver" of economic damages is rising global temperature which induces climate change and extreme weather events. Economic output (as measured by GDP) is impacted through the physical damages that affect productivity and/or the stock of productive factors (Figure A 2)

Global temperature increases are the main driver of climate impacts and are regionalised via the damage functions. To accurately reflect the relationship between emissions and projected temperature change in D.Climate, outputs from separate climate models are used to parametrise global temperature and emissions trajectories aligned to a specific climate scenarios. Specifically, global mean surface air temperature (GSAT) changes relative to the pre-industrial (1850) baseline and global greenhouse gas emissions are sourced from the Model for the Assessment of Greenhouse Gas Induced Climate Change (MAGICC) as described in Meinshausen et al., (2011) and Meinshausen et al., (2020), and configured by Nicholls et al., (2021).,[4,5] MAGICC is developed and maintained through Climate Resources.

Climate Resources has separately developed a regional downscaling approach (MESMER-X) to provide regional average temperature, precipitation, and relative humidity variables (such as Wet Bulb Globe Temperature) to quantify the physical damages associated with a changing climate.[6] This data is provided to Deloitte Access Economics by Climate Resource. Climate Resource provides annual average historical and forecast data for each region specified in the D.Climate model database (refer to Chapter 2.2), from 1850 until 2100. This is provided for each temperature pathway outlined in the model scenarios (refer to Chapter 5). The variables provided include surface air temperature, precipitation, and wet bulb globe temperature for each region and year. These are provided at the 0.1, 0.5, and 0.9 percentiles, based on modelling completed by Climate Resource. This data is used in the calculation of the different physical damages, described in detail below. As economies reduce emissions, these damage impacts also reduce. In this sense, abatement drives avoided damage benefits within the damage module. The combined effect of warming driven by historical emissions already in the atmosphere and the amount that will be emitted under the emissions path described previously, means that some amount of climate damage is unavoidable.

The relevant global and regional temperature pathways are used to quantify the physical damages across six regionalised damage functions which include:

1. Heat stress damages to labour productivity
2. Human health damages to labour productivity
3. Sea level rise damages to land and capital stock
4. Damages to capital stock and the capital depreciation rate from climate disasters
5. Agricultural damages from changes in total factor productivity
6. Tourism damages to net inflow of foreign currency

The damages module draws on damage functions originally developed by Roson and Sartori (2016), Kjellstrom et al., (2017), Diaz et al., (2025), Ortiz-Bobea et al., (2021), among others.[7] Several of the damage functions have been updated to reflect advances in the academic literature, and more detail of these are found in the sections below.

4.2 Heat stress damages on labour productivity

Rising global temperatures lead to shifts in the distribution of daily peak temperatures and relative humidity. Heat waves are likely to become more frequent and increasingly extreme for many countries.

A working environment that is sufficiently hot can negatively affect the health and safety of workers, as well as restrict their ability to perform tasks and limit their productive capacity. To continue functioning at elevated body temperatures, workers may instinctively reduce work intensity (whether it occurs through self-instinct or occupational health management interventions) resulting in reduced "work capacity" and lower labour productivity.

This analysis estimates the effect of rising temperatures and changing relative humidity levels on labour productivity using WBGT as a measure of heat stress. The data for WBGT for each time period and region is provided by Climate Resources. The methodology follows an approach proposed by Kjellstrom et al., (2017), which uses a series of functions describing the relationship between WBGT and labour productivity across three different work intensities based on a review of epidemiological datasets.[8] It is assumed that changes in labour productivity (an economic concept) are equal to changes in estimated work capacity (a physiological concept).

Consistent with the approach proposed by Kjellstrom et al., (2017), it is assumed that a geography or region's WBGT varies over three 4-hour intervals comprising approximately 12 hours in a working day. These three variants of WBGT (mean, max and half) have been projected at monthly intervals using the simplified WBGT index – sWBGT – based on surface temperature and water vapour pressure (developed by the Australian Bureau of Meteorology). Labour productivity is then estimated for each geography/region at monthly intervals, across each of the three 4-hour intervals assumed to comprise the working day. Monthly labour productivity estimates are then averaged to give an aggregate measure of labour productivity.

4.3 Human health damages to labour productivity

Climate change poses diverse and complex risks to human health, which have been a prominent feature of estimates of future climate change impacts. Many estimates of economic damages rely on direct cost methodologies (i.e., price times quantity). With regard to human health, the price is typically equal to the value of a statistical life, based on estimates of willingness to pay to reduce the risk of death or diseases, or the willingness to accept compensation for increased risk. However, these methods ignore the human health impacts on labour productivity and the demand for health services.

This analysis estimates the higher-order economic effects (or indirect costs) of human health impacts and variations in labour productivity based on the work undertaken by Roson and Sartori (2016), which in turn is based on Bosello et al., (2006).[9] Bosello et al., (2006) conduct a meta-analysis of the epidemiological, medical, and interdisciplinary literature to estimate the additional number of extra cases of mortality and morbidity associated with a given increase in some vector-borne diseases (malaria, dengue, schistosomiasis), heat- and cold-related diseases, and diarrhea. The information obtained in this research has been combined with data on the structure of the working population to infer the number of lost working days. The changes in morbidity and mortality are interpreted as changes in labour productivity. Roson and Sartori (2016) update the work of Bosello et al., (2006) to account for recent literature on health impacts and studies mentioned in IPCC (2014), scaling up or down the variations in labour productivity.

The results of these studies are expressed as changes in average labour productivity for a 1ºC increase in the temperature (implicitly assuming that the relationship is approximately linear). For the purposes of this analysis, and to understand the relationship between human health impacts , an increase in average temperature, and time, we regressed the variables to find an equation with a satisfactory fit for the relationship.

4.4 Sea level rise damages to land and capital stock

As average global temperatures continue to rise, glaciers and polar ice are melting, and water bodies are experiencing thermal expansion. Together, these factors cause sea-level rise (SLR), Changing temperatures also affect local weather and climate, increasing both the likelihood and intensity of storm surges in coastal regions.

SLR can impact a geography/region's total stock of capital through a combination of erosion, inundation, and salt intrusion along the coastline. As the global stock of land declines due to SLR, productive capital on that land is either fully depreciated and needs to be relocated or needs to be replaced more frequently due to gradual deterioration from erosion and salt-water intrusion. The extent of capital lost to SLR will depend on several geography-specific characteristics, including
(i) the composition of the shoreline (cliffs and rocky coasts are less subject to erosion than sandy coasts and wetlands),
(ii) the total length of the coastline,
(iii) the share of the coast that is suitable for productive purposes and
(iv) the vertical land movement (e.g., coastal subsidence or uplift).

In this analysis, the impact of SLR and coastal inundation has been quantified as a reduction in capital productivity in coastal regions using outputs from Depsky (2023).[10] This open-source version of Diaz (2016) Coastal Impact and Adaptation Model (CIAM) quantifies global coastal damages for 12,000 coastal regions for a range of future adaptation (protection and/or retreat), emissions and socio-economic trajectories. Coastal damages include both market impacts, such as capital costs from inundation and flooding, and non-market impacts, such as reduction in ecosystem services from wetland loss and mortality from extreme storm surges. These estimates can be flexibly aggregated at the city, country, regional, and global level, and are widely used by government bodies and for cost-benefit analysis, including the US EPA's calculation of social costs of carbon.[11]

Since economic models, such as D.Climate, are designed to analyse market-based impacts, the damage estimates utilised in this analysis have been scaled to reflect only the capital costs of sea level rise and coastal inundation modelled in Depsky (2023) and Diaz (2016).

4.5 Damages to capital stock

Capital damages are "measured as a reduction in capital productivity across sectors", reflecting the fact that a changing climate requires firms to spend more on capital to achieve the same amount of output in every period.

In this analysis, the relationship between temperature increase and estimated rising insurance premiums from the XDI report is used as a proxy for the annual change in capital productivity in the D.Climate model, by state and territories in Australia.[12] The XDI data provides future estimates for increasing total technical insurance premiums at the Local Government Area level – akin to a monetised capital damage by Local Government Area. The estimated damages produced by this methodology can be interpreted as a percentage of annual capital investment that is diverted to repair and replace damaged assets due to an associated average temperature in a region. This effectively smooths a stochastic process of natural disaster impacts over time into an average annual damage estimate captured by a reduction in capital productivity.

Although the damage estimate does not measure the direct impact of any particular temperature increase to a particular location at a particular time in future modelled periods, the implied relationship between temperature change and capital damage in XDI indirectly and implicitly reflects the fact that, as global temperatures continue to increase above pre-industrial levels, the frequency and intensity of natural hazards will rise in aggregate, and the productivity of capital will fall, on average.

In addition to damages to the capital productivity in a region, there is literature to suggest that there will be responses to capital depreciation rates in response to global average temperature.[13] To address this, a shock to model an increase in the capital depreciation rate, in addition to damages to capital productivity, is incorporated to the damages to capital shock. This approach links the rate of capital depreciation with climate change using a theoretical link (following a Cobb-Douglas production function) between output, capital, and the depreciation rate of capital, where the relationship between output and temperature is empirically determined and implied shock to the depreciation rate is derived. A conservative approach, drawing on a range of sources, adopts a stylised 1°C change in temperature leading to an increase in the capital depreciation rate by 1 percentage point.[14] The year-on-year difference in temperature was used to derive the value of the capital depreciation rate shock.

4.6 Agricultural damages from changes in total factor productivity

Climate change will see rising temperatures, higher concentrations of CO_2 in the atmosphere, and different regional patterns of precipitation which affect agricultural production. In this report, the impact of climate change on the agriculture sector is studied through changes in total factor productivity (TFP) of agriculture using an empirical relationship between TFP, temperature, and precipitation identified in Ortiz-Bobea et al., (2021).[15] By focusing on TFP, Ortiz-Bobea et al., (2021) offers a broader reflection of the effects of climate change on the agricultural sector, than previous studies that have focused mainly on crop yields. The relationship between agricultural productivity, temperature and precipitation is also defined by modelling a counter-factual trend, with greater methodological transparency and specification tests that empirically justify the baseline model utilised in Ortiz-Bobea et al., (2021).

Consistent with the approach of Ortiz-Bobea et al., (2021) agricultural productivity in this analysis is a function of temperature and precipitation. Surface temperature and precipitation is projected at annual intervals for each scenario. Agricultural productivity is then estimated for each geography/region, annually.

4.7 Tourism damages to net inflow of foreign currency

Climate-induced economic tourism damages are driven by changes in net visitor flows and expenditure. In D.Climate, changes to net visitor flows and expenditure are fundamentally driven by the exposure of each region to climate change. However, the impacts can be varied. Countries with lower current temperatures can experience a beneficial net inflow of foreign currency as temperatures rise and tourism increases in the region. Conversely, for countries with high current temperatures, further temperature rises mean the economy could experience a net outflow of foreign currency as tourism spending is reallocated to other regions.

To estimate tourism damages in D.Climate, functions that relate visitor arrivals and departures to average temperature are employed. These functions are consistent with those employed by Roson and Sartori (2016) and are derived from economic models expressed in terms of land area, average temperature, length of coastline, per capita income, and the number of countries with shared land borders. Projected average temperatures are used as inputs to these functions to determine a resulting net flow of foreign currency. The magnitude and persistence of tourism damages are also a function of the economic structure of each region's economy. Regions with more diverse economic structures are less likely to experience persistent economic damages as industries are less reliant on tourism and more malleable and adaptable.

4.8 Limitations of the damage module

The damage function has benefited from a rapidly expanding econometric literature, which has enabled the parameterisation of plausibly causal relationships that more accurately capture relationships between climate and the economy.[16] Deloitte Access Economics has incorporated these into a more disaggregated, multi-sectoral view of damages and have updated damage estimates based on more recently available science and research.[17] For example, a number of damage functions used in this analysis reflect a core finding that temperature increases have a nonlinear relationship with economic outcomes.[18] Deloitte Access Economics nevertheless recognises that there are a range of impact channels that are not explicitly modelled using D.Climate. In this sense, this work can be considered a conservative estimate of impacts, and ongoing model development will look to incorporate these channels over time. A selection of these includes:

- Individual natural disasters and extreme events[19]
- Changes in household energy demand[20]
- Impact of water stress on agriculture[21][22]
- Crime and other social impacts[23]
- Geopolitical risk[24]
- Ocean acidification[25]

Deloitte Access Economics regularly reviews existing damage functions to reflect the latest research and understanding of the economic impacts of climate change. To this end, the underlying methodologies used to quantify the effect of climate change on agricultural productivity and capital productivity have recently been updated using new and emerging findings from Oritz-Bobea (2021) and Diaz and Moore (2015) respectively.[26] An independent review of Deloitte Access Economics' damages module was completed by Professor Tom Kompas, which continues to guide the ongoing development of these approaches.

An extensive literature focuses on climatic nonlinearities that are not captured in this framework. Within climate-economic modelling, the most renowned argument for considering these impacts is made by Martin Weitzman and includes the discussion of "tipping points".[27] These include events, such as the partial disintegration of ice sheets, biosphere collapses, or permafrost loss, that pose a threat of abrupt and irreversible climate change. Positively, the most recent IPCC report argues that there is growing confidence that taking action to reduce emissions will significantly lower the likelihood of certain tipping points being reached.[28] Given these uncertainties, this analysis primarily considers the chronic impacts of warming, providing a conservative estimate of the potential future damages of climate change.

Scenario **definitions**

D.Climate utilises a scenario analysis framework to model the impacts of climate change and climate policy on economic activity. In this report, there are two climate cost scenarios presented, a "Low Climate Cost" and a "High Climate Cost" scenario. The emissions level and associated temperature pathway for these scenarios have been informed by scenario analysis developed originally by the IPCC in its Sixth Assessment Report on Climate Change (AR6) and the Network of Central Banks and Supervisors for the Greening of the Financial System (NGFS). These are outlined in the sections below.

5.1 Assumed growth: A baseline scenario

'Assumed growth' reflects a set of economic projections that do not account for the impacts of climate change on the economy and can be used to calibrate the D.Climate model. There are no temperature pathways and their associated climate damages introduced into this scenario. The economy grows according to forecasts from Deloitte Access Economics (see Chapter 3.1 for more detail).

5.2 "Lower Climate Cost": climate stabilises well below 2°C

This scenario is aligned to the temperature pathway in the NGFS Net Zero by 2050 scenario.[29] This economic path broadly aligns to quick and coordinated global action to limit warming of global temperatures to around 1.5ºC above pre-industrial levels by 2100. The pathway achieves global net zero by 2050 and minimises the economic damages of climate change for NSW, Australia and the world.

The NGFS framework explores a set of different possible transition pathways, with varying levels of ambition and coordination in climate policies. These scenarios can be grouped into four quadrants: orderly transition, disorderly transition, hot house world, and 'too little, too late' scenarios. The Net Zero by 2050 scenario represents an orderly transition, reflecting the early introduction of ambitious climate policies that become more stringent over time. Both the physical and transitions risks are relatively subdued compared to other scenarios.

Given that this scenario reflects early, coordinated action on climate change, which limits both emissions and warming, it was chosen for the "Lower Climate Cost" scenario.

This scenario limits global warming through a combination of stringent climate policies and increased innovation to facilitate decarbonisation. The world reaches net zero emissions CO_2 emissions by approximately 2050 in this scenario. This scenario also includes some jurisdictions reaching net zero for all GHGs by 2050 (the US, EU, UK, Canada, Australia, and Japan).

As emissions are reduced, global average temperatures do not rise by as much compared to other scenarios. This limits the anticipated climate damages that are expected to coincide with rising global temperatures. Consequently, there are less severe costs to the economy under this scenario.

5.3 "High Climate Cost": continued warming to over 2.6°C

In 2011, a set of four emissions and warming pathways were published to support consistent scenario analysis in the climate modelling community, called representative concentration pathways (RCPs).[30] These show different levels of future GHG emissions, and how the concentration of different emissions levels in the atmosphere may lead to different climate outcomes.

In 2017, a concurrent research effort sought to develop a set if similar set of consistent future scenarios for human development: shared socioeconomic pathways (SSPs).[31] These focus on more societal factors including demographics, human development, economic growth, inequality, governance, technological change, and policy orientations.

Neither RCPs or SSPs are "complete" without the other and have been integrated into a joint SSP-RCP scenario framework, that has been adopted by the IPCC in the Sixth Assessment report (AR6).[32]

The scenario used for the "High Climate Cost" scenario is aligned to SSP2-4.5. This reflects RCP 4.5 and SSP2. Under these scenarios, CO_2 concentrations peak at around 2040 and start to fall in the middle of the century. There is a slow transition towards renewable energy, and a moderate increase in extreme weather by the end of the century. Globally, social, economic, and technological trends occur as they have historically, with global efforts making slow progress in achieving sustainable development goals. There are some improvements in resource and energy intensity, however environmental systems still suffer. This assumes that current global emissions reductions policies and pledges are met, and this leads to a median estimate of warming of greater than 2.6°C at 2100, relative to pre-industrial times.

5.4 Why these two scenarios?

The selection and definition of these two scenarios were developed agreed in discussions with the Net Zero Commission. They were selected to reflect the following principles:

1. Assumptions underpinning some of the more severe climate scenarios have become less plausible over time. Scenarios with emissions aligned to an RCP8.5 or greater than 4°C outcome rely on assumptions of long term and ongoing expansion of coal use for electricity at a global scale.[33] There has been evidence of the world making progress in "bending the curve" – avoiding a path of 4°C of global average warming aligned to projections of the early 2000s.[34]
2. There are uncertainties in the climate, the economy and the academic understanding of both that could result in impacts that are different from the median estimates of these scenarios. The scenarios applied in this report are not a forecast of what is 'most likely' but an estimate of impacts from the specific scenario assumptions.
Where assumptions change, so too does the estimate long-term economic outcomes. The scenario set used in the report have their uncertainties tested using sensitivity analysis.
3. The Low Climate Cost scenario has the outcome of the world limiting warming and achieving net zero emissions by 2050. The Low Climate Cost scenario has the outcome of the world limiting warming and achieving net zero emissions by 2050. The difference this scenario and the High Cost Scenario can be understood as the economic benefit of reducing climate change costs.

5.5 Benchmarking D.Climate results

There are a wide range of estimates of the relationship between climate change and economic outcomes. Consensus has formed, however, around a negative relationship between global GDP and more than 2°C of warming. This negative relationship also holds for most regions in the world, while some regions (e.g., Asia Pacific and Africa) are likely to be more negatively affected than others (e.g., Europe).

Examining more regional-level impacts in this study reveals more nuanced impacts of climate change on some regions that are not captured by more aggregated averages.
Selected damage estimates (global) from comparable studies have been included in the table below. While Deloitte's estimates are at the larger side of the range of damages estimates across the literature, the regional breakdown in D.Climate is likely contributing to this outcome.

The estimates for NSW in this report are larger than both previous D.Climate studies the NSW IGR. This report builds on the NSW IGR study and includes a wider range of climate risks, global damage flowing through to NSW exports and investment and more recent economic data. The economic impact estimates in this study are larger than previous D.Climate-based studies mainly due to updates to the agriculture, sea level rise and capital damage shocks described in Section 4.

Table 5.1 Select damage estimates from comparable studies (global and NSW)

Source	GDP deviation from baseline	Global average warming (°C)	Year	Comments
This project: Deloitte (2025)	-9.6% (NSW)	2.3	2070	This project: RCP4.5 vs no climate change.
NSW IGR (2021)	-0.3%	2.2	2060	RCP4.5 vs RCP2.6, bottom-up damage estimates. Looks at limited set of damages and does not include global impacts.
Oxford Economics (2022)	-50% to -60%	5	2070	RCP 7.0, volatility damage function
This project: Deloitte (2025)	-14.1% (global)	2.3	2070	This project: RCP4.5 vs no climate change.
Deloitte (2025)	-14.1% (global)	2.3	2070	RCP4.5 vs no climate change.
Deloitte (2024)	-6% (global)	2.8	2070	As estimated for recent report Turning Point: Feeding the World Sustainably.
Network Greening for the Financial System Phase 5 (2024)	-15%	2.0	2050	Delayed Transition scenario, NGFS based on REMIND model, not NiGEM.
Kompas (2018)	-3%	3	2100	Global estimates not published for 2050
McKibbin (2021)	-0.7% to -3.7%	RCP6.0	2051-2060	Regional variation
SwisseRE (2021)	-1.3% to -11%	2	2050	"Unknown unknowns" estimates are featured in report.
IMF (Kahn et al) (2019)	-2.5%	RCP8.5	2070	GDP per capita
Oxford Economics (2022)	-50% to -60%	5	2070	RCP 7.0, volatility damage function
Neale and Pitman (2024)	-40%	4.5	2100	Accounting for global weather in climate damages
Burke et al 2018	-30%	4	2100	GDP per capita, damages accelerate over longer term

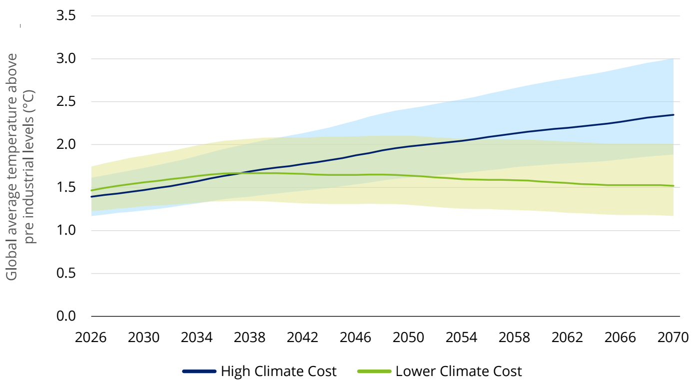
5.6 Sensitivities around core scenarios

While there are estimates of future climate and economic pathways, there are still ranges of uncertainties for given climate scenarios that may or may not occur. There are also uncertainties as to how global, national, and state economies will respond to these scenarios. To address these, sensitivities were conducted on both the temperature pathway and the economic pathway underlying these scenarios.

5.6.1 Temperature sensitivities

While higher temperature pathways are typically associated with worse environmental damage and degradation, the extent of this damage also broadens – with estimated impacts showing a far wider range of expected damages, as compared to lower temperature pathways. Similarly, while certain emissions pathways are associated with estimated changes to global surface temperatures, these estimates reflect median expectations of temperature outcomes. In reality, factors impact temperature outcomes mean that likely outcomes sit within ranges, as shown in below (Chart 5.1).

Chart5.1 Global yearly average temperature deviation from pre-industrial levels to 2070 (°C), Higher and Lower Climate Cost Scenarios Net Zero by 2050 and SSP245 pathways



Source: Deloitte Access Economics Analysis of data provided by MAGICC, Meinshausen et al. (2011, 2020), Nicholls et al. (2021). Note: The shaded areas represent the 90% confidence interval around the mean estimates. The High Climate Cost scenario is aligned to an SSP2-4.5 temperature pathway. The Lower Climate Cost is aligned to the NGFS Net Zero by 2050 temperature pathway.

Standard modelling typically focuses on the worsening environmental outcomes that are expected under higher warming pathways. Here, estimates of climate damages are typically adopted to reflect what is "most likely" to occur. While this is important in communicating the economic costs associated with higher temperatures, the uncertainty inherent to climate change means that the range of outcomes when modelling climate change impacts is wide. As a result, the relative size of costs when comparing a narrow middle of the road scenario to an NGFS net zero by 2050 scenario could be greater than expected.

As such, sensitivity analyses around these climate outcomes, as well as how key climate damages may drive costs for the NSW economy, will support report narrative by not only demonstrating the economic costs associated with higher temperatures, but also greater uncertainty – and thus the potential for even greater devastation – that would face NSW in the case of less proactive climate action.

5.6.2 Economic sensitivities

To capture economic uncertainty, a sensitivity has been conducted on the damage function which contributes the most towards the overall economic costs: heat stress. Due to its direct impact on labour productivity, and the impact this has on industry production, output, and gross value add, any uncertainty with how the economy will respond to heat stress will incur significant economic costs.

There are different minimum temperature thresholds at which different types of work are able to be performed. These thresholds are based on different metabolic rates and are provided for an average work intensity (200W, 300W, and 400W).[35] This is then used to group industries into different categories, based on the average work intensity required to perform this work for an extended period of time.

However, rather than all work being conducted used at an average intensity value, as used in the core scenarios, work occurs at a range of intensities that are associated with different minimum temperature thresholds. For example, rather than all office work occurring at a 200W intensity, as is used to calculate the core scenario damages to labour productivity, it occurs at a range of 167-243W.[36] The economic sensitivities apply these ranges as new minimum temperature thresholds used to calculate the heat stress damage function that are applied to each sector. This reflects the uncertainty associated with how different sectors will respond to a changing climate.

Additional **D.Climate results**

In the absence of climate change impacts, NSW's long run economic growth is expected to continue in line with its historical rages, around 2.17% per year. Accounting for climate change materially slows economic growth in NSW, with the economic pressure climate change poses becoming increasingly severe over time. The main report discusses the detail of the core scenario results. This section focuses on the findings of the sensitivity analysis.

6.1 Temperature sensitivity results

Climate-economy modelling typically focuses on median or average estimates of climate futures and the associated damages. Exploring the sources of uncertainty around these median estimates is required to provide insight into risks, the potential for extremes and the overall consequences of this. In doing so, testing for uncertainty via sensitivity analysis confirms economic insights which can more meaningfully support policy decision making and risk mitigation.

The climate sensitivity was performed to assess how, for particular emissions pathways, there is a distribution of potential climate outcomes around the median estimates used in the core scenarios. This was analysed by including both the 90th percentile and the 10th percentile climate outcomes for the pathway of emissions in each scenario. The 90th percentile of the High Climate Cost scenario represents global average warming of around 3°C by 2070 and the 10th percentile of the Lower Climate Cost scenario represents around 1.2°C of global average warming by 2070. This climate sensitivity does not include a view to tipping points.

The sensitivity confirms that a 90th percentile climate outcome for the "High Climate Cost" scenario emissions pathway will exacerbate the, with results indicating the costs could be approximately $95 billion larger, in net present value terms. Conversely, less warming under the "Lower Climate Cost" scenario reduces the costs to the NSW economy, by approximately $78 billion in net present value terms. These impacts are considered to be relatively conservative estimates of the climate sensitivity as the damage functions do not account for tipping points or specific acute events that may arise non-linearly from higher-than-average climate outcomes.

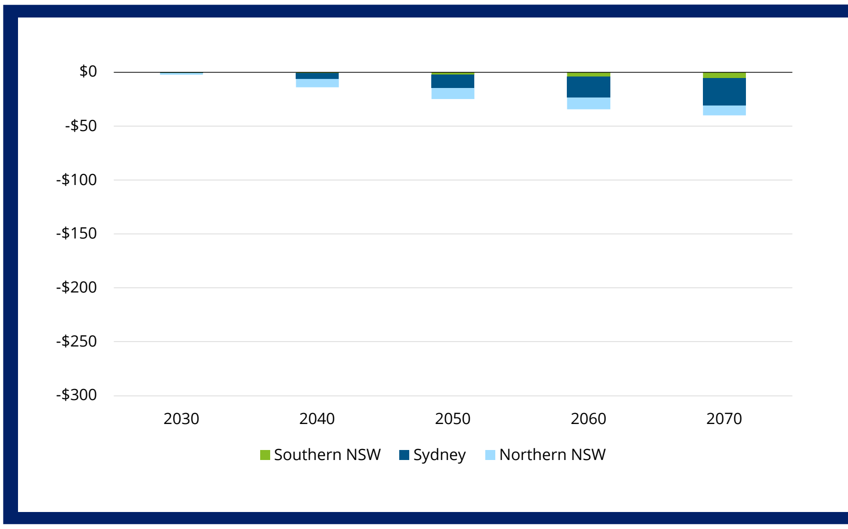


Chart 6.1: NSW "Lower Climate Cost" + low climate outcome, GSP deviations from a no climate change baseline (level deviation, $b)

Source: Deloitte Access Economics.

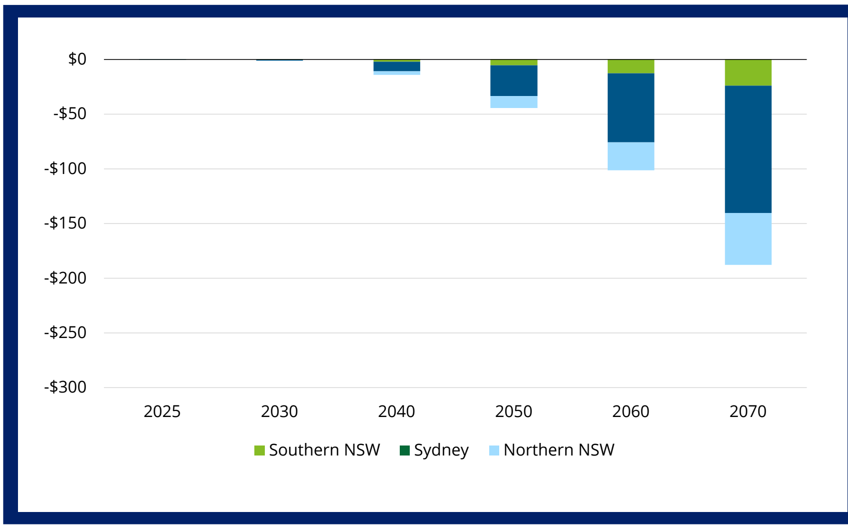


Chart 6.2: NSW "High Climate Cost" + high climate outcome, GSP deviations from a no climate change baseline (level deviation, $b)

Source: Deloitte Access Economics.

6.2 Economic sensitivity results

The economic sensitivity was performed to assess how the economy responds to shifting climate conditions. This is analysed by varying the heat stress damage function as it has the largest impact to the economy, as outlined in Chapter 5.5.2. This economic flexibility test is a useful proxy to understanding how adaptation to changing climate conditions impacts economic costs.
This economic flexibility test is a useful proxy to understanding how adaptation to changing climate conditions impacts economic costs.

Sensitivity analysis confirms that economic risks have a significant downside and potential for more extreme impacts. Similar to the core scenario, the majority of the effects are observed in Sydney. However, the entire state will be impacted.

With significant action to reduce emissions and a lot "going right", the sensitivity tests show that the economic costs of warming for NSW could be around $200 billion smaller than the Lower Climate Cost scenario costs[37].

On the downside, if the climate warms faster or the economy cannot respond or adapt quickly enough, the sensitivity tests show that the economic costs of climate change could be up to approximately $940 billion in addition to the costs of the High Climate Cost scenario[38].

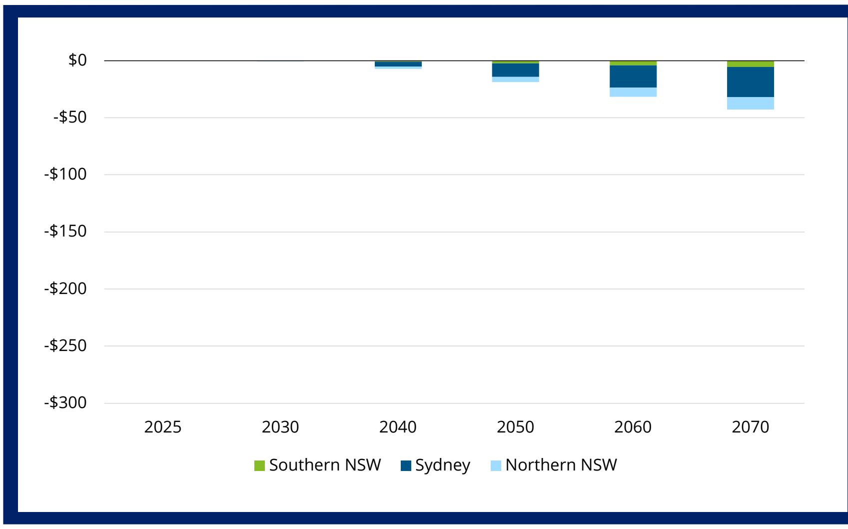


Chart 6.3: NSW "Lower Climate Cost" + low economic sensitivity, GSP deviations from a no climate change baseline (level deviation, $b)

Source: Deloitte Access Economics.

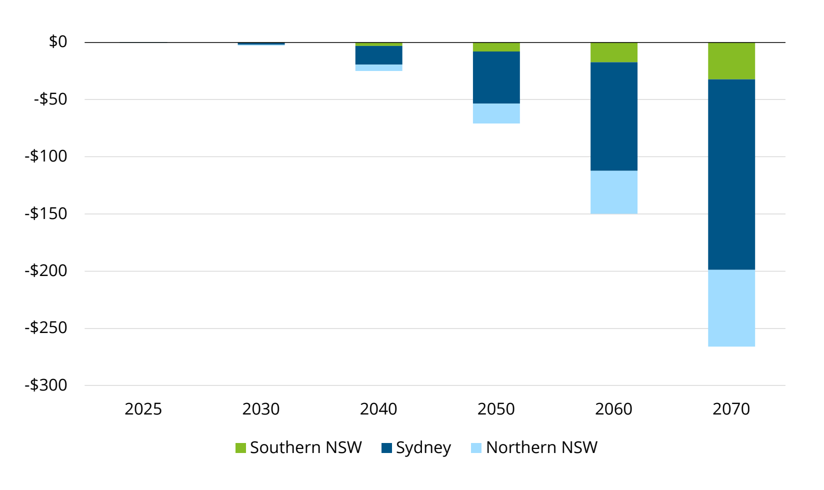


Chart 6.4: NSW "High Climate Cost" + high economic sensitivity, GSP deviations from a no climate change baseline (level deviation, $b)

Source: Deloitte Access Economics.

6.3 Impacts on employment by industry

The NSW- and region-level impacts on employment are reported in this study. Employment changes by industry drive these overall results, however, the employment by industry has not been reported. For most industries, as reflected by the impacts on industry gross value added, employment is lower due to climate impacts. These lower employment impacts are concentrated on the industries that are most labour-intensive and represent the largest share of the NSW economy: private services, government services, construction, among others.

The results of this modelling suggest a marginally positive impact on employment in the agriculture industry for NSW. There remains further research required to understand the drivers of this result and how these might vary by region. The likely drivers of this result for NSW are driven by the following dynamics in the model:

- The productivity effect: as climate change impacts the productivity of agriculture, firms in the industry will try to find other ways to increase production, which may mean that they use relatively more labour over time. Further, one of the primary mechanisms by which the damage functions impact a sector is through changes in labour productivity, and as labour becomes less productive, larger numbers of workers are required to meet the same or similar levels of production compared to the baseline.
- The cross-industry effect: within NSW, the damage to other sectors means there are fewer job opportunities in those sectors. This means that some labour is available to work in other industries, and to solve the model, some of these workers may shift to the agriculture sector.
- The competitiveness effect: climate change is damaging agricultural industries in all regions of the world. If other regions face higher costs to its agriculture industry than NSW, then agricultural production in NSW may remain at or exceed current levels as other regions are no longer able to provide current levels of agricultural production, and as other less impacted regions transition towards becoming larger producers of agricultural products.

Household **impact modelling**

7.1 Analysing the impact on households in New South Wales

The outputs of D.Climate are typically discussed at a macroeconomic level, and not directly associated with individual or household impacts. To illustrate the potential impacts to NSW households, further analysis was conducted to present potential impacts of climate change on an average household's grocery expenses and household income. This reflects a decline in living standards that NSW households are likely to face under a changing climate.

7.2 D.Climate outputs used

The following D.Climate outputs were used to extend the economic impact to NSW households:

- Total private household expenditure (million $AUD2025),
- Total private household consumption (million $AUD2025), and
- Total percentage deviation between baseline and scenarios of prices received by suppliers plus output taxes as a proxy for the price faced by consumers

Each of these outputs are the difference between the assumed growth baseline scenario and the climate scenario (either Lower Climate Cost or High Climate Cost), expressed by region and industry where appropriate.

7.3 Estimating potential changes in grocery prices driven by climate scenarios

To model the impacts to household groceries, outputs from D.Climate were applied to representative price indices for different grocery items. The "Agriculture, Land and Food" industry includes fresh produce that have undergone little-to-no processing, such as fruits and vegetables, but also includes other agricultural products, such as milk, dairy, eggs, and cattle grazing. Processed foods are reflected under "Other Manufacturing". A full list of the grocery items and their categorisation is outlined in 7.3.2 below.

7.3.1 Calculating price indices

Price index data from the Australian Bureau of Statistics (ABS) by Australian Dietary Guidelines food groups was used to establish a baseline for the representative price indices. Relevant food groups were then assigned to either the Agriculture, Land and Food or Other Manufacturing industry classifications used in the D.Climate model. The following Australian Dietary Guidelines Price Indices (AGDPI) were used and classified as:

Agriculture, Land and Food

- Vegetables and legumes/beans
- Fruits
- Milk, yoghurt, cheese and alternatives, mostly reduced fat
- Lean meats and poultry, fish, eggs, tofu, nuts, seeds:

Other Manufacturing

- Grain (cereal foods)
- Oils and other processed items
- Other discretionary processed food items

The baseline price index for each food group was then constructed by taking the values in 2023 and growing them at a long run inflation rate of 2.5% per year to the year 2070.[39]

These baseline prices where then multiplied by the D.Climate-derived price deviations, by industry and in each scenario. The average of the "Agriculture, Land and Food" and "Other Manufacturing" industries was taken to calculate the price index for their respective grocery items by region and the rate of increase in this index reflected the inflation rate of these goods.

7.3.2 How was the average grocery basket and grocery spend constructed?

The representative grocery baskets were selected by examining previous work undertaken by CHOICE when comparing prices at some of Australia's national supermarket brands.[40] These items were then mapped to an associated D.Climate industry (Table 7.1).

Table 7.1 Representative basket 1 and modelling aggregation

Item	Modelling aggregation
1kg white flour	Agriculture, Land and Food
400g canned tomatoes	Agriculture, Land and Food
2L full cream milk	Agriculture, Land and Food
1kg royal gala apples	Agriculture, Land and Food
1kg carrots	Agriculture, Land and Food
500g beef mince	Agriculture, Land and Food
Weetbix, 375g pack	Other manufacturing
Tea bags	Other manufacturing
White sandwich bread	Other manufacturing
1kg cheese	Agriculture, Land and Food
1kg frozen peas	Other manufacturing
500g pasta	Other manufacturing
2kg white sugar	Other manufacturing
500g salted butter	Agriculture, Land and Food

Source: CHOICE (2025) and Deloitte Access Economics (2025)

Household grocery baskets can vary widely due to large variation in terms of budget, taste and preferences, dietary restriction, local specials, store, store location, and more. Additionally, CHOICE notes that, "the intent is to compare the prices of commonly bought items, rather than creating a basket that's representative of an average weekly shop.[41] "Accordingly, for this analysis, the representative grocery baskets were examined to determine only the proportion of total spend on goods in the basket that fall into the "Agriculture, Land and Food" and "Other Manufacturing" categories, not necessarily quantify how much each individual household is looking to spend on each category. The proportion of the total spend for the representative items showed that products produced by the "Agriculture, Land and Food" industry comprised around two thirds of the total spend and processed items produced by the "Other Manufacturing" industry comprised one third of the total spend.[42]

Weekly household spend data is sourced from Canstar Blue's survey of 2,800 shoppers in July 2025.[43] The average 2-person household in New South Wales spends $180 weekly on groceries. Only New South Wales-specific data on 2-person households could be sourced. However, it showed that the average 2-person household in New South Wales spent about 1.07 times more than the national average on groceries weekly. This increased spend ratio was applied to the national average of 4-person households weekly grocery spends to estimate the average for New South Wales which came to $242.70.

7.3.3. How are results communicated?

Results are communicated for 2- and 4-person households based on deviations from the baseline forecast of consumer prices to the High Climate Cost scenario. The total yearly spend on fresh and processed groceries assumes that the average household shops weekly.

Valuing **the future**

It is inherently difficult to "discount" the future, particularly concerning an issue as socially and economically complex as global climate change due to increased global average temperatures.

In considering this issue, it is important to recognise the intergenerational impact of climate change on society and in doing so, account for the tendency of people to preference short term economic flows over longer-term flows. In comparing welfare, utility and costs and benefits across generations, the discount rate needs to be determined for analysis.

In determining the rate, the question becomes what rate is appropriate to embody these preferences in estimating the net present value of impacts to economies and societies from climate change and various climate change policy responses.

Greenhouse gas emissions have a long residence time in the atmosphere, which means that the value of the impacts of today's emissions must be considered for future generations. Equally, the decisions made by society today in relation to policy responses regarding mitigation and adaptation to altered climatic conditions, impact future generations significantly.

In this context:

The use of a high discount rate implies that society put less weight on future impacts and therefore less emphasis on guarding against such future costs.[44]

The use of a low discount rate highlights the importance of future generations' wellbeing.[45] Society should act now to protect future generations from climate change impacts.

A discount rate of 2% has been used by Deloitte Access Economics in this analysis, after considering the differing perspectives within literature, the economic framework adopted for analysis in D.Climate and broader policy actions modelled. This rate reflects a consistent view social discounting in climate change economic analysis. For example, the results of a survey of economists in the American Economic Journal: Economic Policy (the sample contains over 200 academics who are defined as experts on social discounting by virtue of their publications) indicates that most favour a low discount rate: with more than three-quarters comfortable with a median discount rate of 2%.[46] More recently, Bauer and Rudebusch (2023) have analysed trends in interest rates in the bond market to posit that lower interest rates since 1990's also provide a rationale to utilise lower a social discount rate in climate policy analysis.[47]

The results presented in the main report are presented using a 2% rate on this basis. The weighting of impacts to the 2050 to 2070 period means that the overall net present value of impacts are sensitive to discount rate (. It should also be noted that, given the very long term impacts of greenhouse gas emissions in the atmosphere, without action to reduce emissions, the impacts would continue beyond 2070 if the modelling were completed over a longer time horizon.

Table 2.2: Sensitivities to discount rates and time periods, Higher Climate Cost scenario

	Discount Rate		
NSW GSP ($millions)	2%	4%	7%
2024-2070	-1,518,000	-846,000	-400,000
2024-2050	-325,000	-259,000	-182,000
2050-2070	-1,193,000	-587,000	-218,000

Source: Deloitte Access Economics estimates.
Note: Figures are rounded to the nearest $billion.

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