



Investor  
Group on  
Climate  
Change

## **Submission:**

Climate Change Authority - Setting, tracking and achieving Australia's emissions reduction targets - Issues Paper

June 2023

## **About the Investor Group on Climate Change**

The Investor Group on Climate Change (IGCC) is a collaboration of Australian and New Zealand institutional investors focused on the impact of climate change on investments.

Our members manage more than \$30 trillion in assets under management (AUM), with beneficiaries including more than 7.5 million Australians and New Zealanders. Members include our countries' largest superannuation and retail funds, specialist investors and advisory groups.

We are a not-for-profit organisation. Our work is funded by members' fees, philanthropy, partnerships, and sponsorship from supporters who understand the power of capital to support climate action.

## Summary of key points

SECTION	IGCC COMMENT	RECOMMENDATION
<p><b>Climate change is a systemic financial risk.</b></p> <p><b>Section 2.1. Strategic Framework</b></p>	<p>Climate change creates huge financial risks and opportunities for Australia. Climate change is considered a mainstream financial risk among investors. The greatest of these risks is the damage that would be caused by global warming above 1.5°C.</p> <p>To attract and keep capital and maintain economic competitiveness, Australia needs effective, consistent and robust policy frameworks that provide a supportive investment environment to achieve long-term investment returns.</p> <p>To limit risks and maximise returns investors are integrating climate change into their portfolio construction, capital allocation and active stewardship activities. Capital is mobile and governments and companies that do not have credible strategies and policies to manage their transition, will increasingly become unattractive, and exposed to divestment and capital flight.</p>	<p>In national progress reporting and policy recommendations, consider and incorporate emerging international investor expectations for companies, sectors and government policy. Comparability and consistency for global frameworks will support investment in the Australian economy by providing clarity to global capital markets, reduce regulatory burden, and avoid ongoing capital flight.</p>
<p><b>Physical climate risks – building national resilience</b></p> <p><b>Section 2.1. Strategic Framework</b></p>	<p>The Authority’s focus on building resilience to climate change damage is crucial and welcome. The economic, financial, social and environment costs of climate damages are likely to be larger than the costs of achieving net zero. This is the case even under ambitious emissions scenarios. Credible, timely, effective, and visible policy interventions to are needed reduce the impacts of physical risk, maintain the economic and social viability of exposed regions, avoid capital flight from exposed</p>	<p>The Authority (with necessary Government funding) should continue to build its capacity to assess and make recommendations on policy to address physical climate risks and increase resilience. Initially, this would include ensuring physical risk indicators are strongly incorporated into the Authority’s Strategic Policy Framework and Progress Framework. These indicators should</p>

	regions, and facilitate public-private partnerships, which will be central to finance adaptation needs.	measure the direct and indirect effectiveness of adaptation policy on increasing resilience, against clearly defined resilience targets. In addition, physical risk and resilience should be repositioned as key economic concerns and should be considered in all relevant policies to avoid maladaptation during decarbonisation. This should support and not duplicate existing Government processes such as the development and undertaking of the National Climate Risk Assessment. This should also draw on indicators and benchmarks that are being developed by investors, insurers, and public-private partnerships globally to support international comparability.
<b>Aligning National Economic Strategy to 1.5°C</b>  <b>Sections: 2.3. Target-setting Framework, 3.5. Targets</b>	National targets and economic strategies that are aligned to 1.5°C will deliver the best long-term returns to investors. To have any influence on achieving global emissions reductions on the scale required, Australia must itself commit to a 1.5°C aligned target as soon as possible, not least because Australia has clear economic advantages in a world that undertakes a rapid and orderly transition to net zero emissions.	Australia's NDCs under the Paris Agreement should be aligned with limiting average global warming to 1.5°C.
	There are broad range of possible approaches to defining a 1.5°C target for Australia. Investor frameworks for assessing sovereign climate risks and opportunities consider both least cost and fair-share national pathways.	In presenting its recommendations on Australia's 2035 target, IGCC recommends the Authority provide a 1.5°C least cost emissions pathway and a 1.5°C fair-share carbon budget in its advice to Government.

<p><b>Unlocking Sectoral Investment in Net Zero</b></p> <p><b>Section 3.2. Sectoral pathways</b></p>	<p>The establishment of 1.5°C sector pathways and goals is a core ingredient in unlocking finance into climate solutions. Sector pathways and goals help to ensure transition risk is managed over a suitable timeframe and minimise economic disruption by providing a clear framework for investors and the companies they own, to guide business strategy, climate-related financial disclosures, manage asset decommissioning, workforce and community transition and the timely allocation of capital towards new technology and infrastructure.</p>	<p>To support the development of the Net Zero Australia Plan, the Authority should recommend clear 2030, 2035, 2040 and 2050 emissions pathways and goal posts for all sectors. This would include recommendations on policy actions required to close gaps between projected emissions and sector goals.</p> <p>Sector pathways and goals should:</p> <ul style="list-style-type: none"> <li>• Be science based and use a combination of least cost and fair share approaches to achieving 1.5°C aligned national targets;</li> <li>• Acknowledge pathways will need to change over time;</li> <li>• Be developed to allow comparability with internationally recognised global analysis;</li> <li>• Build on the existing work that has already been undertaken in Australia;</li> <li>• Be sufficiently granular to support development and execution of credible Australian investor and company transition and adaptation plans; and</li> <li>• Be developed in consultation with the private sector and other stakeholders.</li> </ul>
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<p><b>Align scenarios and modelling with investor needs</b></p> <p><b>Sections: 2.3. Target-setting Framework, 3.5. Targets, 3.2. Sectoral pathways)</b></p>	<p>Australian-level climate risk and opportunity scenarios are required to facilitate private investment but must be aligned with global best practice. The Authority’s modelling can support investment in the transition to net zero and resilience to the impacts of climate change.</p> <p>Climate change is already inflicting significant macroeconomic costs on Australia and the rest of the world. Failure to integrate climate change damage into economic analysis of future policy will lead to perverse outcomes and increase the risk of stranded assets.</p>	<p>Modelling should:</p> <ul style="list-style-type: none"> <li>• cover both transition and physical risks;</li> <li>• be aligned with global best practice scenario analysis;</li> <li>• include orderly transition (1.5°C), disorderly, current policies and hot house (4+ °C) scenarios;</li> <li>• use a disorderly transition to net zero as the baseline scenario;</li> <li>• be undertaken in close consultation with other government modelling exercises;</li> <li>• be iterative and include stakeholder input;</li> <li>• generate outputs that support the development and execution of credible Australian investor and company transition and adaptation plans.</li> </ul>
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For further information and to discuss any matters within this submission, please contact:

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## Introduction

The Investor Group on Climate Change (IGCC) welcomes the opportunity to provide feedback on the Climate Change Authority's (the Authority) *Setting, tracking and achieving Australia's emissions reduction targets - Issues Paper*.

The Authority's Issues Paper covers a broad range of topics. IGCC has focused its comments on the areas most material to long-term investment returns:

- the setting of Australia's 2035 emissions target (Sections: 2.3. Target-setting Framework, 3.5. Targets)
- sector by sector emissions pathways and plans (Sections: 3.2. Sectoral pathways), and
- cross cutting issues such as physical climate risks and economic modelling frameworks (Sections: 2.1. Strategic Framework, 2.2. Progress Framework, 3.2. Sectoral pathways)

## Climate change is a systemic financial risk

*Climate change creates huge financial risks and opportunities for Australia. Climate change is considered a mainstream financial risk among investors. The greatest of these risks is the damage that would be caused by global warming above 1.5°C.*

*To attract and keep capital and maintain economic competitiveness, Australia needs effective, consistent and robust policy frameworks that provide a supportive investment environment to achieve long-term investment returns.*

*To limit risks and maximise returns investors are integrating climate change into their portfolio construction, capital allocation and active stewardship activities. Capital is mobile and governments and companies that do not have credible strategies and policies to manage their transition, will increasingly become unattractive, and exposed to divestment and capital flight.*

**Recommendation to Authority (Section 2.1. Strategic Framework):** In national progress reporting and policy recommendations consider and incorporate emerging international investor expectations for companies, sectors and government policy. Comparability and consistency with global frameworks will support investment in the Australian economy by providing clarity to global capital markets, reduce regulatory burden, and avoid ongoing capital flight.

It is well recognised that climate change is a material and systemic financial risk to investors, a first-order risk to the economy and a threat to the stable functioning of the global financial system.<sup>1</sup> This recognition has prompted regulatory and legal guidance in almost all major global financial centres, including Australia, identifying climate change as a foreseeable, material and actionable risk that directors and trustees have a fiduciary duty to address.<sup>2</sup>

As the long-term custodians of trillions of dollars in retirement funds, investors have a fiduciary duty to deliver long-term returns for their beneficiaries. Unless climate change is addressed in an orderly and just way, the long-term retirement savings of millions of Australians are under threat.

Australia can be a prosperous and vibrant economy in a net zero world. The country has all the necessary ingredients to attract investment across the economy to achieve net zero emissions by 2050. These include export opportunities, driven by increasing demand for existing and new products such as green steel and aluminium, green hydrogen and many critical raw materials.

While the transition to net zero emissions offers an enormous opportunity to Australia, it also presents significant risk. Australia's economy is relatively emissions intensive and has higher carbon exposure than other major markets. In addition, failure to implement a just transition with concrete outcomes will erode public and investor confidence in national climate policy directions.

The biggest risk is missing the opportunity to limit the damage of climate change.

Climate damages above 1.5°C jeopardise the stability and resilience of the social, financial and environmental systems upon which investment relies. The Intergovernmental Panel on Climate Change (IPCC) has concluded that Australian institutions, organisations and systems are at high risk of being unable to cope with the socio-economic damages that would ensue from global warming of around 2°C.<sup>3</sup> Long-term investment confidence in Australia, as a result, depends on confidence in avoiding this warming.

### Long-term investment returns depend on effective, consistent and robust climate change policy responses

Institutional investors are co-owners of companies and assets throughout the Australian and global economies: climate change is a risk from which they cannot divest. Therefore, to secure investment returns, institutional investors must act within their portfolios and engage with businesses and policymakers on climate solutions.

The scale of investment necessary to achieve net zero is beyond either the private sector or the public sector alone. Both sectors are already making climate-positive investments, but for the greatest shared benefit, the scale needs to grow substantially.<sup>4</sup>

Investors, businesses and governments will need to work together to meet this challenge. Effective and durable national policies will be critical to give clear signals to business and investors to invest in zero carbon opportunities.

Countries that mitigate climate risk in their entire economy with clear policy signals will be more competitive in attracting and maintaining local and global investment. They will face relatively lower sovereign risks, lessening the likelihood of downgrades to debt and credit ratings, as investors increasingly assess the underlying transition and physical implications of climate change at a

national level. To have effect at an economy-wide level, systemic and sector-based levers are needed.

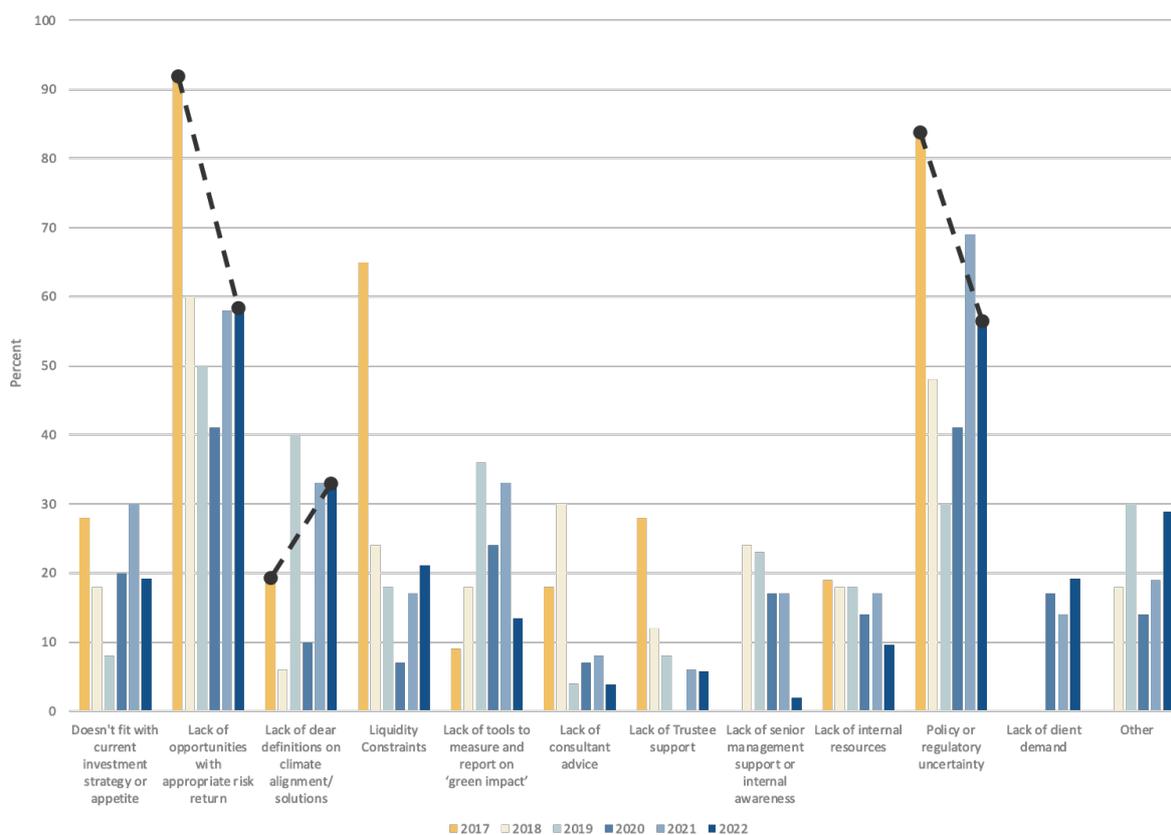
### Recent climate policy improves the investment environment

Climate change policy stability and political consensus is critical for investor confidence to deploy capital towards climate solutions.<sup>5</sup> Policy instability has been a key barrier to investment in Australia over two decades. Durable political consensus is required to reverse the trend of turbulent climate policymaking in Australia and avoid ongoing capital flight.

Investor feedback indicates that a stronger 2030 emissions target, bipartisan support for net zero emissions by 2050, passage of Australian *Climate Change Act*, and climate policy reforms at a sector and state level are starting to provide policy and regulatory certainty for investors in Australia.

In 2021, around 70% percent of investors highlighted policy uncertainty as a key barrier to investment in Australia, compared to 53% in 2022<sup>6</sup>. However, climate policy uncertainty remains a barrier, as does lack of appropriate investment opportunities (58%), and lack of clear definitions for what constitutes a climate solution (33%) (Figure 1).

Figure 1: Main barriers to increasing exposure to low carbon or climate aligned investment solutions – 2017 – 2022. Dotted lines show how the three major barriers have changed since the first survey. Note: investors were asked to select the ‘top 3’ responses. Questions without three years of data are not included.



## Comparability and consistency with global investment frameworks

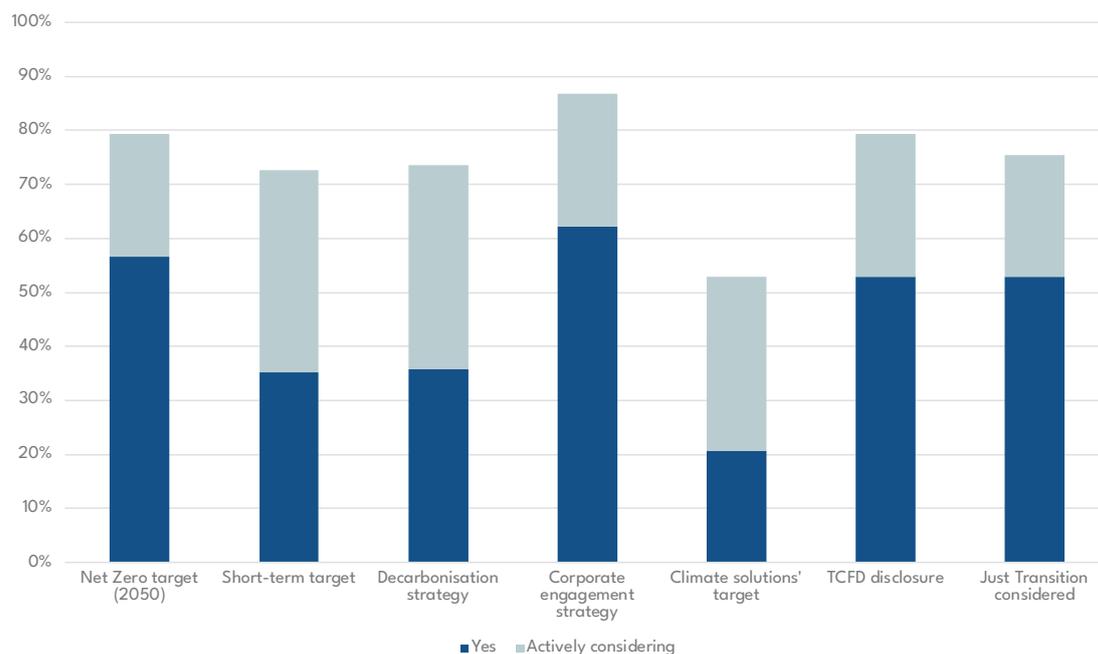
In its annual survey to gauge investor responses to climate change, in September 2022, IGCC surveyed institutional investors (superannuation funds, sovereign wealth funds and asset managers) regarding net zero-aligned investing.<sup>7</sup> This report provides the collective views and progress of investors with funds representing more than A\$30 trillion AUM globally and A\$2.1 trillion AUM domiciled within Australia. Therefore, this report covers approximately 60% of the total AUM in Australia. Many survey respondents are IGCC members.

Based on this survey, Figure 2 summarises investors' climate change commitments and actions. It demonstrates that climate change is starting to define how portfolios are constructed, the high priority it commands in the corporate stewardship of investee companies, a strong focus on social considerations such as just transition, and a growing focus on setting targets for climate solution investments (e.g. \$X billion or X% of portfolio).

To meet these targets and deliver long-term returns, investors will realign portfolios and capital allocation decisions and increase their active stewardship of investee companies. This will require them to make choices between companies and markets based their emissions intensity and resilience to the impacts of climate change.

In national progress reporting and policy recommendations, the Authority should consider and incorporate emerging international investor expectations for companies, sectors and government policy. Comparability and consistency for global frameworks will support investment in the Australian economy by providing clarity to global capital markets, reduce regulatory burdens, and avoid ongoing capital flight.

Figure 2: Proportion of investors taking specific actions on climate change. Note, IGCC runs this survey annually and in most cases “Actively considering” translates into a “Yes” within one to two years.\*



\* A climate solution investment is an investment in economic activities that contribute substantially to climate change mitigation. TCFD = Taskforce for Climate Related Disclosures.

## Physical climate risks – building national resilience

*The Authority's focus on building resilience to climate change damage is crucial and welcome. The economic, financial, social and environment costs of climate damages are likely to be larger than the costs of achieving net zero. This is the case even under ambitious emissions scenarios. Credible, timely, effective, and visible policy interventions are needed to reduce the impacts of physical risk, maintain the economic and social viability of exposed regions, avoid capital flight, and facilitate public-private partnerships, which will be central to finance adaptation needs.*

**Recommendation to Authority (Section 2.1. Strategic Framework):** *The Authority (with necessary Government funding) should continue to build its capacity to assess and make recommendations on policy to address physical climate risks and increase resilience. Initially, this would include ensuring physical risk indicators are strongly incorporated into the Authority's Strategic Policy Framework and Progress Framework. These indicators should measure the direct and indirect effectiveness of adaptation policy on increasing resilience, against clearly defined resilience targets. In addition, physical risk and resilience should be repositioned as key economic concerns and should be considered in all relevant policies to avoid maladaptation during decarbonisation. This should support and not duplicate existing Government processes such as the development and undertaking of the National Climate Risk Assessment. This should also draw on indicators and benchmarks that are being developed by investors, insurers, and public-private partnerships globally to support international comparability.*

IGCC welcomes the Authority's integration of adaptation to climate change throughout the issues paper. Building resilience to the impacts of climate change is central to Australia's long-term prosperity.

While resilience was positioned primarily as a wellbeing concern in the issues paper, for institutional investors, physical risk is a pressing and significant economic concern.

There is mounting evidence that the economic impacts of physical risks are larger than transition risks, such as modelling undertaken for the world's central banks, which concludes<sup>8</sup>, *“For all scenarios and timescales, physical risks outweigh transition risks. Stringent mitigation in line with the Net Zero 2050 scenario will already be beneficial by 2050 and strongly reduces risks towards the end of the century. This also underlines the need to add investments on adaptation.”*

In Australia, the physical impacts of climate change will cost the economy hundreds of billions of dollars in the coming decades, primarily driven by loss of life and physical damage from extreme weather events.<sup>9</sup> Institutional investors are exposed to these impacts directly and indirectly. Direct impacts may include damage caused by more intense and more frequent extreme weather events or reduced productivity due to altered climate conditions. Indirect impacts may include disruptions to supply chains that interrupt business, more expensive or unavailable insurance and worse overall economic conditions.

For investors and governments, financing adaptation and climate resilience is a necessity and an opportunity. Innovative financial mechanisms and public–private co-investments will be required to avoid the costs of climate change falling on vulnerable people and communities. In the absence of these measures, the government risks becoming the insurer of last resort.

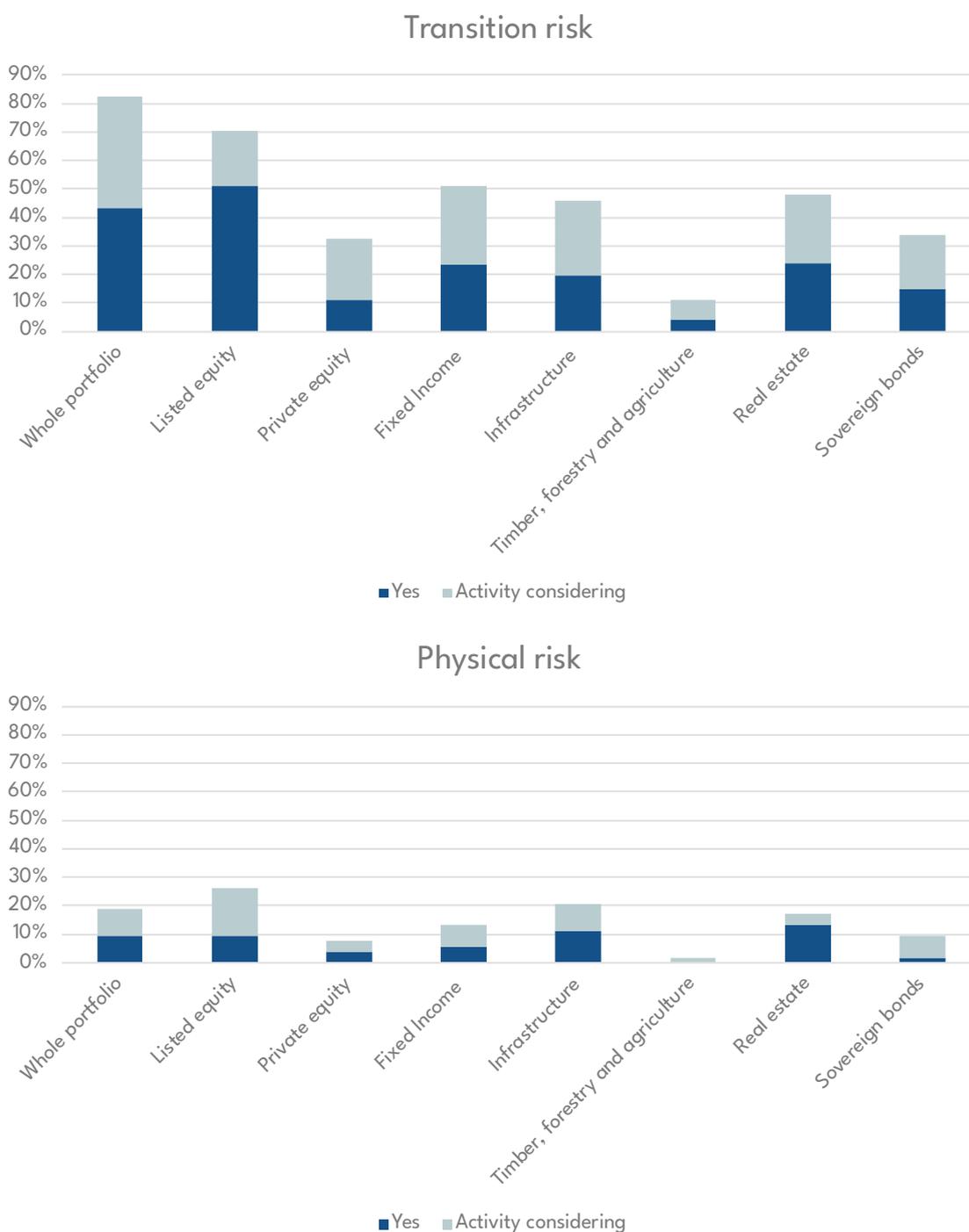
To invest in adaptation and to continue to invest in high physical risk regions (i.e., Australia), investors need clear adaptation policy based on credible risk information, that leads to increased resilience and an acceptable level of residual risk. Otherwise, as more investors assess the physical risk within their own portfolios (due to mandatory disclosure, regulatory pressure and/or competitive advantage), there is a growing risk of lower investment returns, stranded assets and capital flight.

### Physical risk and financial markets

Currently, the physical impacts of climate change are significantly under-priced in financial markets<sup>10</sup>. For example, only 22% of investors in a recent survey have assessed physical climate risk across their whole portfolios, this compares to around 80% for transition risk (Figure 4). (ASX 200 companies are assessing physical risk slightly less comprehensively than the surveyed investors.<sup>11</sup>)

Given the severity of projected climate impacts based on current emissions trajectories, we expect investors and companies to assess physical risk more comprehensively and accurately over the coming years. As tools and methodologies emerge to better assess and value physical risk, this may trigger rapid and systemic market corrections which will expose regions with significant vulnerability to large-scale divestment. Feedback from IGCC members and international investors indicates that this is already beginning to occur to a limited extent.

Figure 3: Assessment of transition risk vs physical risk.



## Australia can be a world leader in resilience

Governments have a key role in managing these systemic and regional risks. While a region or asset may have high exposure to climate hazards, with adaptation and other risk management measures, vulnerability can be reduced. Credible, timely, effective, and visible policy interventions can avoid divestment from exposed regions and attract the necessary private capital to meet resilience goals and targets. IGCC and its members have developed several policy recommendations to avoid divestment from regions exposed to physical risks and support investment in adaptation<sup>12</sup>.

Australia's unique exposure to physical risk, alongside its scientific and emergency management expertise in natural hazards, mean it is well-placed to provide international leadership on developing and achieving resilience targets. These targets should be framed around resilience (as the outcome) as opposed to adaptation, to avoid maladaptation and include measures that can increase resilience (e.g., community education, risk transfer, managed retreat).

The Federal Government's upcoming National Climate Risk Assessment can provide a useful shared evidence base for understanding physical risk<sup>13</sup>. Aligning government and regulatory work programs and ensuring close consultation with scientists and industry is essential to streamline and amplify these efforts and ensure outputs are fit for purpose beyond government use.

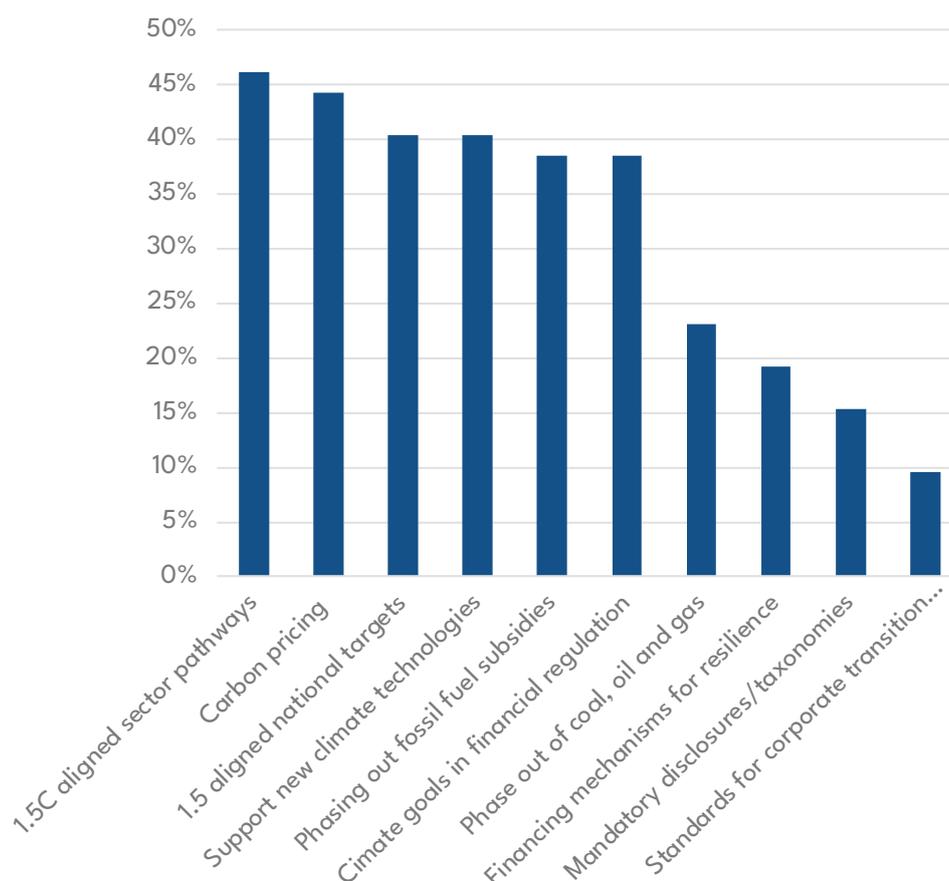
## Aligning National Economic Strategy to 1.5°C

*National targets and economic strategies that are aligned to 1.5°C will deliver the best long-term returns to investors. To have any influence on achieving global emissions reductions on the scale required Australia must itself commit to a 1.5°C aligned target as soon as possible, not least because Australia has clear economic advantages in a world that undertakes a rapid and orderly transition to net zero emissions.*

**Recommendation to Authority (Section 2.3. Target setting framework):** Australia’s NDCs under the Paris Agreement should be aligned with limiting average global warming to 1.5°C.

Australia’s 2035 target is very important to investors (Figure 5). 1.5°C-aligned national and sector targets will give investors longer term visibility of national policy goals and promote timely investment to support an orderly economic transition that secures Australia’s position in the global economy, provides necessary support at all levels of society, and achieves greater emissions reductions over the coming decade.

*Figure 4: Investors - the key policy priorities of the Federal Government. Investors were asked to select the top three answers. Note this survey was taken before the carbon pricing reforms under the Safeguard Mechanism were agreed.<sup>14</sup>*



The focus on achieving science-based national targets stems from investor, central bank, and scientific analysis that demonstrates that the greatest net benefit to the economy will be achieved by early policy interventions to align national economic strategies to the objective of the Paris Agreement to limit damages from average global warming above 1.5°C.<sup>15</sup>

Beyond reducing the scale and scope of compounding climate damages from warming above 1.5°C<sup>16</sup>, Australia has clear economic advantages in a world that undertakes a rapid and orderly transition to net zero emissions. For example, export opportunities driven by increasing demand for existing and new products, including green steel and aluminium, green hydrogen and many critical raw materials.

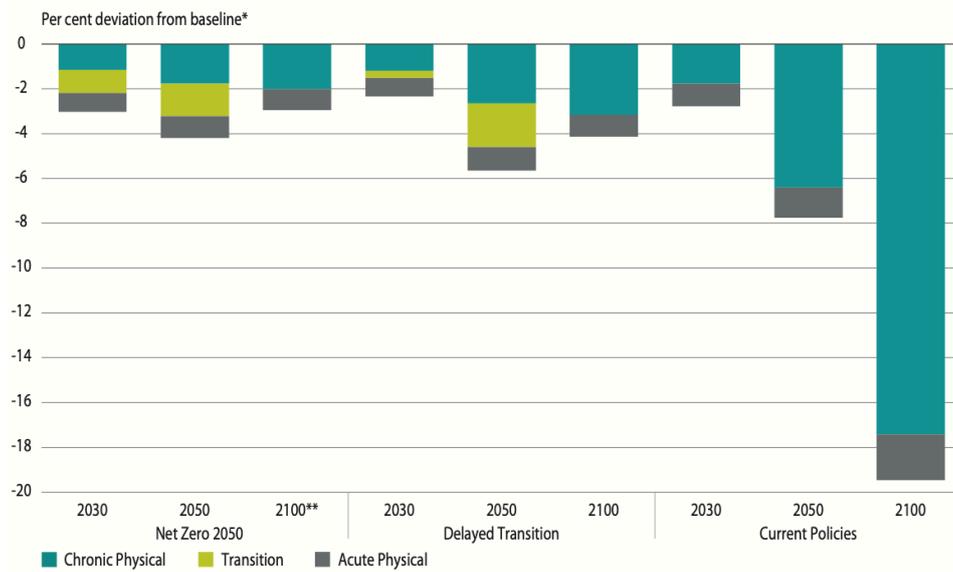
#### *Net Economic, Community and Social Benefits of 1.5°C*

The projected warming under current global emissions reduction policies will put many social and ecological systems at very high risk and beyond adaptation limits. In Australia, impacts will exacerbate many extreme events, increase heat-related mortality and morbidity for people and wildlife, and reduce water availability in some regions.<sup>17</sup>

Delays in emission reductions and adaptation will impede climate-resilient development, resulting in more costly impacts and requiring a greater scale of adjustments. These impacts will disproportionately affect vulnerable people and communities.

Conversely, limiting global warming to 1.5°C, with low overshoot, will have significant social and economic benefits, including opportunities associated with economic transition and avoided physical risk and adaptation costs. The figure below highlights the impact of different emissions pathways on global GDP, demonstrating the significantly reduced costs and greater opportunity under a 1.5°C pathway.

### GDP deviation due to transition, chronic and acute risks - REMIND model



\* The NiGEM baseline is a hypothetical scenario with no transition nor physical risk.  
 \*\* Economic impacts are modelled out to 2050. To obtain an estimate of impacts in 2100, we took the estimate of chronic physical risk impacts based on the damage function, extrapolated acute physical risk increase (based on the period 2022-2050) up to 2100, and assumed no transition risk impacts at this point (ie. the GDP loss is solely due to physical risk).  
 Source: IIASA NGFS Climate Scenarios Database, NiGEM model (REMIND inputs).

Source: Network for Greening the Financial System (NGFS)<sup>18</sup>

#### Net benefits of 1.5oC – An Investors view

Australian Asset Owner - \$66 billion in AUM:

*“We expect climate change and climate related policy and technology developments to impact on future investment returns. We use scenarios help us assess climate-related risks and opportunities, given its complexity, and the significant uncertainty as to how it will shape investment outcomes.*

*“The analysis suggests a Current Path scenario (2.7°C global warming) is likely to be the most damaging for both the climate and also global economic growth and investment returns, over the long-term.*

*“Despite greater near-term transition costs for Sustained Action (well below 2°C) and Net Zero by 2050 (1.5°C) scenarios, mitigating physical climate risks is expected to deliver better economic outcomes than the Current Path scenario over the long-term.”<sup>19</sup>*

### Transition to net zero must be equitable

While the transition to net zero emissions offers an enormous opportunity to Australia, it also presents significant risk. Australia's economy is relatively emissions intensive and has higher carbon exposures than other major markets.

Failure to implement strategies for a just transition with measurable outcomes would also erode public and investor confidence in national climate policy directions. To promote investment, social equity and maintain public support, the cost and benefits of the transition need to be shared equitably.

IGCC welcomes the Government's commitment to establish the Net Zero Transition Authority, and its mandate to engage with investors to facilitate investment in transitioning regions. IGCC has commissioned analysis to assess and address the barriers to investment in these regions and would welcome the opportunity to present this research to the Authority when it is finalised.

## 1.5°C alignment – An Investor’s view

Australian Asset Manager - \$7 billion in AUM:

*“The signalling by the government of its commitment to an ambitious reduction scenario consistent with limiting warming to 1.5 degrees would have substantial impacts on how we invest capital. While recent changes to climate policy in Australia, like changes to the Safeguard Mechanism, and the update of our 2030 Nationally Determined Target, have provided some certainty on the direction of travel, these actions are not yet aligned with the Paris Agreement, and as of yet have not indicated the level of conviction necessary to limit the worst impacts of warming.*

*“Without an ambitious commitment to emissions reduction in line with the science, investors will continue to invest as though we will not be limiting warming to 1.5 degrees. In that scenario, asset allocation favours defensive rather than productive assets within the Australian economy.*

*“In the long term, where the negative scenario of warming not being limited to safe levels appears likely, we would anticipate extreme risks to physical property and capital, resource scarcity, and systemic risks to institutions which underpin the Australian economy, amidst other impacts.*

*“In the short to medium term, without a 1.5 degree aligned emissions reduction target from government, we are less likely to invest in substantial quantum in renewable energy, batteries, transition minerals, or other climate solutions, because the likelihood of their enthusiastic takeup and expansion would look to be an outside case in this country.*

*“We will also continue to struggle in our exercise of active ownership to encourage companies we invest in to appropriately invest for a rapid transition, through 1.5 degree aligned capital expenditure in necessary clean technology, when they have little conviction the rest of the Australian economy will be moving at that pace.*

*“Inconsistent messaging on the timing and pathway for industry and energy transition in Australia would mean that companies as well as investors are expecting at best delayed and disorderly transition, which puts at risk substantial capital, as well as discouraging private investment in climate solutions and new industry in this country.*

*“At worst, companies and investors would expect that we fail to limit warming to safe levels, resulting in substantial wealth destruction and wide reaching impacts on the ability to operate.*

*The outcome of not providing clear, consistent, science based leadership across government is that investors will finance less of the heavy lifting of transition, because the likelihood of a rapid and successful transition will not be considered the probable scenario. We will not allocate capital in a way which supports a 1.5 degree pathway if the government has not indicated across its*

*actions, and particularly with its next nationally determined target, that the country will be on a 1.5 degree pathway.*

*“The government aligning its emissions targets with a 1.5 degree world would allow us to shift our focus from protecting the portfolio against adverse events, towards a portfolio that seeks to support and benefit from strong economic growth and positive climate outcomes.*

*“More directly, we would also have greater confidence investing in real assets, and property where climate change poses a direct risk, and have greater confidence investing in renewables and investments that support the energy transition in Australia given a more supportive policy environment.”*

## Defining a 1.5°C target for Australia

*There are a broad range of possible approaches to defining a 1.5°C target for Australia. Investor frameworks for assessing sovereign climate risks and opportunities consider both least cost and fair-share national pathways.*

**Recommendation to Authority (Section 2.3. Target setting framework):** In presenting its recommendations on Australia’s 2035 target, IGCC recommends the Authority provide a 1.5°C least cost emissions pathway and a 1.5°C fair-share carbon budget in its advice to Government.

The physical science of climate change can only inform global emissions budgets required to limit global warming. Downscaling these budgets to national emissions requires assumptions on factors such as equity (e.g., historic contribution to the problem), national economic opportunities and challenges in the transition (e.g., access to renewable energy resources), and assumptions on international accounting methods (e.g., use of land use, land use change and forestry and international carbon markets). The Authority should be transparent with all its assumptions on these factors when consider emissions targets.

The Authority and numerous experts have assessed possible Australian emissions pathways consistent with an equitable and technologically possible contribution to limiting climate damages from 1.5-2°C.<sup>20</sup>

In presenting its recommendations on Australia’s 2035 target, IGCC recommends the Authority provide two possible emissions targets. Both approaches below would lead to the same global temperature outcome:

- **A least cost emissions pathway to 1.5°C:** This would involve downscaling global least cost emissions pathways to Australia.<sup>†</sup> One approach would be to apply global carbon prices consistent with 1.5°C to the Australian economy (see Align scenarios and modelling with investor needs section below). This is consistent with the approach the Authority used previously in making recommendations on policy design in the electricity sector<sup>21</sup>.
- **a fair share target for 1.5°C:** Update the previous modified contraction and convergence approach used by the Authority.

Presentation of both a least cost and a fair-share pathway is consistent with emerging global investor frameworks for assessing sovereign climate risks and opportunities<sup>22</sup>.

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<sup>†</sup> Least-cost pathways are technically and economically feasible emissions pathways that could meet the 1.5°C warming limit in practice. The most recognised scenarios for national 1.5°C-aligned benchmarks have been developed by Climate Analytics. This analysis undertakes a rigorous process to make scenario data consistent with the most recent historical emissions data, a process known as harmonisation, and then breaks down regional 1.5°C pathways to the country level, a process known as downscaling. Climate Analytics (2022), 1.5°C National Pathway Explorer: <https://1p5ndc-pathways.climateanalytics.org>

## Unlocking Sectoral Investment in Net Zero

*The establishment of 1.5°C sector pathways and goals is a core ingredient in unlocking finance for climate solutions. Sector pathways and goals help to ensure transition risk is managed over a suitable timeframe and minimise economic disruption by providing a clear framework for investors and the companies they own, to guide business strategy, climate-related financial disclosures, managed asset decommissioning, workforce and community transition and the timely allocation of capital towards new technology and infrastructure.*

**Recommendation to Authority (Section 3.2. Sectoral pathways):** To support the development of the Net Zero Australia Plan, the Authority should recommend clear 2030, 2035, 2040 and 2050 emissions pathways and goal posts for all sectors. This would include recommendations on policy actions required to close gaps between projected emissions and sector goals.

National targets and macroeconomic policies define the overall direction of the Australian economy to net zero emissions. However, least-cost approaches to achieving national objectives involve a combination of national and sector-specific policies.<sup>23</sup>

### Investable sector pathways

The establishment of "investable" 1.5°C sector pathways and goals is critical to unlocking finance for climate solutions. Inability to attract investment is a barrier preventing many sectors from decarbonising and transitioning towards net zero. Investment is not flowing, in part, because previously produced pathways are not investable.

Investors need to predict project revenue before deploying capital. To predict project revenue, investors require legislated policies and clear implementation plans. To unlock capital, sector pathways therefore need to be backed by policy and clear implementation plans. Such pathways contribute to a clear framework for investors and the companies they own, to guide business strategy, climate-related financial disclosures, and the allocation of capital towards new technology and infrastructure.

In addition, lack of consistent Australian level sectoral pathways and climate scenarios is inhibiting comparability across companies, and, thereby, capital allocation to lower transition risk businesses.

Recent international comparative analysis commissioned by IGCC also concludes that clear sector-by-sector pathways and plans have been central to establishing the necessary preconditions for clean energy innovation and the development of investable climate solutions<sup>24</sup>. They are also central to effective climate-related financial disclosures, the Government's Sustainable Finance Strategy and taxonomy, company transition plans, and investor scenario analysis.

IGCC welcomes the Government's commitment to develop a Net Zero Australia Plan, including sector plans, in response the Authority's 2022 Annual Progress Report. IGCC has also

commissioned a paper on investor needs for sector pathways to unlock private sector capital. We will share this with the Authority when completed in Q3 2023.

To support the development of the Net Zero Australia Plan, the Authority should recommend clear 2030, 2035, 2040 and 2050 emissions pathways and goal posts for all sectors<sup>†</sup>. High emitting sectors are the priority and granularity of analysis can be increased through time.

These recommendations should:

- Be science based and use a combination of least cost and fair share approaches to achieving 1.5°C aligned national targets (see Defining a 1.5°C target for Australia section above).
- Acknowledge that pathways will need to change over time to reflect changes in the commercialisation of technology, the effectiveness of government policies and changes in underlying assumptions about the growth and direction of the Australian and international economy. A review period should be recommended, for example every five years.
- Be developed to allow comparability with internationally recognised global analysis such as the Network for Greening the Financial System (NGFS) and IEA Net Zero scenarios (see Align scenarios and modelling with investor needs section below).
- Build on the existing work that has already been undertaken for example, the Australian Industry Energy Transitions Initiative<sup>25</sup>, Climateworks/CSIRO<sup>26</sup> and Climate Analytics<sup>27</sup>.
- Recommend actions to close gaps between projected emissions and sector goals. These policies should focus on crowding in private sector investment, include an appropriate mix of measures to deliver supply and demand for climate solution investments, consider social licence and workforce impacts, and ensure environmental approvals processes are both robust and timely. This could also include recommendations on sub-sector or technology targets (e.g. the Renewable Energy Target) and climate solutions export oriented targets (e.g. \$100 billion of clean exports per annum by 2035).
- Be sufficiently granular to support development and execution of credible Australian investor and company transition and adaptation plans and realistic assessment of physical and transitional climate risks in an Australian context.
- Ensure consistent, comparable and requisite information is generated for inclusion in mandatory climate disclosure reporting and climate transition plans for the private sector. As mandatory disclosures should reference and report against these sectoral pathways it is

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<sup>†</sup> There are a number of ways to categorise "sectors" for emissions pathway purposes. This should be consistent across other climate and emissions reporting standards (e.g NGERs, mandatory climate disclosure reporting) to enhance usability.

Sectoral pathways and their underlying assumptions could also be used to develop sets of sector specific metrics for mandatory climate disclosure reporting purposes (in addition to a set of common metrics across sectors) to enable better assessment and evaluation by investors.

critical to consult with the private sector on what kind of information should be included in the sectoral pathways to facilitate their effective use.

- Ensure there is consensus and consistency on sectoral and industry classifications across pathways and reporting regimes. Without standardised reporting, there will be significant gaps in data provided. This causes challenges in tracking and comparing company progress properly, assessing and managing investment risks, and investors' ability to allocate capital in alignment with their target risk and return profiles. It also leads to significant variation in estimates and forecasts used by advisers and asset managers managing physical and transition climate risk within portfolios.

## Specific sectoral comments

### The electricity sector

The pace of the current transition in the electricity sector needs to be built upon. Federal and State governments have taken positive steps to support a more orderly transition in the sector, e.g. National Energy Transformation Partnership, Capacity Investment Scheme, and Rewiring the Nation investments. Additional policy progress will be needed to ensure the necessary transmission infrastructure and workforce are in place, coal and mid-merit gas are phased out and the transition has community support. Policy also needs to provide clarity around the role of direct public sector investment in the market.<sup>28</sup>

### The Primary Energy sector

Lack of clarity on the appropriate pace of fossil fuel phase out in an Australian context has allowed unmitigated and ongoing investment in new long-lived assets. These investment decisions are based on offshore demand projections derived from national policies that are not aligned with limiting climate damages above 1.5°C and assumptions regarding the economic viability of emerging technologies such as Carbon Capture and Storage that are not supported by deployment to date. This represents a significant potential risk both for the Australian economy and for achievement of Australia's decarbonisation goals.

### Climate solutions export sectors

The USA's *Inflation Reduction Act* (IRA) and the European Green Deal and other nations' major boosts in clean energy subsidies have increased the urgency of fostering the local clean innovation ecosystem, as Australia looks to compete for investment in global capital markets.

The Government committed to further action to develop Australian clean energy industries, supported by \$5.6 billion of funding in the 2023-24 Budget. It is unlikely that Australia will be able to compete with the US IRA directly, but will be able to leverage opportunities for domestic investors as a result of the Act and other similar programmes emerging in Europe and Asia.

The Authority should provide advice on key elements of this work, for example, identifying sectors where Australia has global comparative advantage in a net zero economy (e.g. critical minerals supply chains) and where government resources and policy should be focused.

The Authority should clearly and firmly articulate the importance of Government leadership in developing domestic value chains in the climate solutions sector<sup>29</sup>. Rather than perpetuating a dig-and-ship paradigm, by replacing fossil fuel exports with high-value critical minerals or hydrogen, Australia should pursue an integrated national strategy involving Federal and State and Territory governments, as well as investors, business and communities, to develop secondary and tertiary industries in processing, refinement, manufacturing, and value-added export. This should be underpinned by strong R&D networks and outputs.

### Carbon draw down opportunities

Achieving net zero emissions by 2050 will not be sufficient to mitigate climate change. Modelling of 1.5°C (and well below 2°C) indicates significant amounts of carbon removal from the atmosphere will be necessary. Given its large land mass and carbon removal reservoirs, Australia has a potential comparative advantage in new direct carbon capture and geological storage industries. The Authority should provide advice on the long-term role of Australian carbon draw down so that investors gain clarity around the long-term value of different approaches to land management, sectoral pathways, technologies (e.g. direct air capture), and land-based carbon sequestration. We should be thinking about the investment landscape in decadal terms and ensuring that decisions taken now will support future financial performance outcomes.

## *Sector Pathways - An Investor's view*

Global asset manager - \$995 billion in AUM:

*“Challenge to assess future energy mix required for industrial players: Without clear guidelines for 1.5-degree alignment across sector pathways it is challenging to assess what the future energy mix will be for Australia as an economy and in particular specific hard-to-abate sectors.*

*“Several hard-to-abate sectors continue to rely heavily on natural gas as a source of energy and have not appropriately invested capital in order to reduce their dependence. There is an underlying assumption that domestic natural gas supply will continue to be accessible and affordable for these industrial players.*

*“Having 1.5-degree alignment of the energy system and a federal roadmap for Australia's future energy mix would help investors better understand the operational and financial shift that companies need to make to secure sufficient renewable energy in the future as they move away from fossil fuel alternatives.*

*“Challenge to drive greater ambition in company climate transition plans: Through our engagement we are seeing multiple examples across hard-to-abate sectors, such as with aluminium production.*

*“Without clear guidelines for 1.5-degree alignment, companies are reluctant to explore or deploy the relevant range of technology solutions to achieve emissions reduction. Engagement with companies in the sector have responded that they cannot take action now on decarbonising their aluminium operations as the technology is not currently commercially viable, there are insufficient sources of affordable renewable energy and that they require additional government support and concessions before they can pursue decarbonisation initiatives.*

*“Having greater clarity on what 1.5-degrees alignment entails will give investors the ability to more targeted in our engagement approach and push for more ambitious action.*

*“Challenge to assess the decarbonisation capex required to align with 1.5 scenarios: Without clear guidelines for 1.5-degree alignment it is challenging for investors to assess whether the decarbonisation capital expenditure announced by companies is sufficient to achieve the emissions reduction required.*

*“In addition, many companies in hard-to-abate sectors have yet to announce decarbonisation capital expenditure plans, as a result it is challenging for investors to assess the future amount of capital that will need to be allocated, as well as the level of transition risk that the companies continues to be exposed to as it does not change and adapt its operations and business model.*

*“For example, in the mining sector without clear guidelines for 1.5-degree aligned emissions reduction targets for stationary emissions, it is challenging for investors to assess the level of investment required to deliver those emissions reductions and whether the capital is being spent appropriately on technology and initiatives that will deliver those reductions (vs. carbon offsets for example).”*

## Align scenarios and modelling with investor needs

*The Authority's modelling can support investment in the transition to net zero and resilience to the impacts of climate change.*

### **Recommendation to Authority (Section 3.2. Sectoral pathways, Economic analysis):**

Modelling should:

- cover both transition and physical risks
- be aligned with global best practice scenario analysis
- include orderly transition (1.5°C), disorderly, current policies and hot house (4+°C) scenarios
- use a disorderly transition to net zero as the baseline scenario
- be undertaken in close consultation with other government modelling exercises
- be iterative and include stakeholder input
- generate outputs that support development and execution of credible Australian investor and company transition and adaptation plans and realistic assessment of physical and transitional climate risks in an Australian context.

Australian level climate risk and opportunity scenarios are required to facilitate private investment but must be aligned with global best practice. IGCC notes that the Authority is commissioning modelling as part of its considerations and advice to Government. This work can support investment in the transition to net zero and build resilience to the impacts of climate change.

### *Physical impacts modelling - An Investor's view*

Australian asset manager - \$92 billion in AUM:

*“Current modelling approaches and related policy thinking do not effectively accommodate systemic or non linear risks. While this is difficult, there should be some recognition of this point, and inclusion in policy assumptions.*

*“What happens when a flood event immediately follows a major storm that occurs directly after a significant bushfire that comes after several years of drought – and what influences do these (compounding) risks have on transition issues including regional price dynamics and supply chains?*

*“We may not be able to answer these questions, but they should be explicit in our policy thinking – we need to state what we don't know, making the unknown unknowns into (at least) considered unknowns.”*

It is critical that:

- Climate modelling and scenarios cover both transition and physical risks (including both chronic and acute physical impacts). Climate change is already inflicting significant macroeconomic costs on Australia and the rest of the world<sup>30</sup>. Failure to integrate climate change damage into economic analysis of future policy will lead to perverse outcomes and increase the risk of stranded assets.

For example, billions of dollars are currently being spent on infrastructure and projects in Australia to support exports to Asia. This is all being undertaken on the basis that climate change will not impact on the ability of Asia to develop over the coming decades.

However, it is well understood that Asia is highly vulnerable to climate change damages and will suffer substantial economic impacts (Figure 6). The Reserve Bank of India has recently warned that the physical risk of climate change threatens the national goal of becoming an advanced economy<sup>31</sup>.

Unless physical climate risks are included in national economic analysis, governments, companies and investors risk wasting substantial capital on investments that become stranded because of local, regional and global climate change damages.

Given current limitations in including all chronic and acute climate risks in modelling the economic damages of climate change, the Authority should include a statement outlining the physical risks not incorporated into the modelling.

- Climate modelling and scenarios be aligned with best practice global scenarios. As a starting point, this should promote use of standard international scenarios such as Network for Greening the Financial System (NGFS)<sup>32</sup> and International Energy Agency Net Zero (IEA) scenarios. The recent vulnerability assessment of the nation's largest banks, undertaken by APRA and the RBA, took this approach<sup>33</sup>. Both NGFS and IEA scenarios are commonly used by national and global investors in assessing transition and physical risks of climate change.
- Climate modelling and scenarios include, at a minimum, an orderly transition to 1.5°C, an abrupt or disorderly transition (1.5°C to 2°C), current policies (3+°C) and hot house (4+°C) scenario analysis.
- Climate modelling use a disorderly transition to net zero as the baseline scenario. The global economy is not on track to achieve an orderly transition to net zero emissions and the IPCC has concluded we are on track for a disorderly transition<sup>34</sup>. Current policy scenarios put us on track towards around 3°C of global warming and assume no substantive acceleration of domestic commitments to reduce emissions.

The latter is highly unlikely given the recent acceleration of global action to drive clean innovation in response to supply chain risks and recent global events such as the invasion of Ukraine and COVID.<sup>35</sup> In addition, the economic and social costs of climate change are projected to be substantially larger than the recent global crisis (for example, several times larger than the economic costs of COVID). It is unlikely governments would not respond to compounding climate damages with additional emissions reduction policies.

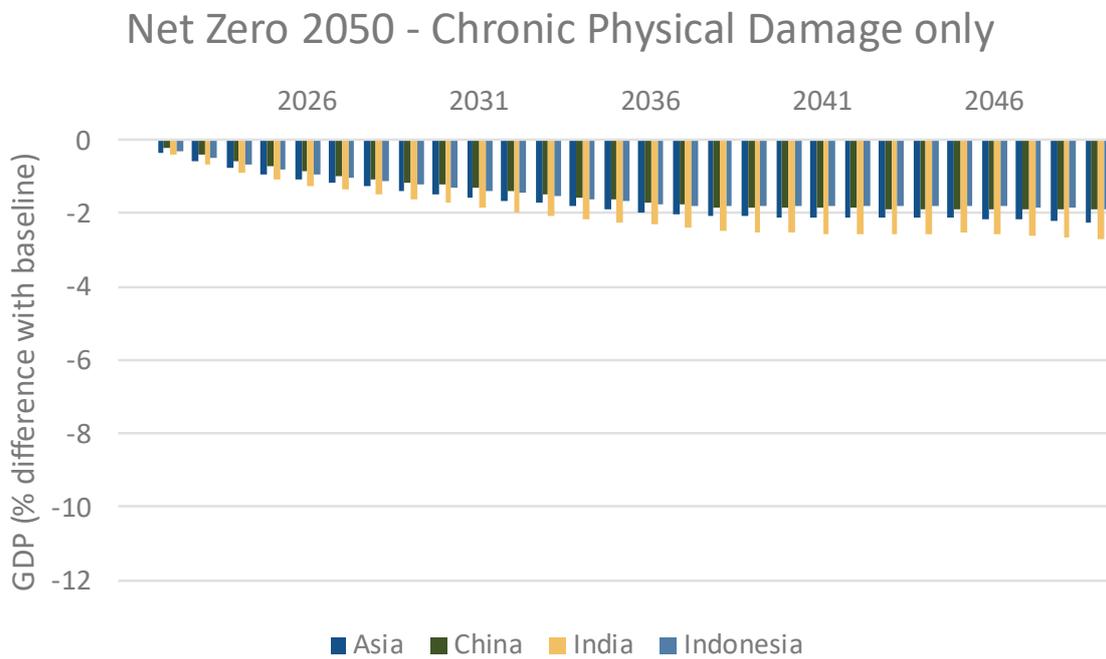
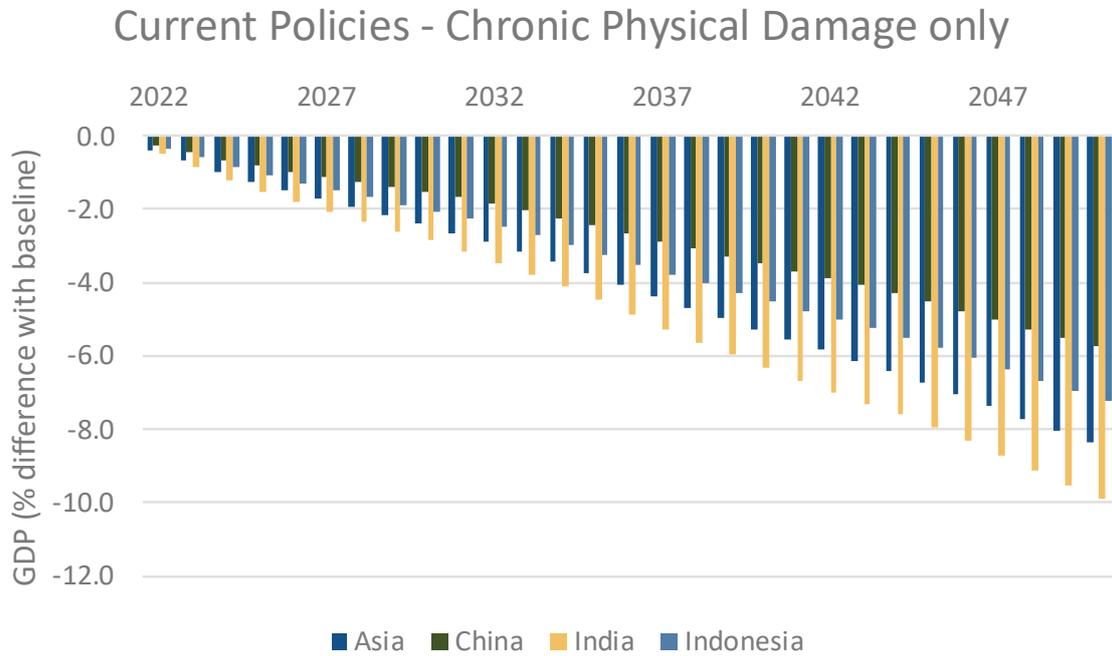
- Climate modelling and scenarios are undertaken in close consultation with other government modelling exercises, investors and other key stakeholders. For example, the upcoming National Climate Risk Assessment should provide the basis for the integration of physical climate risks into national economic modelling to avoid duplication and lack of comparability.
- Climate modelling and scenarios are iterative through time and include stakeholder input. Modelling transition risks is much more advanced than the assessment of physical risks, though the latter is advancing rapidly. Changes in technology costs, national and global economic conditions, geopolitics and community attitudes can occur rapidly. This is not a reason not to include factors such as physical risk in analysis but highlights the need to take an iterative approach to modelling exercises and be very transparent with all the assumptions used in and limitations of the analysis. For example, the NGFS and IEA update their scenarios annually.
- Climate modelling and scenarios are sufficiently granular to support development and execution of credible Australian investor and company transition and adaptation plans and realistic assessment of physical and transitional climate risks in an Australian context.<sup>§</sup>
- Climate modelling and scenarios consider that setting an under-ambitious target is likely to increase the cost of capital for Australian businesses, further increasing the economic costs of a slow decarbonisation pathway relative to more ambitious pathways.
- Climate modelling and scenarios are not constrained by Australia's current 2030 NDC of 43% reduction on 2005 levels. This target is not consistent with a 1.5°C trajectory.
- Climate modelling and scenarios incorporate technology cost forecasts that recognise technology learning rates tend to be significantly higher than what many modelling exercises anticipate.<sup>36</sup>

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<sup>§</sup> For example, sector categories should be aligned with ANZSIC classifications as far as possible. The NGERs reporting system already utilises the ANZIC classification system to categorize businesses and industries and to facilitate standardised reporting of greenhouse gas emissions and energy consumption across various sectors. This allows for better analysis and tracking of emissions and energy data within specific sectors and enables benchmarking and identification of emission trends at an industry level. The ANZIC codes provide a common language for businesses to report their activities accurately and facilitate the compilation and analysis of greenhouse gas and energy data at a national level.

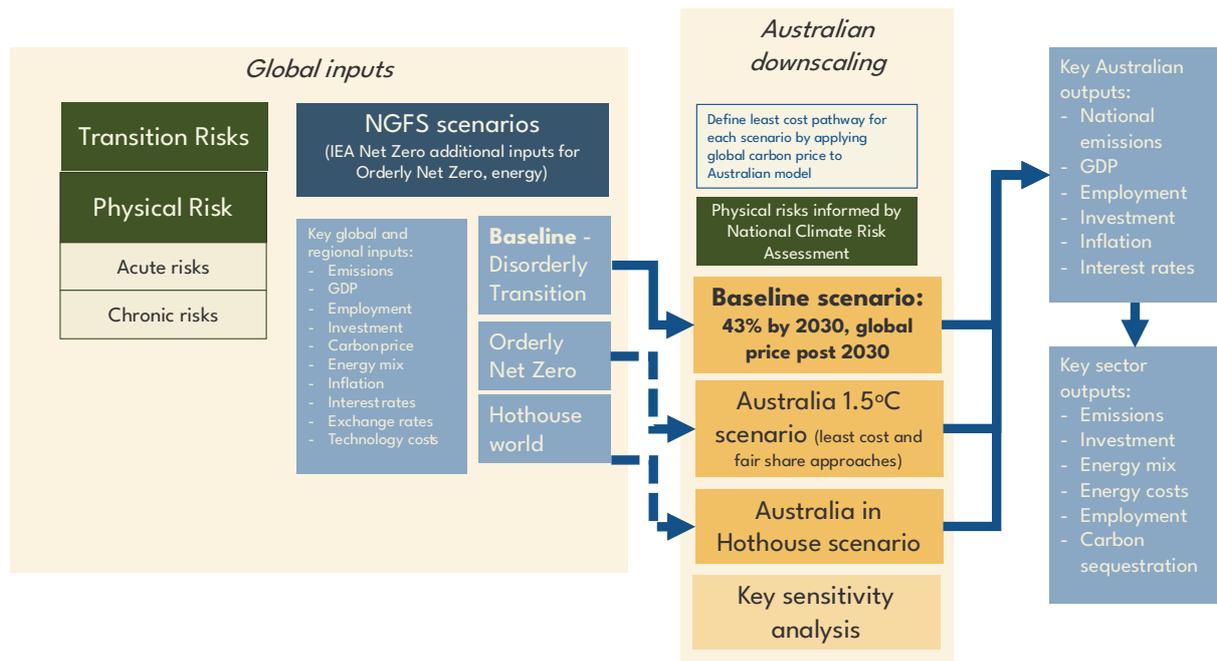
Figure 7 outlines a possible modelling framework that could be applied to capture the points above.

Figure 5: Chronic climate damages in Asia - Current Policies v 1.5°C. Does not include all chronic impacts, acute damages, and impacts such as conflict and mass migration.\*\*



\*\* NGFS Scenario Portal: NiGEM NGFS v1.22 [REMIND-MAgPIE 3.0-4.4] scenarios

Figure 6: Meeting investors' needs - A possible integrated modelling framework to access policy risks and opportunities



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<sup>1</sup> See, for example:

- <https://www.fsb.org/work-of-the-fsb/financial-innovation-and-structural-change/climate-related-risks/>
- <https://www.imf.org/en/Topics/climate-change>
- [https://www.bis.org/topic/green\\_finance.htm](https://www.bis.org/topic/green_finance.htm)
- <https://www.ngfs.net/en>
- <https://www.cfr.gov.au/financial-stability/climate-change.html>

<sup>2</sup> For example: <https://cpd.org.au/2021/04/directors-duties-2021/>.

<sup>3</sup> [https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC\\_AR6\\_WGII\\_Chapter11.pdf](https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter11.pdf)

<sup>4</sup> [https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC\\_AR6\\_WGIII\\_Chapter15.pdf](https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter15.pdf)

<sup>5</sup> <https://igcc.org.au/driving-australian-climate-innovation/>

<sup>6</sup> <https://igcc.org.au/the-state-of-net-zero-investment-in-australia/>

<sup>7</sup> <https://igcc.org.au/the-state-of-net-zero-investment-in-australia/>

<sup>8</sup> <https://www.ngfs.net/en>

<sup>9</sup> See:

- <https://www.ipcc.ch/report/ar6/wg2/>
- <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-dae-economic-reality-check-minderoo-foundation-17012022.pdf>

<sup>10</sup> [https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC\\_AR6\\_WGIII\\_Chapter15.pdf](https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter15.pdf)

<sup>11</sup> <https://acsi.org.au/wp-content/uploads/2022/07/ACSI-Research-Climate-Change-Disclosure-in-ASX200-July-2022.pdf>

<sup>12</sup> <https://igcc.org.au/wp-content/uploads/2022/09/IGCC-Policy-2025-PrioritiesWeb.pdf>

<sup>13</sup> IGCC forthcoming

<sup>14</sup> <https://igcc.org.au/the-state-of-net-zero-investment-in-australia/>

<sup>15</sup> See, for example:

- [https://www.ngfs.net/sites/default/files/medias/documents/820184\\_ngfs\\_scenarios\\_final\\_version\\_v6.pdf](https://www.ngfs.net/sites/default/files/medias/documents/820184_ngfs_scenarios_final_version_v6.pdf)
- [https://sustainable.unimelb.edu.au/\\_data/assets/pdf\\_file/0012/3087786/Australias\\_Clean\\_Economy\\_MSSI\\_Issues\\_Paper12.pdf](https://sustainable.unimelb.edu.au/_data/assets/pdf_file/0012/3087786/Australias_Clean_Economy_MSSI_Issues_Paper12.pdf)
- <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-dae-new-choice-climate-growth-051120.pdf?nc=1>

<sup>16</sup> [https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC\\_AR6\\_WGII\\_Chapter11.pdf](https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter11.pdf)

<sup>17</sup> [https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC\\_AR6\\_WGII\\_Chapter11.pdf](https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter11.pdf).

<sup>18</sup>

[https://www.ngfs.net/sites/default/files/medias/documents/ngfs\\_climate\\_scenarios\\_for\\_central\\_banks\\_and\\_supervisors\\_.pdf.pdf](https://www.ngfs.net/sites/default/files/medias/documents/ngfs_climate_scenarios_for_central_banks_and_supervisors_.pdf.pdf).

<sup>19</sup> [https://rest.com.au/rest\\_web/media/documents/why-rest/about-rest/sustainability/rest-sustainability-responsible-investment-climate-change-supplement.pdf](https://rest.com.au/rest_web/media/documents/why-rest/about-rest/sustainability/rest-sustainability-responsible-investment-climate-change-supplement.pdf)

<sup>20</sup> See, for example:

- <https://www.climateworkscentre.org/wp-content/uploads/2020/04/CWA-DECARBONISATION-FUTURES-2020-TECH-REPORT.pdf>
- <https://climateanalytics.org/publications/2020/scaling-up-climate-action-in-australia/>
- <https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp>

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- <sup>21</sup> <https://www.climatechangeauthority.gov.au/reviews/special-review/special-review-electricity-research-report>
- <sup>22</sup> <https://www.ascorproject.org>
- <sup>23</sup> [https://report.ipcc.ch/ar6wg3/pdf/IPCC\\_AR6\\_WGIII\\_FinalDraft\\_Chapter13.pdf](https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_Chapter13.pdf).
- <sup>24</sup> <https://igcc.org.au/driving-australian-climate-innovation/>
- <sup>25</sup> <https://energytransitionsinitiative.org/>
- <sup>26</sup> <https://www.climateworkscentre.org/wp-content/uploads/2020/04/Decarbonisation-Futures-March-2020-full-report-.pdf>
- <sup>27</sup> [https://climateanalytics.org/media/cat\\_2020-11-10\\_scalingup\\_australia\\_fullreport.pdf](https://climateanalytics.org/media/cat_2020-11-10_scalingup_australia_fullreport.pdf)
- <sup>28</sup> [https://ceig.org.au/wp-content/uploads/2023/04/2023-04-12-CEIG-Collaboration-to-Support-Transition\\_MR\\_final.pdf](https://ceig.org.au/wp-content/uploads/2023/04/2023-04-12-CEIG-Collaboration-to-Support-Transition_MR_final.pdf)
- <sup>29</sup> <https://igcc.org.au/driving-australian-climate-innovation/>
- <sup>30</sup> [https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC\\_AR6\\_WGII\\_Chapter11.pdf](https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_Chapter11.pdf)
- <sup>31</sup> [https://rbi.org.in/Scripts/BS\\_PressReleaseDisplay.aspx?prid=55622](https://rbi.org.in/Scripts/BS_PressReleaseDisplay.aspx?prid=55622)
- <sup>32</sup> <https://www.ngfs.net/en>
- <sup>33</sup> [https://igcc.org.au/wp-content/uploads/2023/03/IGCC\\_APRACVA\\_BriefingNote.pdf](https://igcc.org.au/wp-content/uploads/2023/03/IGCC_APRACVA_BriefingNote.pdf)
- <sup>34</sup> [https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC\\_AR6\\_WGIII\\_Chapter15.pdf](https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_Chapter15.pdf)
- <sup>35</sup> <https://www.iea.org/reports/net-zero-by-2050>
- <sup>36</sup> <https://www.sciencedirect.com/science/article/pii/S254243512200410X>