NAVIGATING CLIMATE CHANGE

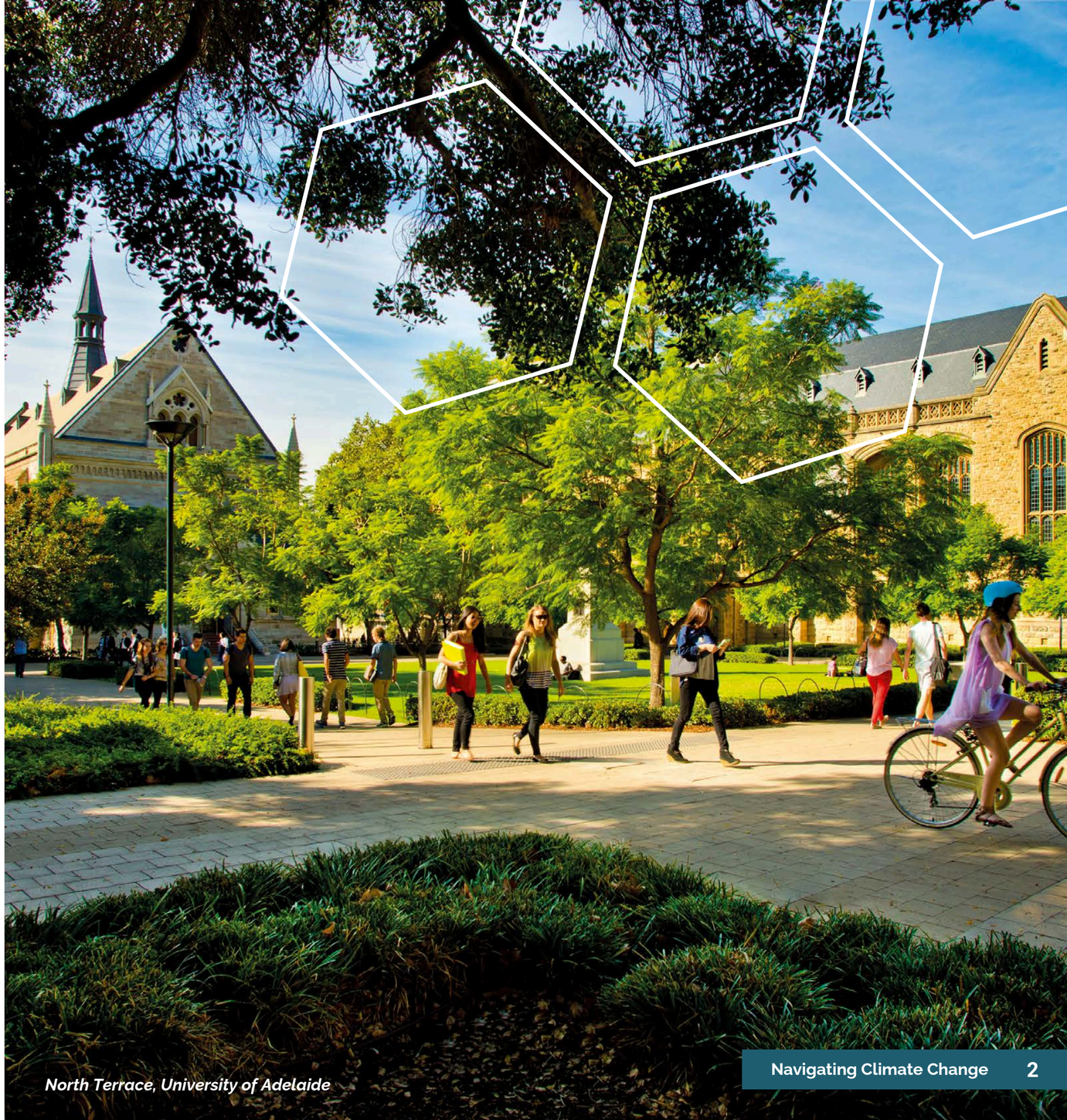
JUNE 2025

Scenarios for Australia's Tertiary Education Sector

ACTS

CONTENT

Cover image: Campus pedestrians, Australian National University



North Terrace, University of Adelaide

ACKNOWLEDGEMENT OF COUNTRY AND COMMITMENT TO INDIGENOUS PARTNERSHIP

We acknowledge that we live and work on the unceded lands of the First Nations peoples of Australia. For millennia, First Nations knowledges, expertise and relational approaches to caring for the land, allowed a flourishing of Country and community. We acknowledge, that First Nations knowledges were shunned and sidelined in favour of approaches that privileged ownership and profit over Country and community. Addressing the complex environmental and social challenges we now face requires the invaluable wisdom and perspectives of First Nations peoples. As each institution builds upon this report for their own climate risk assessments, we are committed to ensuring the work we do is enriched and guided by two-way seeing and learning together with Indigenous elders, leaders, staff, students and local communities.

We pay our respect to the Traditional Custodians of the lands on which we live and work:

- The Australian National University (ANU) operates its main Acton campus on the lands of the Ngunnawal and Ngambri-Kamberri peoples
- Charles Sturt University operates in the lands of the Wiradjuri, Ngunawal, Biripai, and Gundungarra peoples
- Deakin University operates on Wadawurrung Country, Eastern Maar Country and Wurundjeri Country
- Monash University operates on the traditional lands of the Boonwurrung/Bunurong and Wurundjeri people of the Kulin Nation
- Murdoch University operates on the lands of the Whadjuk and Binjareb people of the Noongar Nation.
- Royal Melbourne Institute of Technology (RMIT University) operates on the unceded lands of the people of the Woi wurrung and Boon wurrung language groups of the eastern Kulin Nation.
- Swinburne University of Technology operates on the lands of the Wurundjeri People of the Kulin Nation.
- University of Adelaide operates on the lands of the Kaurna people
- The University of Melbourne on the Wurundjeri Woi-wurrung and Bunurong, the Yorta Yorta Nation and the Dja Dja Wurrung people.
- University of Tasmania operates on the lands of the Palawa/Pakana and Gadigal people.
- University of Western Australia operates on the lands of the Whadjuk people of the Noongar Nation.
- University of Wollongong spreads across many interrelated Aboriginal Countries that are bound by this sacred landscape, and intimate relationship with that landscape since creation. From Sydney to the Southern Highlands, to the South Coast. From fresh water to bitter water to salt. From City to Urban to Rural.

FOREWORD

Lin Stevenson
ACTS President

At Australasian Campuses Towards Sustainability (ACTS), we are proud to champion collaboration within the tertiary education sector to address the pressing challenges of climate change. This report, developed through the collective efforts of the ACTS member network and led by the Climate Scenarios Working Group, marks a significant step forward in preparing our institutions for an uncertain future.

Climate change is no longer a distant concern; it is reshaping our world - and our campuses - today. Rising temperatures, shifting rainfall patterns, and increasing extreme weather events underscore the urgency of this work. This report provides a vital framework for navigating these challenges while unlocking opportunities for resilience and transformation.

Building on the foundation laid by our colleagues in Aotearoa New Zealand in the development of their own climate scenarios in 2024, this effort exemplifies the power of collaboration and shared expertise. It brings together rigorous scientific evidence, forward-looking scenario analysis, and the lived experiences of our campus communities to create a resource that is both practical and deeply relevant.

The scenarios outlined here are not predictions of the future, but are dynamic tools designed to support ongoing planning and translation at a variety of scales to drive collective adaptation responses. Climate adaptation is a journey, not a destination - one that requires continuous refinement, reassessment, and alignment with emerging challenges. This philosophy is embedded throughout the report and underpins its vision for the future.

We extend our deepest gratitude to the twelve institutions whose leadership and commitment made this work possible. Their shared dedication to sustainability and forward-thinking leadership has resulted in a report that serves as both a call to action and a guide for informed decision-making.

As ACTS continues to support institutions across Australasia, we encourage you to engage with this report, explore the scenarios presented, and consider how they might inform your strategies. Together, we can enhance the resilience of our institutions, our communities, and the broader region as we navigate the challenges and opportunities of a changing climate.

Australian National University
Charles Sturt University
Deakin University
Monash University
Murdoch University
The University of Melbourne
RMIT University
Swinburne University of Technology
The University of Adelaide
University of Tasmania
University of Wollongong Australia
The University of Western Australia

EXECUTIVE SUMMARY

WHY READ THIS REPORT?

This report aims to assist the tertiary education sector in Australia to navigate the challenges arising from climate change. It provides a framework for addressing these challenges while also exploring opportunities for adaptation and transformation within the sector.

The urgency of this work is underscored by the fact that climate change is not a distant future threat; it is already reshaping our world with rising temperatures, shifting rainfall patterns, and increasingly extreme weather events that are resulting in compound, cascading risks.

The Climate Scenarios Working Group of the Australasian Campuses Towards Sustainability (ACTS), which included twelve universities, worked throughout 2024 and 2025 to develop and explore four scenarios. More than 150 stakeholders from a wide range of expertise areas participated through a series of workshops, which were designed to help Australia's tertiary education sector prepare for the impacts of climate change in the short, medium and long-term. The report summarises the findings of this project, in which the following question was examined:

> "How **could** climate change impact Australia's tertiary education sector in the **2030s**, **2060s** and **2090s**?"

While climate change is the central focus of this work, the sector also faces many other changes, including the increasing capabilities of Artificial Intelligence (AI), the erosion of trust in democracy, the ageing of our population and geopolitical instability. The interaction of these and other drivers of change were explored in the workshops, using the four scenarios to structure discussions about possible futures for Australia and the tertiary education sector.

Seven academic experts in climate change, economics and sociology reviewed earlier drafts and provided feedback on the plausibility of the futures outlined. This feedback was invaluable in developing the final version of the four scenarios as set out in this document.

For people working in strategic roles in the Australasian tertiary education sector, this report provides an outline of some possible futures and the likely uncertainties ahead. While these are definitely not predictions, it is hoped that the exploration of the scenarios outlined provides a way of thinking about potential futures and contributes to improved investment decisions, strategic planning and policies that can take their organisation on a pathway of short and long-term success. The sector's preparations for an uncertain future will also assist Australia face the challenges ahead.

THE SCENARIOS

Each of the scenarios is based on different levels of global warming and different government responses to the challenges posed by climate change. Specifically, the four possible scenarios combine the following aspects: either greenhouse gas (GHG) emissions continue to rise, or the world achieves net zero GHG emissions by the 2050s; and either Australia's governments focus on addressing immediate, pressing issues (2-4 years) or on long-term solutions (20-30 years).

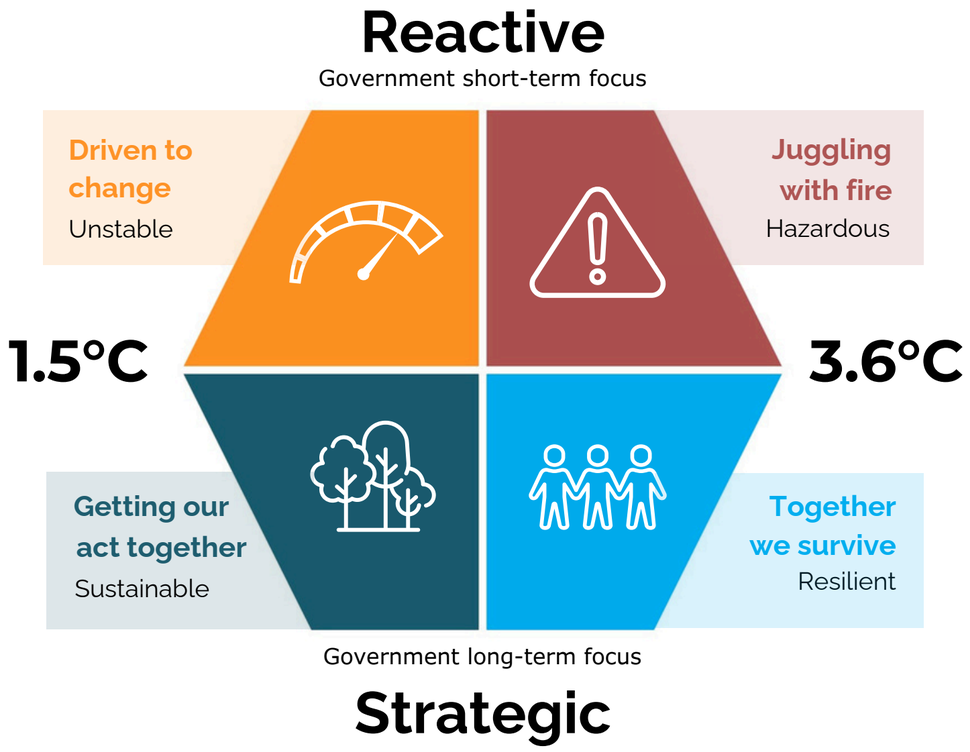


Figure 1. The four climate scenarios

Whilst many experts regard the prospect of limiting temperature rise to 1.5˚C as unlikely, this temperature pathway was used to construct the scenarios as it is a reporting requirement.

KEY FINDINGS

The following challenges were identified in all the scenarios:

- The frequency, severity and impacts of **extreme weather events** increases. However, in *'Juggling with fire'* and *'Together we survive'* the magnitude of extreme events changes the map of the world by the middle of the century. Islands are lost and cities and regions abandoned as areas become uninhabitable, leading to mass migration and widespread geopolitical instability on an unprecedented scale.
- There will be significant **social and economic change** due to efforts required to decarbonise society to reach net zero emissions or through adapting to climate changes if we fail to keep global temperature rises below 2˚C.
- **Fiscal pressures** increase, which may lead to ongoing tightening of belts and changing social expectations of the university sector as society focuses on survival. While the cost of extreme events is lower in *'Driven to change'* and *'Getting our act together,'* significant investments are needed to build net zero carbon societies. However, these investments are dwarfed by the economic losses associated with the higher emissions scenarios.

In addition, the use of scenarios helped to identify specific **challenges for the tertiary education sector**. Some prominent examples are:

- Infrastructure will need to be made more climate resilient, therefore there could be changes in where students learn, how they learn and what they learn.
- Numbers of students could fall over time or rise massively through an acceleration of immigration.

These challenges are accompanied by significant **opportunities for the sector**. Universities could play critically important roles in reducing the likelihood of reaching a 3.6˚C world. They could:

- Provide educational capabilities that ensure that future generations are resilient, creative and can provide the leadership Australia needs to navigate the challenges ahead.
- Undertake research that helps find the technological, societal, political and environmental solutions to the challenges ahead, thereby attracting increasing levels of research funding.
- Connect with their communities to support adaptation.
- Connect with local authorities in responding to extreme weather events.

For a quick overview, go to the Summary of possible outcomes for universities (p. 35).

KEY FINDINGS CONTINUED

The way tertiary education institutions fulfil their roles will differ markedly depending on four key factors:

- The global emissions pathway and consequent changes to Australia's climate
- The global response to the impacts of climate change, such as numbers of international students and climate refugees
- Australian governments' support of public tertiary education and research
- The impact of AI on the nature of work, society and education

These combined factors will create uncertainties for estimating the number of students, their preferred mode of learning, what they will need to learn and the focus of research. Furthermore, they will radically change the staff skills and the physical and digital infrastructure needed in Australia's tertiary education sector.

CONCLUSION

In conclusion, every part of Australia's tertiary education sector will be impacted by climate change and will therefore need to adapt. The changes underway will impact how we deliver teaching, operate our campuses, model our finances, engage with governments, conduct research, and shape student experiences both on and off campus. While we cannot predict the future with accuracy, we are certain that over the rest of the 21st century, the university sector will need to both adapt to a rapidly changing world and be a source of adaptation capacity. Strengthening the university sector's capabilities in providing quality education and delivering strategic research will be central to enabling society to adapt. These capabilities therefore remain central roles for the sector.

The scenarios outlined in this report are not predictions about the future, instead they are dynamic tools designed to support ongoing planning and navigation at a variety of scales, by a diversity of entities. It is the capacity for this strategic navigation and planning within each of the tertiary education institutions that will drive collective adaptation responses. Climate adaptation is a journey, not a destination - one that requires continuous steering, refinement, reassessment, and alignment with emerging challenges. This philosophy of adaptive governance enabling diverse responses is embedded throughout the report and underpins its vision for the future.

Students outside Boola Katitjin "Lots of Learning" Building, Murdoch University

INTRODUCTION

While the world must continue to reduce emissions to mitigate climate change, we also need to plan for how to adapt to the already locked-in impacts. Adaptation planning for the tertiary education sector needs to consider risks (both physical risks, such as how our campuses will survive more severe weather events and transition risks, such as how climate change will impact international student markets and supply chains), and opportunities (such as more demand for climate literate graduates or increased government investment in Research and Development [R&D] for climate solutions).

The Taskforce for Climate-related Financial Disclosures (TCFD) has established a well-respected framework for assessing and reporting climate risks and opportunities. Building on this and the work of the International Sustainability Standards Board (ISSB), the Australian Federal Government has recently passed legislation requiring some corporations and Commonwealth entities, including at least one university, to produce climate-related disclosures, with the Australian Accounting Standards Board (AASB) establishing the technical reporting standards in Australia (see Appendix A for climate related scenario requirements). The NSW Government also requires several NSW universities, through financial reporting regulation, to disclose the financial impacts of climate related risks.

Many Australian universities have not yet holistically identified and actively managed, or disclosed climate-related risks and opportunities. While not all universities are currently required to produce climate-related disclosures, some are looking at doing this voluntarily, acknowledging that there are various benefits in undertaking climate adaptation planning now:

- Understanding climate risks and opportunities will prepare universities to better respond to current and future climate impacts.
- Having a clear picture of what the real-world impacts of climate change could mean for the sector will help institutions to engage their staff, students and local communities with reducing emissions.
- If, or when, the legislation is expanded to include a broader range of organisations, universities will be well prepared to respond.
- In recognising the benefits of identifying and disclosing climate-related risks, New Zealand-based universities undertook a collective project to establish a series of sector-based scenarios which individual universities could utilise for their own planning and disclosure purposes.

Noting the success of the New Zealand project, Australasian Campuses Towards Sustainability (ACTS) established the Climate Scenarios Working Group to develop climate risk scenarios specifically for the Australian tertiary education sector. This initiative aims to support universities in understanding and planning for climate risk disclosure and management, in line with Intergovernmental Panel on Climate Change Sixth Assessment Report (IPCC 6AR) recommendations [1] and inspired by the work of the New Zealand tertiary education sector in developing sector-based climate risk scenarios in 2024 (Climate Change Scenarios for the Aotearoa New Zealand Tertiary Education Sector [2]).

[1] https://www.ipcc.ch/assessment-report/ar6/
[2] https://www.auckland.ac.nz/en/about-us/about-the-university/the-university/sustainability-and-environment/sustainable-campus-and-operations/net-zero-carbon/climate-change-sector-scenarios.html

In doing so, they focused on one key question:

How could climate change impact Australia's tertiary education sector in the 2030s, 2060s and 2090s?

The intention is for this report to be used as a tool to engage tertiary education sector stakeholders and decision-makers in climate adaptation planning and risk management. This approach has several benefits:

- Ensure common assumptions about potential social, technological, economic, environmental and political drivers under different scenarios.
- Include diverse perspectives and therefore create a robust process.
- Create buy-in for the adaptation planning work at each institution.
- Avoid each institution having to develop climate scenarios individually from scratch. Tailoring to each individual institution's context will be required as stage two, which is expected to be undertaken individually by each institution.

This report sets out the approach that was taken for the development of the scenarios, includes a short summary of the scenarios, a full-length description of the scenarios and includes a guide of how the scenarios can be used by an organisation to embed actions within its strategy to respond to the climate risks and opportunities ahead.

CONTEXT

Our climate is changing due to human activity.

There is irrefutable evidence that anthropogenic sources of greenhouse gases (GHGs) being released into the atmosphere are warming the Earth's climate. The Intergovernmental Panel on Climate Change (IPCC) brings together groups of scientists to model the potential impacts of the increasing levels of GHGs in the atmosphere. World temperatures have already risen significantly, by more than 1.1˚C since 1900 [3], due to higher levels of GHGs in the atmosphere. While it is clear that rising GHG levels will lead to higher global temperatures, there is still considerable uncertainty about the level of future emissions, scale of impact, and the time lag between GHG release, subsequent temperature changes, and the local and global impacts of these rising temperatures.

The extent to which the climate will change in the future will depend on the decisions we take to limit GHG emissions.

To explore that uncertainty, the IPCC has developed a range of scenarios of future global temperatures based on different levels of GHGs being released into the atmosphere and the socioeconomic factors that drive emissions and adaptation [4]. These scenarios are referred to as Shared Socioeconomic Pathways (SSPs). They consider possible worlds in which the increase in global temperatures range from 1.5˚C to 4˚C or more (relative to 1850–1900) by the end of the century.

It is now likely that global temperatures will increase by more than 2˚C by the end of the century without significant changes to global patterns of living.

The IPCC's latest reports finds that current policies and commitments are insufficient to limit global temperature increases to below 1.5˚C and that it will be hard to limit increases to less than 2˚C this century. The IPCC's models' outputs find, with high levels of confidence, that deep reductions in GHG emissions are needed this decade to keep to a 2˚C or less global warming this century.

[3] https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf
[4] https://environment.govt.nz/what-you-can-do/climate-scenarios-toolkit/climate-scenarios-list/ipccs-ssp-rcp-scenarios/

We have seen a significant increase in the number of extreme weather events because of a 1˚C increase in global temperatures.

We have seen multiple indications of the effects of climate change over the last few decades. The changes in temperature have varied by region, with Australia seeing a rise of 1.4˚C compared to the average change in global temperatures. The temperature rise has resulted in a variety of impacts seen in Australia and in other parts of the world, characterised by an increasing frequency and intensity of:

- Rainfall causing crop damage and flooding – the biggest flood in modern Australian history inundated the Northern Rivers region in 2022. Four people were killed, 31,000 people were displaced, more than 3,000 businesses were disrupted, and more than 18,000 jobs were affected [5]. Internationally, 100,000 people were displaced by flooding in the Henan province in China in 2024 [6].
- Hailstorms - in 2010 a hailstorm in Perth caused $1.3 billion of damage [7] and in 2020, hailstorms with hail the size of golf balls in Canberra damaged 44,500 cars and many buildings causing over $300 million of damage at the Australian National University alone [8], with reconstruction works still unfinished at the time of writing.
- Storms with wind speeds which damage infrastructure – in 2016, a tornado in Southern Australia damaged critical energy infrastructure [9]. Internationally, ten hurricanes hit the United States with costs estimated to be more than $100 billion in 2024 [10].
- Sea temperatures rise – four marine heatwaves in the last seven years caused bleaching to 50% of the shallow water reefs in the Great Barrier Reef [11]. This is accentuated by ocean acidification, also a consequence of the increase of carbon dioxide in the atmosphere.
- Heatwaves – in the period from 2006 to 2017 there were an estimated 36,000 deaths in Australia attributed to heat [12], the last decade being the hottest on record at 1˚C above average [13].
- Droughts creating water shortages and crop failures – rainy seasons failed in 2015 to 2017 in parts of Africa, displacing more than 800,000 people in Somalia alone [14].
- Fire days - Australia's black summer fires, which ran from September 2019 to February 2020, destroyed more than 3,000 homes and 17 million hectares of land [15]. Seasonal fire periods are becoming longer [16]. For example, in NSW the bushfire season now extends for almost eight months, with greater frequency, severity and overall unpredictability of bushfires. Internationally, the 2025 wildfires in Los Angeles have an estimated cost exceeding $135 billion [17].

These impacts in turn create risks for human life, health, livelihoods, availability of food and water, and significant cost to repair damaged infrastructure. The scale and impact of these effects will only increase as global temperatures continue to climb.

The IPCC 6AR recognises that climate impacts may aggregate and compound with tipping points that could multiply impacts. As a worse case, a University of Exeter 2025 report suggested that if this happened: "At 3˚C or more of heating by 2050, there could be more than 4 billion deaths, significant socio-political fragmentation worldwide, failure of states (with resulting rapid, enduring, and significant loss of capital), and extinction events" [18] .

We now face two climate challenges: mitigation and adaptation.

We are now facing two related and important climate challenges that compete for resources and attention. The first relates to mitigation of future increases in global temperatures. What steps can we take to deliver the deep reductions in GHG emissions over the next 10 to 20 years to ensure that we do not “cook ourselves” with soaring global temperatures? The second is adaptation. What steps should we take to change infrastructure and our way of life to withstand the climate changes that are already locked in?

Relief International already estimates that by 2050 there will be 140 million climate refugees per year across sub-Saharan Africa, South Asia and Latin America [19]. The United Nations estimates that there could be a 30% decrease in crop yields by 2050 [20].

[5] https://www.linkedin.com/pulse/lessons-from-lismore-what-rest-australia-needs-learn-northern-don-sxuff/
[6] https://edition.cnn.com/2024/07/22/china/china-floods-climate-change-intl-hnk/index.html
[7] https://www.abc.net.au/news/2020-03-22/ten-year-anniversary-perth-hail-storm-of-2010/12072760
[8] https://www.insurancenews.com.au/daily/hailstorm-losses-top-300-million-catastrophe-declared
[9] https://knowledge.aidr.org.au/resources/storm-extreme-weather-event-south-australia-september-2016/
[10] https://coast.noaa.gov/states/fast-facts/hurricane-costs.html
[11] https://www.nature.com/articles/s41586-024-07672-x
[12] https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30100-5/fulltext
[13] https://www.theguardian.com/australia-news/2021/jan/08/last-decade-hottest-on-record-for-australia-with-temperature-almost-1c-above-average
[14] https://api.internal-displacement.org/sites/default/files/publications/documents/201809-mid-year-figures_0.pdf
[15] https://www.uwa.edu.au/-/media/Faculties/FABLE/Docs/UWA0001_After-the-Fires-Survey-Report_Exec-Summary_Infographic.pdf
[16] https://soe.dcceew.gov.au/overview/pressures/climate-change-and-extreme-events
[17] https://www.bbc.com/news/articles/c07g73p48050
18] https://actuaries.org.uk/document-library/thought-leadership/thought-leadership-campaigns/climate-papers/planetary-solvency-finding-our-balance-with-nature/
[19] https://reliefweb.int/report/world/report-impact-climate-change-migration-october-2021
[20] https://unfoundation.org/blog/post/climate-change-and-the-future-of-food/

Momentum is growing to prepare for these challenges.

We are seeing nations around the world making commitments to reduce their GHG emissions, and debate and policies are being considered to progress the journey of adaptation to the new climate we will see in our future.

The tertiary education sector will play a key role preparing Australia for the future.

Up to this point, the tertiary education sector across the world (specifically universities and research institutions) has played a key role in understanding the effect of human activities on the global climate, and what that will mean for future global temperatures. Not only will the tertiary education sector be required to continue this role, but increasingly will be expected to:

- Invest in the capabilities and confidence of our future leaders, innovators, entrepreneurs and carers.
- Provide thought leadership on societal challenges and the policy settings and governance models needed to mitigate the risks.
- Support the development of low carbon technologies.
- Utilise campuses as living laboratories for both prototyping and showcasing low carbon and resilient infrastructure.
- Monitor and protect the environment and support community transitions.

The tertiary education sector will also now need to take a closer look at what these changes will mean for their own futures. How will climate change affect social expectations of the sector? What form of teaching will take place over the next 75 years? And what will demographic and technological changes, such as artificial intelligence, mean for the future of the tertiary education sector?

The tertiary education sector is a key part of the social and economic fabric of Australia.

There are thousands of providers of tertiary education in Australia. These include universities providing higher education as well as government owned Technical and Further Education providers (TAFEs) and private Registered Training providers, who deliver vocational education and training (VET).

There are 43 Australian universities [21], with more than 130,000 employees and more than 1.4 million students [22]. Operating revenue is around $35 billion per year [23]. Australia's universities attract more than $6 billion of investment in research and development (a quarter of which is made by industry).

Similarly, there were 5.1 million VET students enrolled in nationally recognised courses in 2023 across over 3,500 providers [24]. This was achieved through an investment of approximately $11 billion from various levels of government [25].

But the university sector is already facing challenges with increasing costs set against decreasing real funding for Commonwealth supported students, which has fallen by $2 billion since 2020 [26]. Reduced numbers of international students because of COVID restrictions and, more recently, the cap on international student numbers have resulted in revenue from international students no longer covering university funding gaps. Over 25 universities posted deficits in both 2022 and 2023. The overall financial health of many of the universities in the sector is poor. This has led to under investment in infrastructure, which creates a deficit for future investment to ensure that facilities at the universities remain safe and fit for purpose. These trends will increase the challenges of adapting to challenges that we will face as a result of climate change.

[21] https://australianuniversities.com.au/list/
[22] https://universitiesaustralia.edu.au/stats-publications/
[23] https://universitiesaustralia.edu.au/wp-content/uploads/2022/08/220523-Data-snapshot-2022_web.pdf
[24] https://www.ncver.edu.au/research-and-statistics/publications/all-publications/total-vet-students-and-courses-2023
[25] https://www.ncver.edu.au/research-and-statistics/publications/all-publications/government-funding-of-vet-2023
[26] https://universitiesaustralia.edu.au/wp-content/uploads/2024/11/UA091-Critical-challenges-in-Australias-university-sector_v2.pdf

PROCESS

A sector-level approach to the development of scenarios was adopted, mirroring the approach used to develop climate scenarios for New Zealand's tertiary education sector.

The process to develop this report was led by sustainability professionals from twelve Australian universities' and designed in a way that was mindful of regulatory expectations, learned from a similar approach followed by New Zealand's tertiary education sector, and followed best practice in the development of scenarios. The stages in the process were:

- Deciding on the question to explore through the scenario development and subsequently finalise the scope of the work.
- Running two sets of workshops (December 2024; 10 in total across Australia): the first to seek input on how to answer the overarching question; and the second to weave those thoughts into plausible views of what the future could hold.
- Bringing together the ideas developed through the workshops into this report.

Canberra Climate Scenarios Workshop, December 2024

The graphic below provides a diagrammatic representation of the process, including the stages, to develop the scenarios. A full account of the process can be found in Appendix B.

Overall process to create the climate scenarios and response

COMPLETE

Pre-workshops

- Agree on the question
- Agree on the scope
- Agree on the axes

Workshop 1

- Identify primary impacts
- Identify secondary impacts
- Capture secondary impacts on the tertiary education sector
- Identify other drivers
- Capture combined impacts

Workshop 2

- Explore the extent of changes in each scenario
- Challenge and test assumptions
- Capture key insights

Post-workshops

- Write scenarios narrative
- Model the impacts
- Write report

NEXT STAGE

Access and plan
Each institution to integrate climate scenarios into their risk management

- Identify risks and opportunities
- Agree implementation plan

Figure 2. Process flow for scenario development

Please note: Because the report has been developed primarily with input from universities, we acknowledge the report may be biased towards university-specific outcomes. However, the majority of the findings are still applicable to the tertiary education sector as a whole.

HOW TO USE THE SCENARIOS

The scenarios in this report are not predictions of the future. The scenarios provide the user with a range of possible outcomes of the impact of climate change and other key drivers on the tertiary education sector. While the scenarios are not predictions, all are plausible and some aspects from each of the scenarios is likely to occur.

The scenarios are designed for use by individual tertiary education institutions to consider how they can and should best respond to climate change, given their current situation and strategic positioning. The primary audience for these scenarios is those in governance positions within the organisation who will have to develop the strategic response and consequent actions that the organisation will take to respond to climate change.

This report does not focus on impacts on biodiversity or First Nations' perspectives. Ideally, these would be explored by tertiary education institutions as they map their unique climate risks and opportunities and develop strategic responses.

The following approach to using the scenarios can support a robust strategy:

Step 1 - Become familiar with the scenarios
Step 2 - Identify the key risks and opportunities for your institution
Step 3 - Prioritise the risks and opportunities
Step 4 - Decide actions to mitigate risks and capture opportunities
Step 5 - Integrate these actions into strategy and planning documents within your university

Steps 1 to 3 can be combined in engagements with key decision makers, ideally including the leadership team.

Strategic risks are defined as **internal and external events that may make it difficult, or even impossible, for an organisation to achieve its objectives and strategic goals**. These risks can have severe consequences that impact organisations in the long-term. Risks should be defined in terms of the cause and the effect if the risk materialises. Strategic opportunities, conversely, **provide organisations significant opportunity to further its objectives**.

Strategic risks and opportunities can be considered in terms of:

- Broader contextual risks and opportunities (e.g., recession or global conflicts affecting supply chains).
- Sector specific risks, whether internal risks and opportunities (e.g., fraud) or external risks that will affect the tertiary education sector (e.g., changes to levels of government funding for tertiary education institutes).
- More immediate risks (e.g., increasing use of AI) and longer-term horizon risks (e.g., increasing ranking of Chinese Universities).
- Risks that are the result of an event (e.g., earthquake) or those that build up over time (e.g., ageing workforce).

Two different approaches can be used to prioritise the risks and opportunities. The first is a likelihood and impact matrix to help prioritise risks. The second is to note the risks and opportunities that occur in more than one of the possible future scenarios, with those occurring in all four receiving the highest weighting.

Braggs Lab, University of Adelaide

A presentation (developed by the Working Group but not published here) can be used to introduce key stakeholders to the scenarios, the process for the development of the scenarios and frameworks to identify and prioritise risks and opportunities.

When the strategic risks have been identified, teams within the institution can progress with steps 4 and 5 to develop a proposed set of actions to respond to the risks and opportunities for inclusion in the organisation's strategy and planning documents for consideration by their leadership. Bow tie risk analysis could be used to group risks and consider the optimal response to the priority risks. Bow tie risk analysis puts the causes of the harm on the left, the impact if the risk materialises in the middle, and the possible remedies on the right. Hence, when this is laid out, the shape looks like a bow tie.

It is helpful to check the risks and opportunities identified against a business framework to ensure that all areas are considered. Grace LaConte's risk framework [27] provides a useful starting point in that context. She identifies five key areas:

- Reputational
- Financial
- Competitive
- Operational
- Governance

It is important to note that for high impact, high uncertainty risks and/or opportunities, monitoring may be the optimal response. To acknowledge the importance of the risk or opportunity, but to delay action until the likelihood increases, may be the best strategic response given the remaining uncertainty.

It is acknowledged that the development of climate scenarios is not a one-off process but needs to be repeated over time as climate projections and other change drivers evolve.

[27] https://laconteconsulting.com/2017/07/31/overview-of-the-5-types-of-strategic-risk/

Please note: Although recommendations on risk analysis are provided here, it is ultimately up to each individual institution on how they should identify, manage, and respond to risks and opportunities.

Figure 3. Representative diagram for bow-tie risk analysis

THE SCENARIOS OVERVIEW

The four scenarios in this report are not predictions of the future, nor do they set out the universities' preferences of what they would like to see happen in the future. Rather, they provide a range of possible futures. The scenarios are designed to help Australia's tertiary education sector to respond effectively to challenges and opportunities no matter the future circumstances, facilitating the sector in continuing to serve Australia for the next 75 years and beyond.

The scenarios consider how the broad context in which the Australian tertiary education sector operates will change over the next 75 years and what that will mean for teaching, research, operations and infrastructure, and the staff, students and role of the universities.

Please note:

- None of the scenarios represent the formal view of any of the universities involved, they are a set of plausible futures to ensure effective management of climate risks.
- The scenarios were developed through workshops at the end of 2024 and reflect comments received at that time. It is expected that these scenarios will need to be updated over time.
- Despite acknowledging increasingly clear evidence that a 1.5˚C world is highly unlikely (as raised by participant stakeholders), legal requirements imposed on some participating institutions restricted the scenarios that could be explored. Specifically, legislative requirements relating to climate risk reporting requires scenarios with global temperature rises of (1) 1.5˚C and (2) beyond 2.5˚C above pre-industrial averages. Neither of these temperature increases should be taken as forecasts by the participating institutions.

The scenarios which follow are based on outputs from the workshops where participants considered the question:

"How could climate change impact Australia's tertiary education sector in the 2030s, 2060s and 2090s?"

Two of the scenarios explore a future where global temperatures rise by less than 2˚C above 1850 - 1900 temperatures (which reflects the shared socio-economic pathways (SSP) 1-1.9 and 1-2.6 developed by the IPCC). These scenarios are called "Driven to change" and "Getting our act together". In "Driven to change" the Australian Government's focus is on responding to the immediate challenges of the nation. In contrast, in "Getting our act together" the Australian Government's focus is on the long-term needs of the nation.

The two other scenarios explore futures where global temperatures rise to 3.6˚C above 1850 to 1900 temperatures by the end of the century. These scenarios are called "Juggling with fire" and "Together we survive". This aligns with SSP 3 – 7.0. Similar to the first two scenarios, "Juggling with fire" has all levels of Australian government focusing on immediate challenges, while "Together we survive" shifts the focus of Australian government to the longer term.

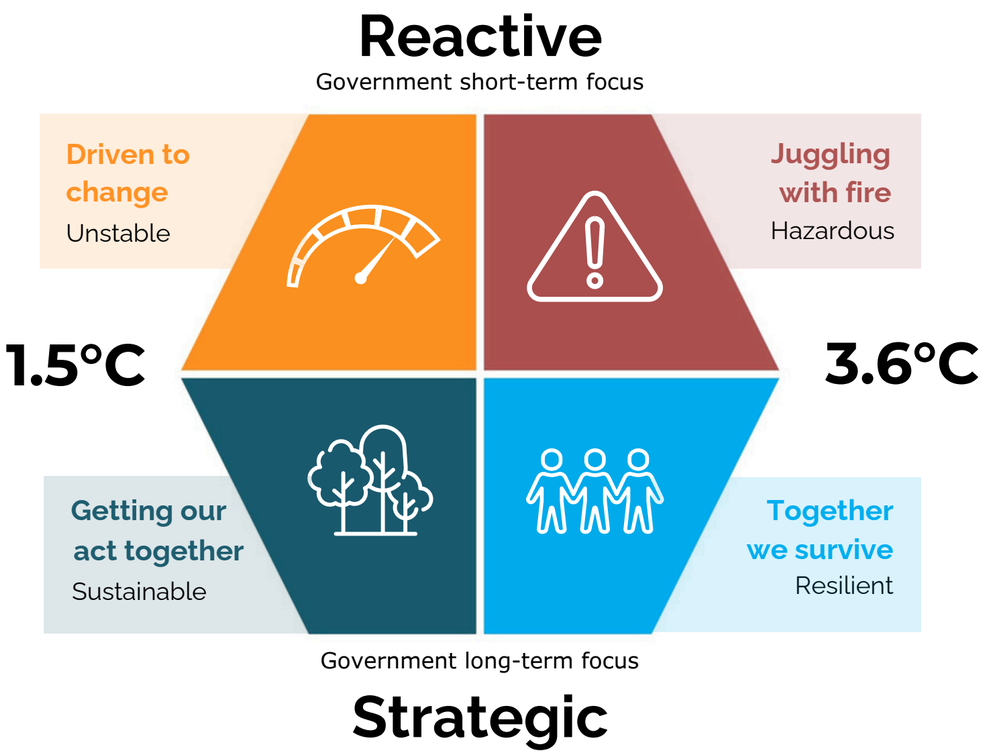


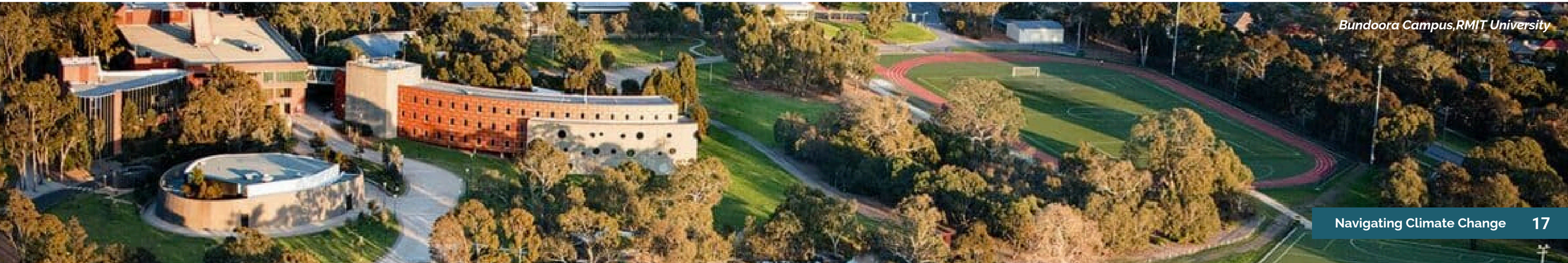
Figure 4. The four climate scenarios

Table 1. Climate scenario - descriptive summary

Scenario	Projected Temp Rise*	SSP** Alignment	Australian Government Focus
Getting our act together	1.5°C	SSP 1-1.9 SSP 1-2.6	Strategic / long-term focus on future needs of the nation
Driven to change			Reactive / short-term focus on the immediate challenges of the nation
Together we survive	3.6°C	SSP 3-7.0	Strategic / long-term focus on future needs of the nation
Juggling with fire			Reactive / short-term focus on the immediate challenges of the nation

**Relative to the 1850-1900 baseline*
***Shared Socio-economic Pathways as per IPCC AR6 Report*

The following sections provide an overview of the characteristics and distinct features for each scenario. Each scenario summary includes a series of diagrams providing a visual representation of the events described.

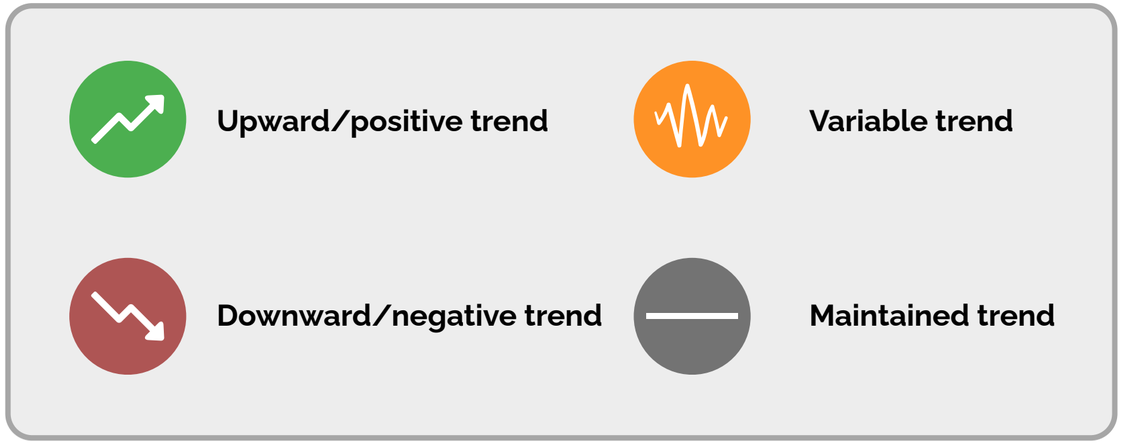


Bundoora Campus,RMIT University

Australian National University campus in Autumn. Image credit: Nic Vevers

POSSIBLE OUTCOMES FOR UNIVERSITIES

The tables in this section present potential outcomes for universities, and possibly the broader tertiary education sector, including the challenges and opportunities associated with the four climate scenarios outlined earlier in the report. The tables cover the short-term (2030s), medium-term (2060s) and long-term (2090s) time horizons for each of the key aspects relevant to the tertiary education sector: teaching, research, operations and infrastructure, the sector's role, and staff and students, including their experience and wellbeing (see Appendix B for a description of each key aspect). They also include an indication of the general trend identified for each key aspect and time scale across all climate scenarios:



Indicators for Tables 2-16

Ideally, these tables should be reviewed in combination with 'The scenarios overview' section, which provides context on the events that lead to these outcomes. Additionally, 'The scenarios in detail' section offers a more comprehensive description of each scenario if needed.

Please note that none of the outcomes represent the formal view of any of the institutions involved. They have been envisioned as a set of plausible outcomes to ensure effective management of climate risks and opportunities.

GETTING OUR ACT TOGETHER

The increase in the frequency and intensity of extreme weather events, even with temperatures rising just to 1.5˚C, led to strong global actions to decarbonise and prepare for the climate changes ahead. In Australia, there was cross party support for action, both to decarbonise and to prepare for the challenges of weather events. Despite global efforts, it was widely acknowledged that temperatures would still peak at 1.6˚C above 1900 levels.

Concern that anything above 1.6˚C could push the world past the tipping point, resulting in major changes to ocean currents and depletion of fish stocks (amongst other impacts), led to renewed global efforts to decarbonise. Australia played its part investing in renewable energy, banning the sale and use of combustion engine cars, and ending the sale of thermal coal and eventually all fossil fuels.

Australia looked ahead and invested in the development of satellite towns that supported a lifestyle of walking and cycling. All new infrastructure was designed to be resilient to extreme weather events.

By the early 2030s, the number of universities decreased to 30, as the cap on international students led to financial failures and mergers. From the late 2030s, universities thrived as the government increased investment in research, with one sixth of the funding to support research, attracting significant interest and investment from business. Commercialisation funding focused on green technology to support the transition to a low-carbon economy. Other areas of investment were in digital capabilities as the government sought to invest in Australia's future prosperity and healthcare in response to the ageing population.

Abundant renewable energy, combined with a wealth of digital talent saw digital clusters thrive throughout Australia and become one of two core sectors for the economy. The other was healthcare, after government investment in ageing healthcare led to breakthroughs in treatments for neurogenerative disorders. This resulted in a golden age of economic growth for Australia, and an increase in demand for tertiary education. The number of wealthy former academics who successfully commercialised their research became an aspiration for the youth of the day.

Green roof at Burnie Campus, University of Tasmania

2025 TO 2039 - CAUSE AND EFFECT PATHWAYS

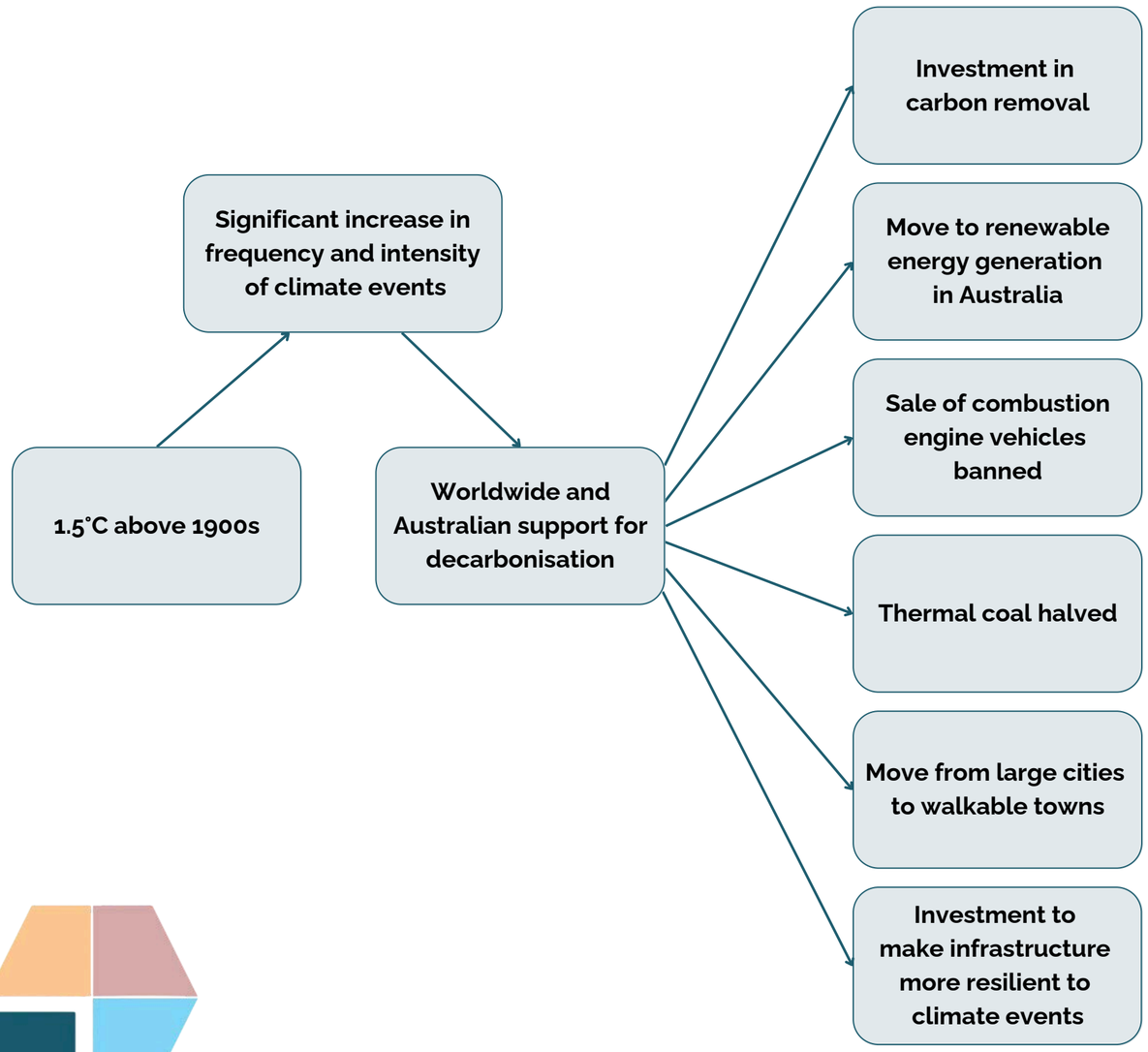


Table 2. Where could the tertiary education sector be in the 2030s?

Teaching	• Decline in student numbers, leading to four Australian universities failing financially and mergers. • Higher rates of student support for areas of government priority - such as decarbonisation tech. • Short course on climate change included in all degrees. • Move towards blended learning.
Research	• Government research priorities focused on STEM, in particular digital technology and health. • Specific fund to commercialise decarbonisation technology. • All research proposals required to meet climate standards. • Increased funding for R&D, recognised as key to long-term prosperity.
Operations	• Rationalisation of property portfolios due to increased building costs from adaptation to climate conditions and declining student numbers.
Sector Role	• Universities regarded as key to achieving carbon goals. • Only 30 universities remain.
Staff	• Fewer staff members following university mergers. • Development of new technical skills to support blended learning.
Students	• Students supportive of universities as exemplars in decarbonisation and prioritise climate change.

2040 TO 2059 - CAUSE AND EFFECT PATHWAYS

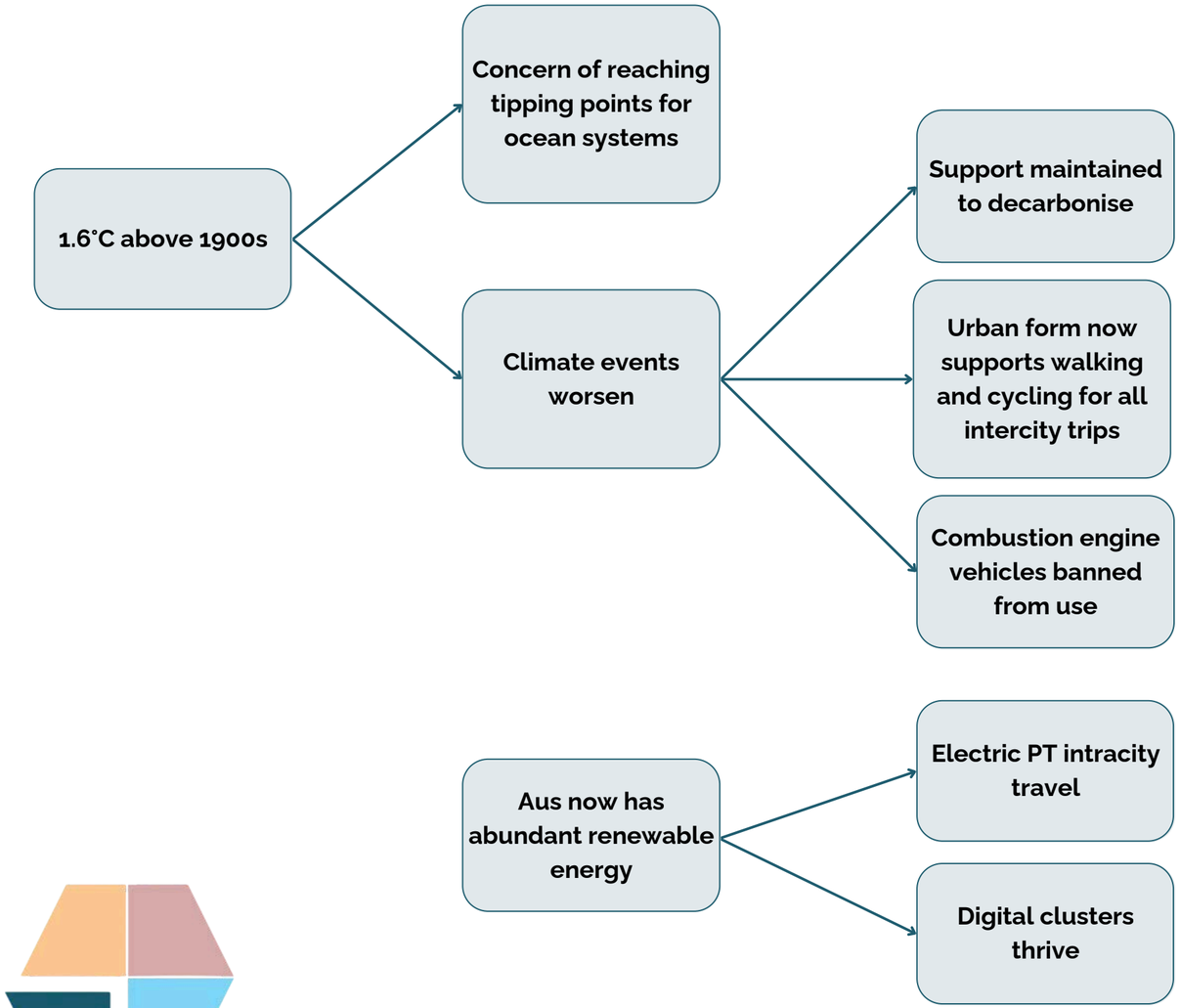


Table 3. Where could the tertiary education sector be in the 2060s?

Teaching	• Return to growth of domestic and international student numbers- the latter caused by government drive to counterbalance the ageing population.
Research	• 2.5% GDP invested in research - golden age for research in universities. • One sixth of government funding allocated to research commercialisation in close co-operation with commercial organisations.
Operations	• Investment in new teaching and research capacity, as well as in digital capabilities to support blended learning. • Creation or growth of science parks at all the remaining universities.
Sector Role	• Working closely with the government to support the transformation of the economic structure and the nation's economic success. • Important role in both research and the critical conscience of society.
Staff	• Benefit from opportunities for significant financial gain through commercialisation efforts – the age of the academic millionaires.
Students	• Academics are seen by students as exemplars of a great career path that allows both a contribution to society and financial prosperity.

2070 TO 2089 - CAUSE AND EFFECT PATHWAYS

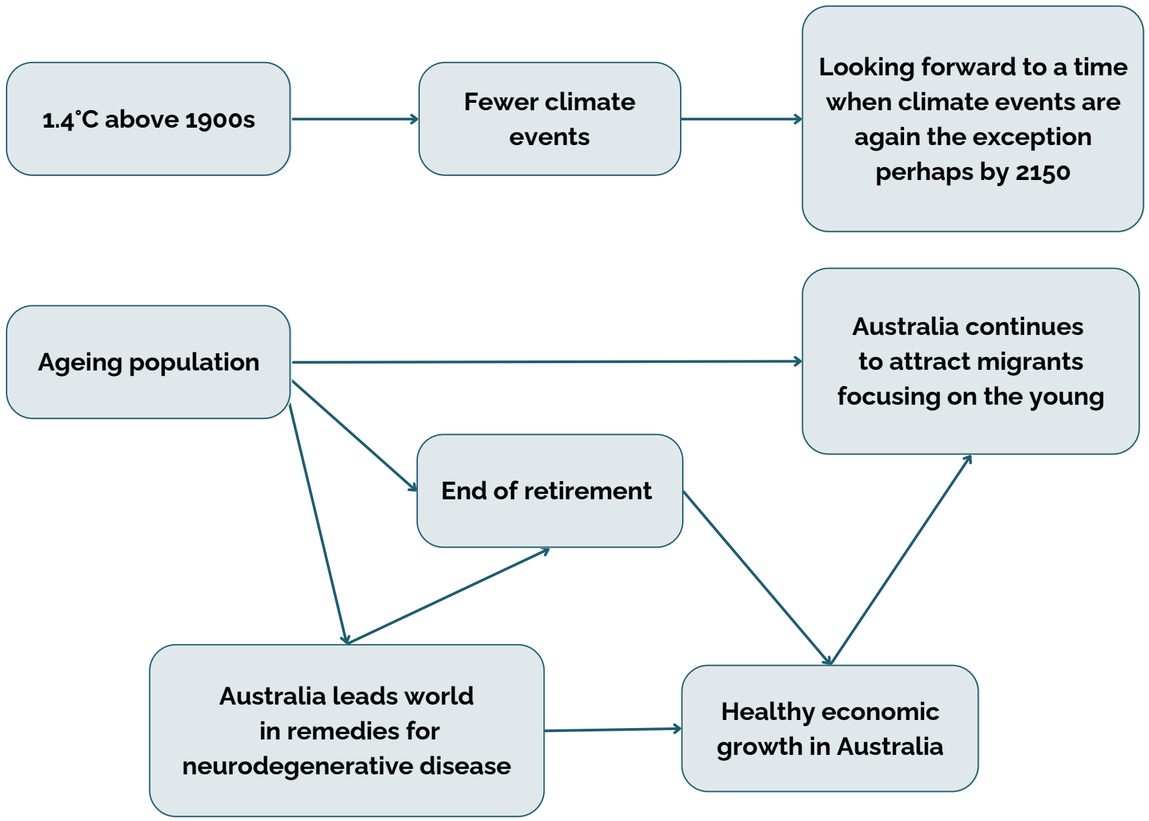


Table 4. Where could the tertiary education sector be in the 2090s?

Teaching	• Continued growth in student numbers driven by population growth and successful careers of those with tertiary education. • Technology-supported learning, allowing all to learn in their native language and in a culturally appropriated way. • Resurgence of interest in the arts and humanities, including languages and cultures, as more people returned to universities after a successful first career.
Research	• Universities regarded as pivotal institutions in delivering the next wave of economic opportunities, including cold fusion, self-healing concrete and 3D printing of human tissue for replacement organs.
Operations	• Continued investment in leading quality teaching and research facilities, ensuring buildings have natural shade and air flows to minimise energy use.
Sector Role	• Key role in the nation's prosperity. • Assistance in policy design for the public sector.
Staff	• Growing opportunities to stay in academia or move to the public or private sectors. • Academia recognised as a guarantee of great career opportunities.
Students	• Appreciation of the high quality of experiences and opportunities provided during their time at the universities.

DRIVEN TO CHANGE

There was an ongoing but gradual increase in the frequency and intensity of extreme weather events throughout the century. This, together with pressure from the Global South, led to the introduction of personal carbon allowances in developed nations, which tightened over time. This created social pressure in Australia for government investment in renewable energy, carbon capture and intercity rail. Long-haul flights became the preserve of the rich, with the majority of the population travelling between cities by rail. Similarly, most switched from personal car ownership to using autonomous electric vehicle services for local travel.

Advances in quantum cryptography delivered secure digital capabilities. Together with rapid developments in AI, this led to a change in the nature of work and rising unemployment. Increasing number of knowledge tasks performed by AI resulted in increasing scepticism about the value of a tertiary education.

Fiscal pressures increased in Australia, with increasing costs of recovery from the growing number of extreme weather events, rising health costs from an ageing population, rising levels of unemployment, and declining revenue from mining of fossil fuels. The fiscal pressures resulted in lower funding for the tertiary education sector and heightened expectations for a faster return on government-funded research.

The combination of declining student numbers and increasing capabilities of AI led to radical changes in the approach to teaching, with private training providers offering lower cost teaching supported by AI teachers. By the 2050s, only six teaching universities remained in Australia, as face-to-face tertiary education became accessible only to the wealthy. By the 2090s there were just nine global providers of online AI assisted tertiary education. The six remaining Australian universities were in the consortium of elite universities providing material for one of the global online providers.

The research capabilities of the universities were combined into Australian Research Institutes (ARIs), with one in each of the States and Territories. Funding from the government for the ARIs focused on near-market research, which attracted increasing amounts of investment from the business sector into the ARIs.

A NSW Riverina paddock during a drier season, Charles Sturt University

2025 TO 2039 - CAUSE AND EFFECT PATHWAYS

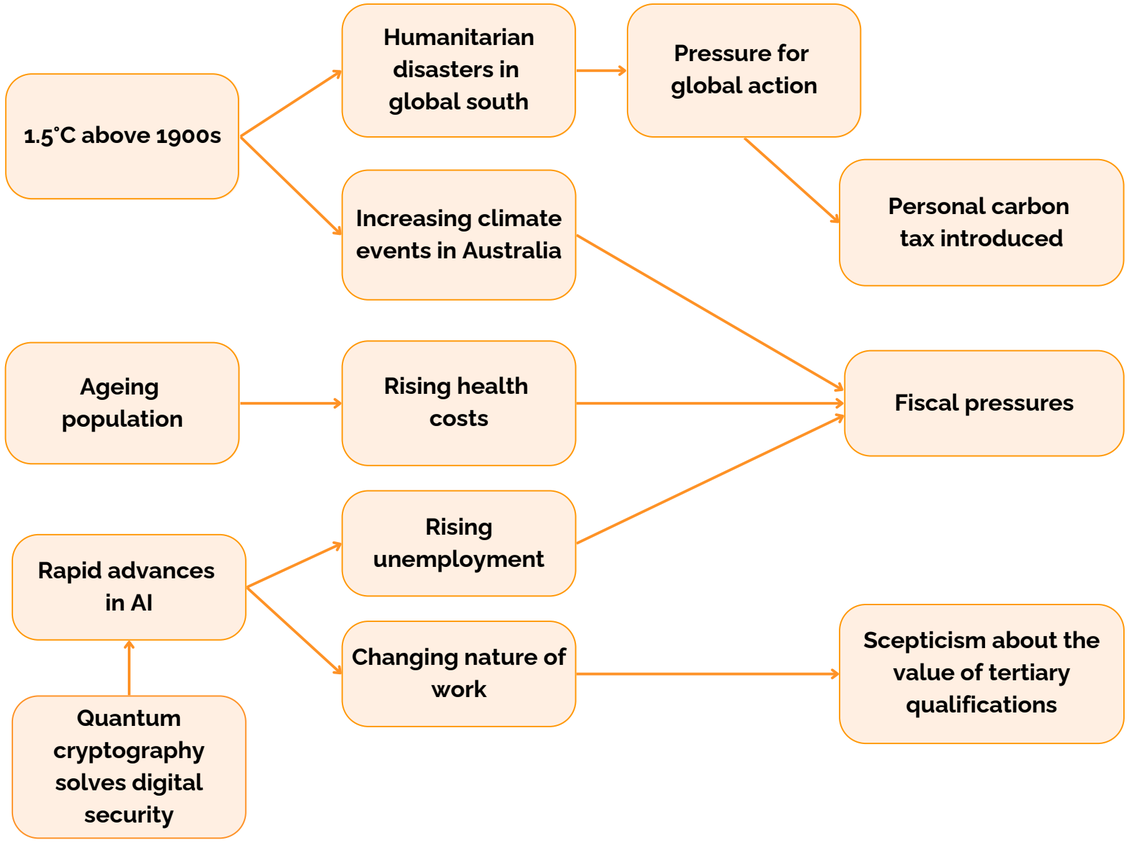


Table 5. Where could the tertiary education sector be in the 2030s?

Teaching	• Decreasing demand for traditional education. • Rise of AI teachers and move to staircase learning.
Research	• Emphasis on near market research partnering with business. • Focus on decarbonisation of emissions-intensive industries. • Tracking of effectiveness of carbon allowances.
Operations	• Property liquidated due to reduced demand for face-to-face teaching. • Investment in digital technologies.
Sector Role	• Future of universities role in teaching questioned. • Role in lobbying for a just transition to a low carbon society.
Staff	• Halving of staff at universities as AI takes on teaching roles.
Students	• Recognition of the benefits of AI teaching, but lacking university community experience. • Students grouped in small clusters with similar interests leading to social echo chambers.

2040 TO 2069 - CAUSE AND EFFECT PATHWAYS

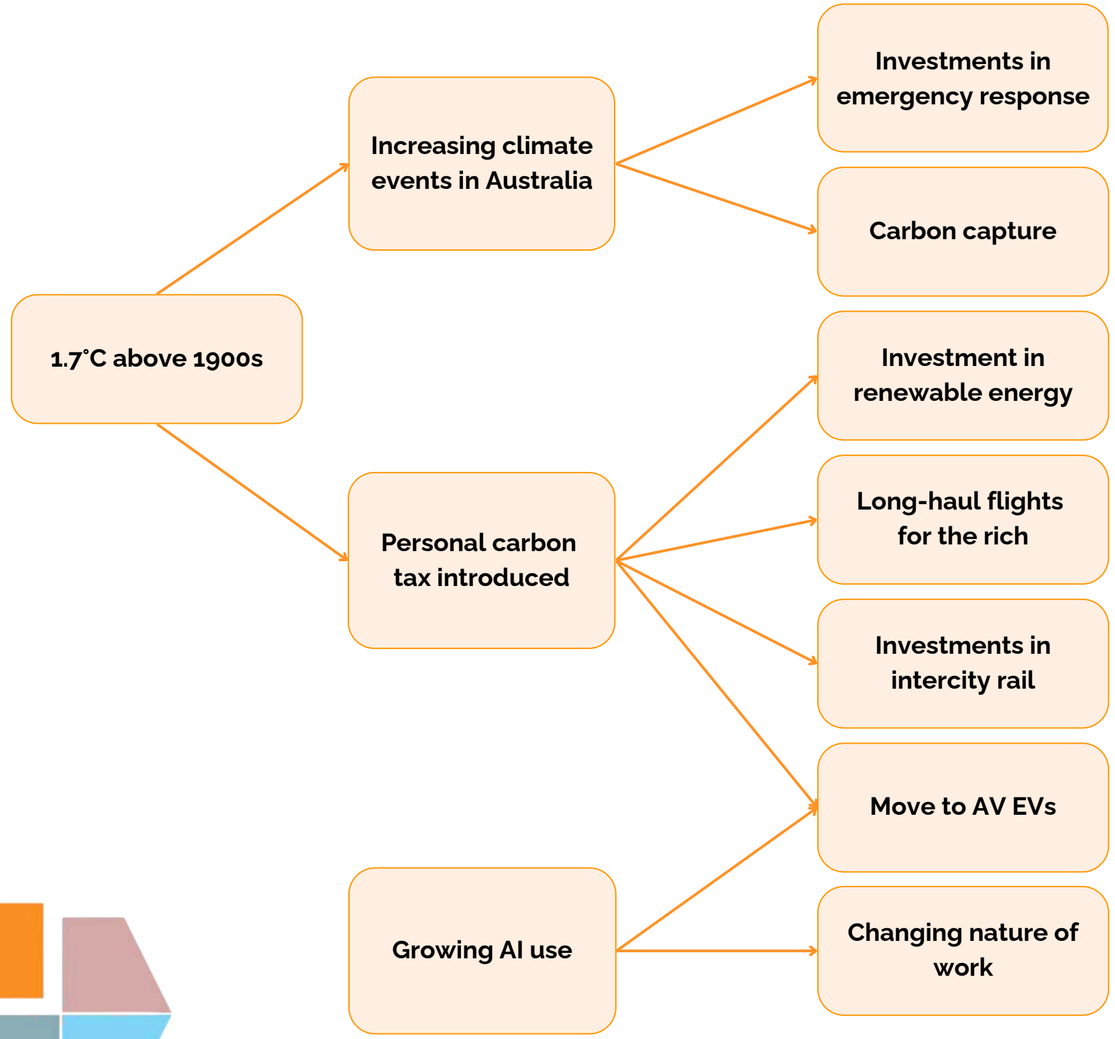


Table 6. Where could the tertiary education sector be in the 2060s?

Teaching	• Mainstream teaching delivered by private tertiary educators, instead of universities, using AI teachers. • Only six elite teaching universities in Australia for the wealthy. • Demand for courses on AI, healthcare and decarbonisation. • Resurgence of interest in arts and humanities, as more personal time due to AI taking on many roles in the knowledge economy.
Research	• In each state, the research arms of universities merged into Australian Research Institutes (ARIs). • Focus on carbon capture and low carbon hydrogen generation.
Operations	• All teaching facilities liquidated, except for those owned by the six elite universities.
Sector Role	• Key roles in research and critical conscience of society.
Staff	• More professional than academic staff to support digital systems. • ARIs staff focus on research only.
Students	• A degree from the elite universities guaranteed a role in the new Research Institutes.

2070 TO 2099 - CAUSE AND EFFECT PATHWAYS

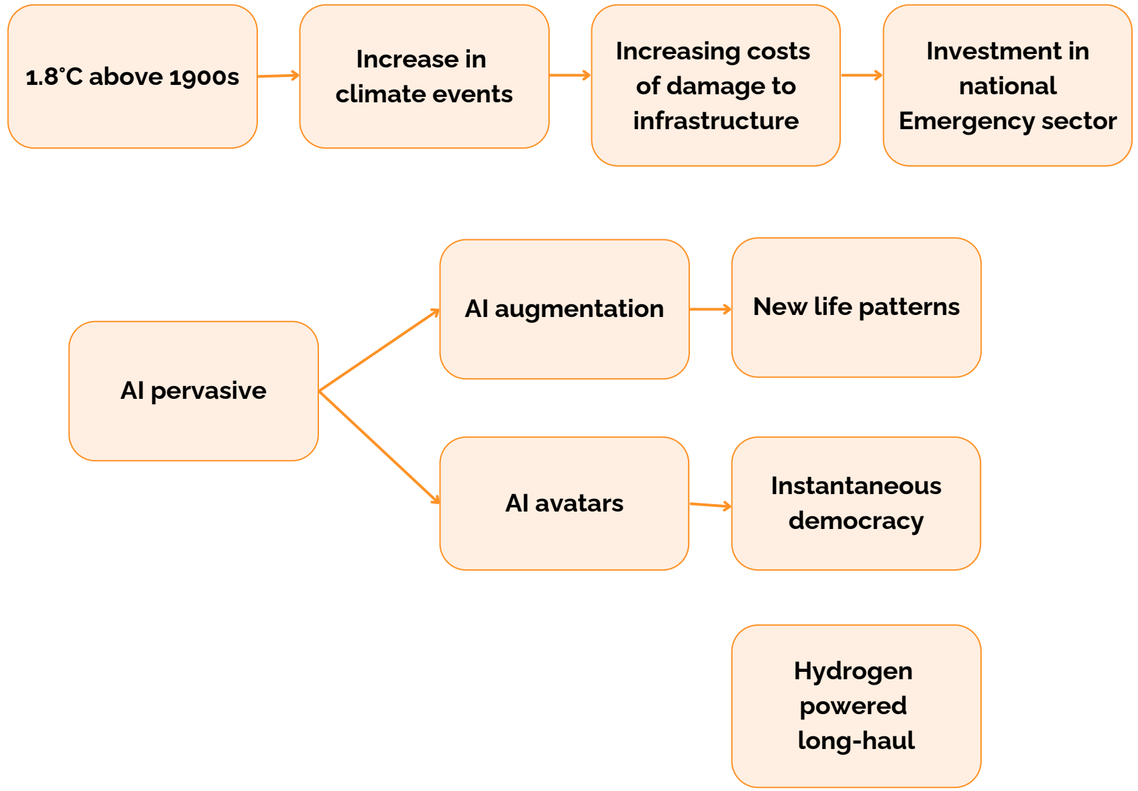


Table 7. Where could the tertiary education sector be in the 2090s?

Teaching	• Only nine global companies providing AI teaching support to the world. • Growth of face-to-face teaching at the six elite Australian universities. • Teaching focus on how to get the most from AI augmentation.
Research	• Increasing research funding for hardening infrastructure and re-establishing communities impacted by extreme weather.
Operations	• Self-insurance scheme created by the elite universities and Research Institutes, as cost of insurance increases. • Increased teaching facilities space in elite universities to respond to growing demand.
Sector Role	• Development of the leaders of the future and establishment of key international connections with global elite. • Academics seen as the sole source of truth in the sea of mis and disinformation.
Staff	• Staff at the elite universities and ARIs regarded as highly esteemed and well paid.
Students	• Varied student experience, depending on whether they are taught by AI or attend an elite university.

TOGETHER WE SURVIVE

Many nations prioritised economic growth over environmental goals, resulting in rising levels of carbon. Australia faced the challenges of drought, and Australian insurers highlighted the future risks if the world continued on its current emissions pathway. Strong social pressure for long-term approach in Australia led to the formation of a cross-party group in Parliament to ensure a long-term view was maintained.

Internationally, scepticism remained, with those nations focusing on economic growth using “clever” carbon accounting in relation to land use change to give the appearance of action. Worsening climate impacts, such as loss of coral reefs and impacts on low-lying island nations led Australia to advocate strongly for global action. As climate challenges intensified and the purchase of hollow carbon credits was debunked, the world began to awaken to the harsh realities of climate change.

Climate change led to desertification of regions and sea level rise, causing coastal cities to be abandoned across the world. A global alliance was formed to help the world adapt as mass migration ensued, with populations moving to the new temperate regions.

Foresight in Australia led to construction of resilient towns in temperate regions. Advanced technologies and innovation in food production were applied to ensure food security and support the ongoing economic success necessary for these investments. Due to its strategic foresight and initiatives, Australia became an island of resilience. This made the country attractive to climate refugees.

Cyber-attacks and the rise of disinformation meant a move back to face-to-face teaching. The tertiary education sector was decentralised, with local hubs supporting local communities to survive in the changing and challenging climate. Academics and students focussed on vocational training, with practical application in the communities in which they were located. Research incubators became a core part of all the local tertiary education centres, supporting the diffusion of innovations that ensured the survival and success of the local communities.

Tertiary education centres, funded by the government as a key part of their adaptation strategy, were considered essential facilities of all new towns.

Brunswick Campus, RMIT University

2025 TO 2039 - CAUSE AND EFFECT PATHWAYS

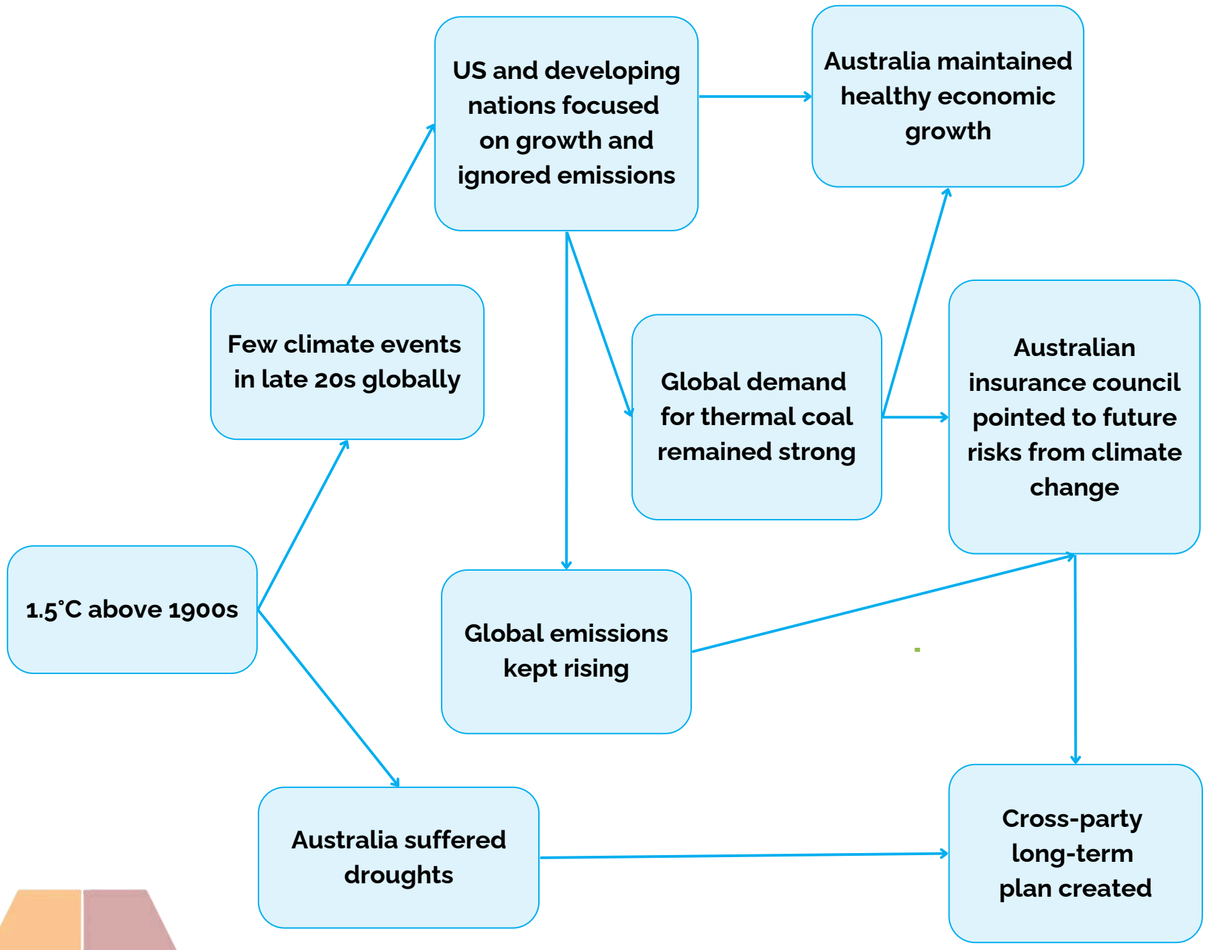


Table 8. Where could the tertiary education sector be in the 2030s?

Teaching	• Decline in domestic student numbers due to scepticism about the value of a degree. • Significant decrease in numbers of international students for all but the Group of Eight Australian universities as a consequence of the rise of Asian universities in global rankings.
Research	• Increased levels of research funding, with a focus on adaptation as the priority.
Operations	• Adoption of new models of teaching to reduce costs, featuring more professional teachers and blended learning, as universities downsized in response to decreasing demand • Decrease in property portfolio and move to local hubs to offset the increasing cost of insurance and energy.
Sector Role	• Academics sought to assist the cross parliamentary group by supporting long- term thinking. • Advocate for effective long-term planning and adaptation to climate change.
Staff	• Reduction in staff numbers, with those remaining living close to university hubs.
Students	• Move to local hubs welcomed by students as it provided access to cheaper accommodation.

2040 TO 2069 - CAUSE AND EFFECT PATHWAYS

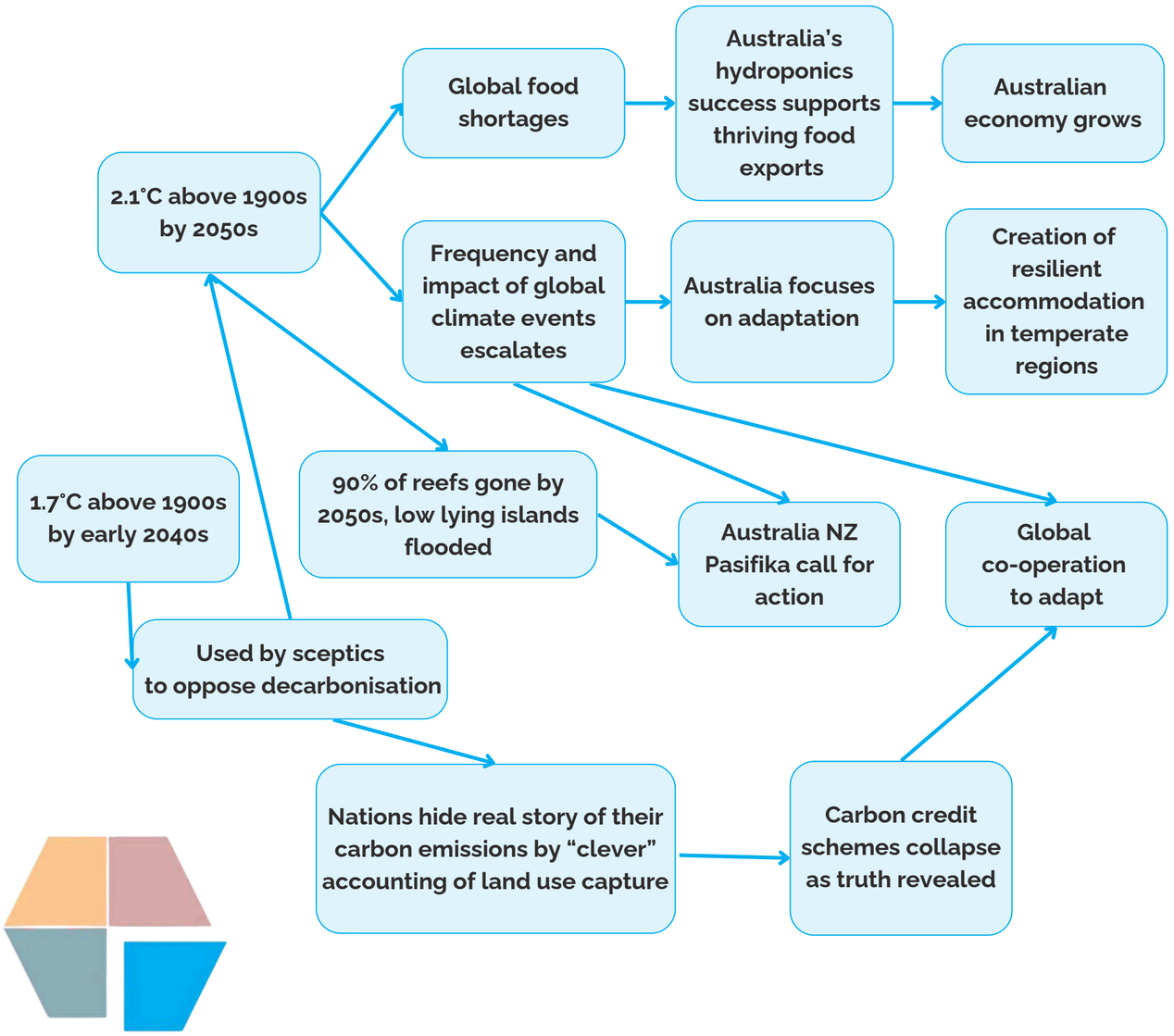


Table 9. Where could the tertiary education sector be in the 2060s?

Teaching	• Significant increase in demand driven by rising population size. • Face-to-face learning preferred by students as it provides support from others when dealing with personal challenges related to climate change. • Decrease in confidence in virtual learning due to cyber security and deep fake challenges. • Demand for vocational learning relevant to living in the new climate environments.
Research	• Additional investment in research, including demonstrator research located in hubs, to respond to local challenges. • Focus on hydroponics and biotechnology to ensure food production in the face of a changing climate.
Operations	• Transition to decentralised locations of local hubs supported by increased government funding.
Sector Role	• Working with State governments and communities to adapt to the new climate.
Staff	• Staff respected as source of truth and key to adaptation.
Students	• Students benefitted from being part of the local community.

2070 TO 2099 - CAUSE AND EFFECT PATHWAYS

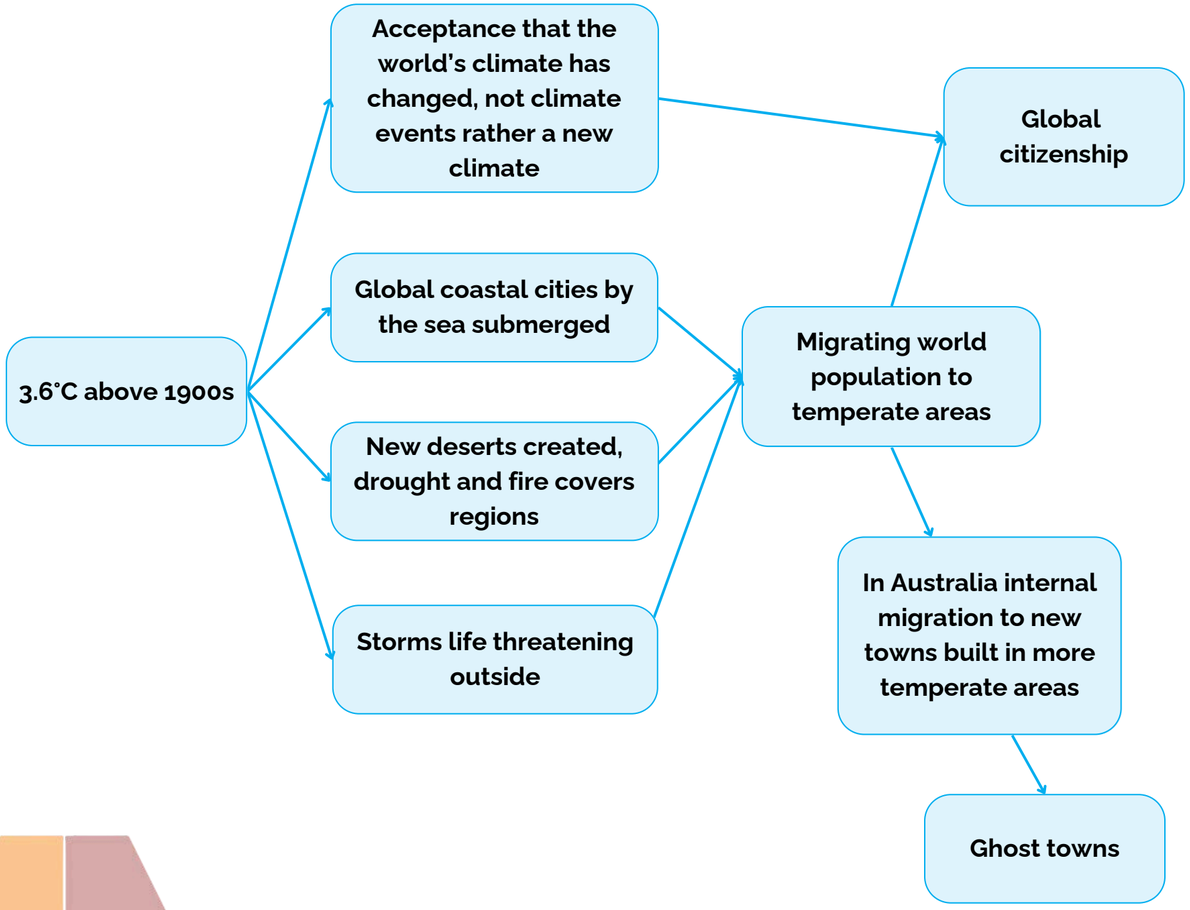


Table 10. Where could the tertiary education sector be in the 2090s?

Teaching	• Continued increase in student numbers driven by population growth and recognition of the value of students learning and contribution to their community in the university hubs. • Courses standardised to three years and more akin to apprenticeships as students acquire skills through mentoring and practical application within the community.
Research	• Focus on carbon capture and ice shelves stabilisation. • Consensus among researchers that strategic adaptation to climate change is needed.
Operations	• Move from abandoned to growing towns, where new university hubs are established, enabled by state funding.
Sector Role	• Universities as civic institutions, integral to the fabric of the new towns.
Staff	• Study limited to hours with tolerable temperatures. Afternoon break as social norm over summer.
Students	• Blurred distinction between staff and students as all learning together to solve the challenges of living in a very different world.

JUGGLING WITH FIRE

There was a break down in commitments to the Paris Agreement, as developing nations' expectations about standards of living increased, and developed nations were not willing to change lifestyles to achieve emissions targets. This led to a continuing rise in global temperatures, reaching 3.6°C above baseline levels by the end of the century.

Countries focussed their efforts on keeping their citizens safe, making nations reluctant to take climate refugees. Challenges created by the worsening climate were exacerbated in the late 2020s by a global pandemic, which provided an excuse for the closure of borders. There were severe economic challenges in Australia as debt was used to support those affected by climate disasters and the pandemic. Governments adopted a short-term focus, with the Commonwealth printing money, resulting in rising inflation.

The Australian government introduced a Weather Emergency Levy to continue to provide emergency response, and help people and businesses recover after events. Australia was recognised as world leading in its response efforts but still struggled to keep on top of the impacts of extreme weather events.

The number of regional conflicts increased in the 2040s, as countries fought over access to potable water and supply chains broke. Governments struggled under the weight of the climate catastrophes and the lack of global support available, unleashing hundreds of millions of climate refugees looking for safer havens. This, together with low crop yields, led to food shortages, widespread crime and civil disobedience. Australia introduced rationing to ensure the survival of all its citizens.

Feedback loops in natural systems caused faster-than-expected melting of ice shelves, leading to the loss of islands and coastal towns and cities to the rising tide. This increased immigration into and migration within Australia.

There was a move towards vocational training, as students focused on survival, leading to the disappearance of traditional universities by the 2080s. Students learned in bite size chunks when they could as they faced disrupted lives. The tertiary education sector became integrated with the government, with all activity (whether research or teaching) focussed on survival and adaptation to the new and challenging environment. The large buildings of tertiary education institutions were seen as a place of refuge and used to house waves of refugees from other parts of Australia and abroad. The tertiary education sector also played a key role in language training and cultural assimilation.

Bushfire smoke over Parville Campus 2020, University of Melbourne
Image credit: Sascha White

2025 TO 2039 - CAUSE AND EFFECT PATHWAYS

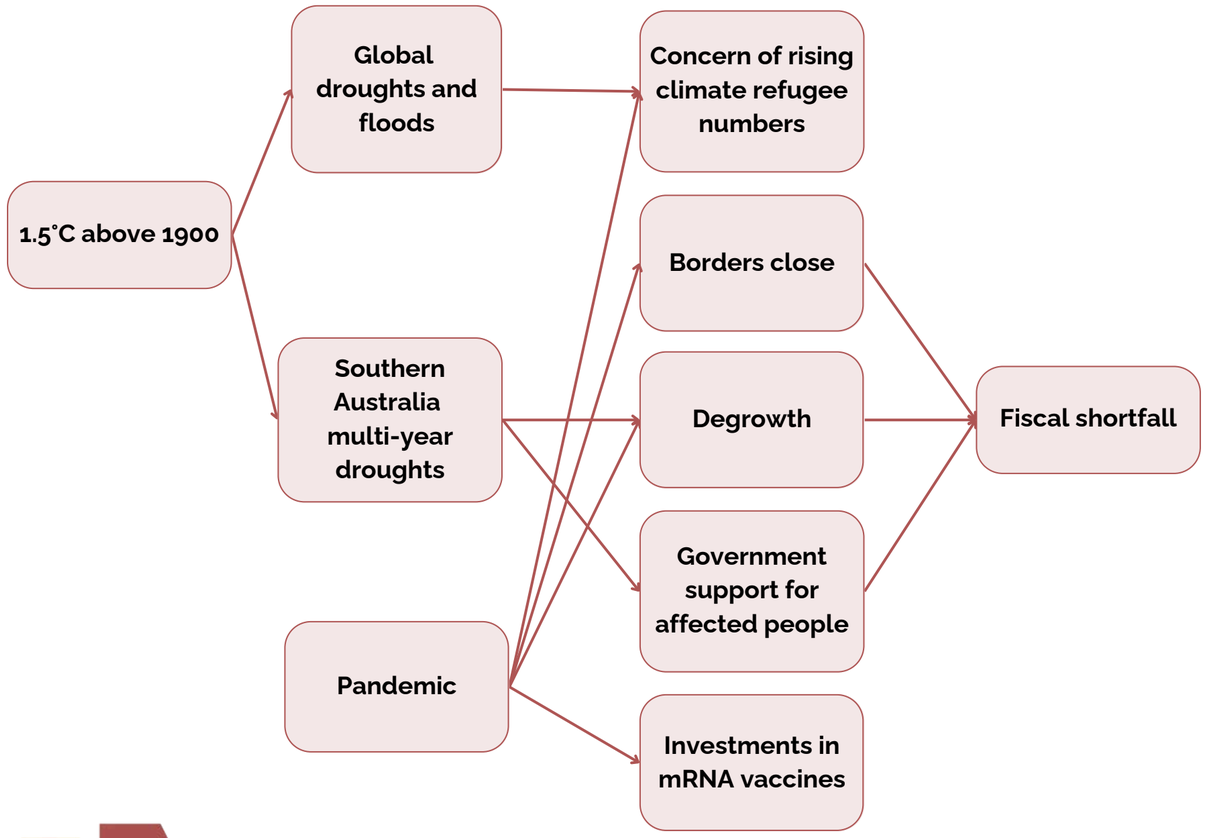


Table 11. Where could the tertiary education sector be in the 2030s?

Teaching	• Reduction in domestic demand for tertiary education following reduced government support for students. • Decline in international students due to tighter border controls. • Investment in offshore and online teaching to build resilience.
Research	• Focus on rebuilding and recovering from climate events, and on vaccines for infectious disease.
Operations	• Downsizing of facilities, which offset rising costs for repairs, insurance and cooling. • Investment focussed on developing central hubs or creating facilities in offshore locations.
Sector Role	• Government support to conduct rapid response research and provide consulting type advice. • Pandemic control through virus testing, leading to closer relations with communities and State government.
Staff	• Decrease in staff numbers. • Staff trained in health and wellbeing to support students.
Students	• Campuses regarded as places of safety and care.

2040 TO 2069 - CAUSE AND EFFECT PATHWAYS

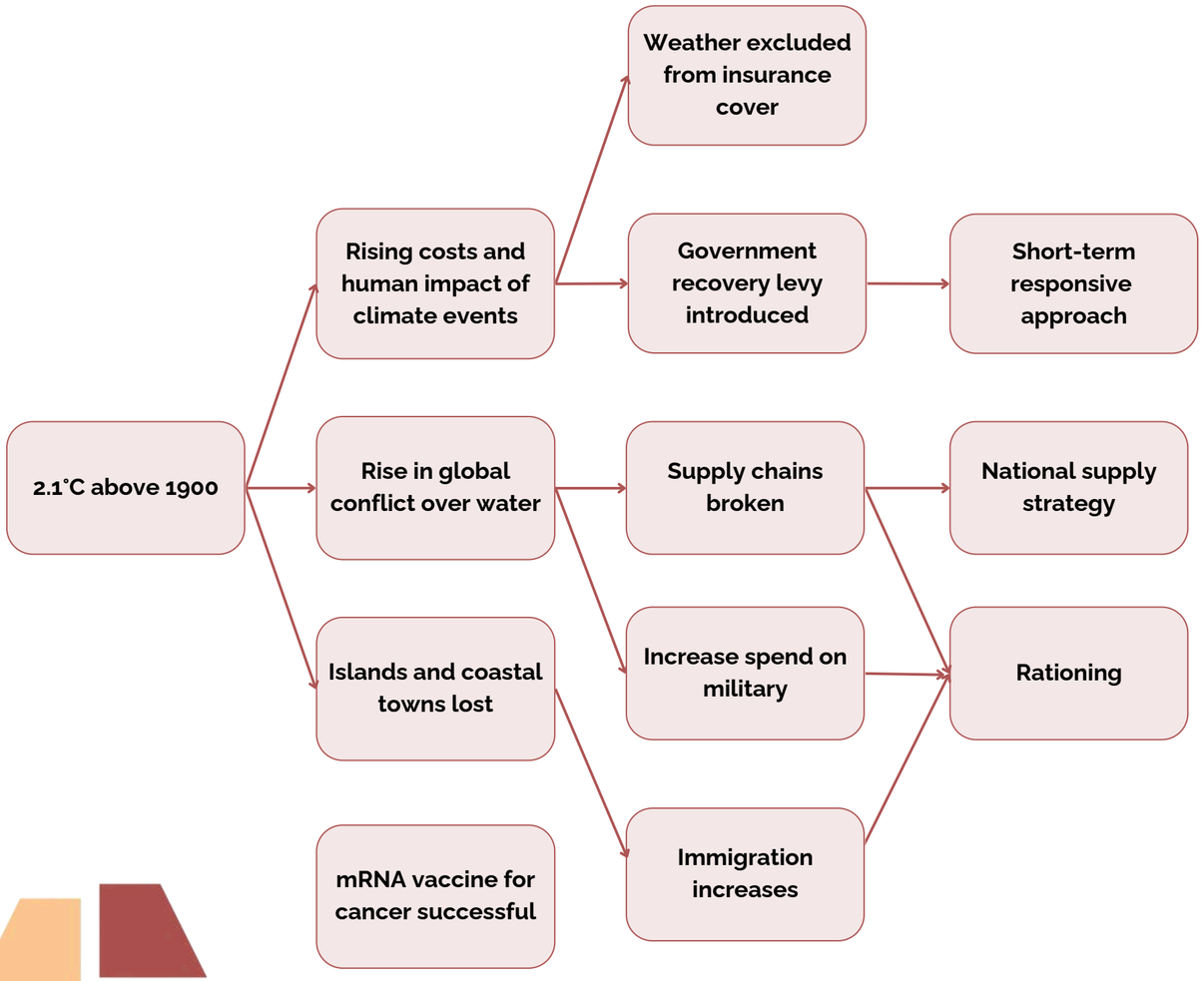


Table 12. Where could the tertiary education sector be in the 2060s?

Teaching	• Decline in student numbers as focus is on survival. • Demand for niche areas and vocational qualifications. Modular course offerings to provide flexibility in a heavily impacted world. • Growing demand for short courses on languages and cultural integration following increasing immigration.
Research	• Strong partnerships with government and business on research to respond to climate challenges. Funding supported by climate levy. • Investment in healthcare leading to Australia creating an effective early detection technology and treatment for cancer.
Operations	• Investment in centralised campuses to provide refuge spaces for people in a safe environment. • Increased investment in security to safeguard the people who were on campus and to protect the water and food supplies.
Sector Role	• Teaching role in niche areas, and reinforced social role as a community refuge.
Staff	• Growth in staff numbers to support integration of immigrants.
Students	• Universities considered as a place of safety, community and acceptance.

2070 TO 2099 - CAUSE AND EFFECT PATHWAYS

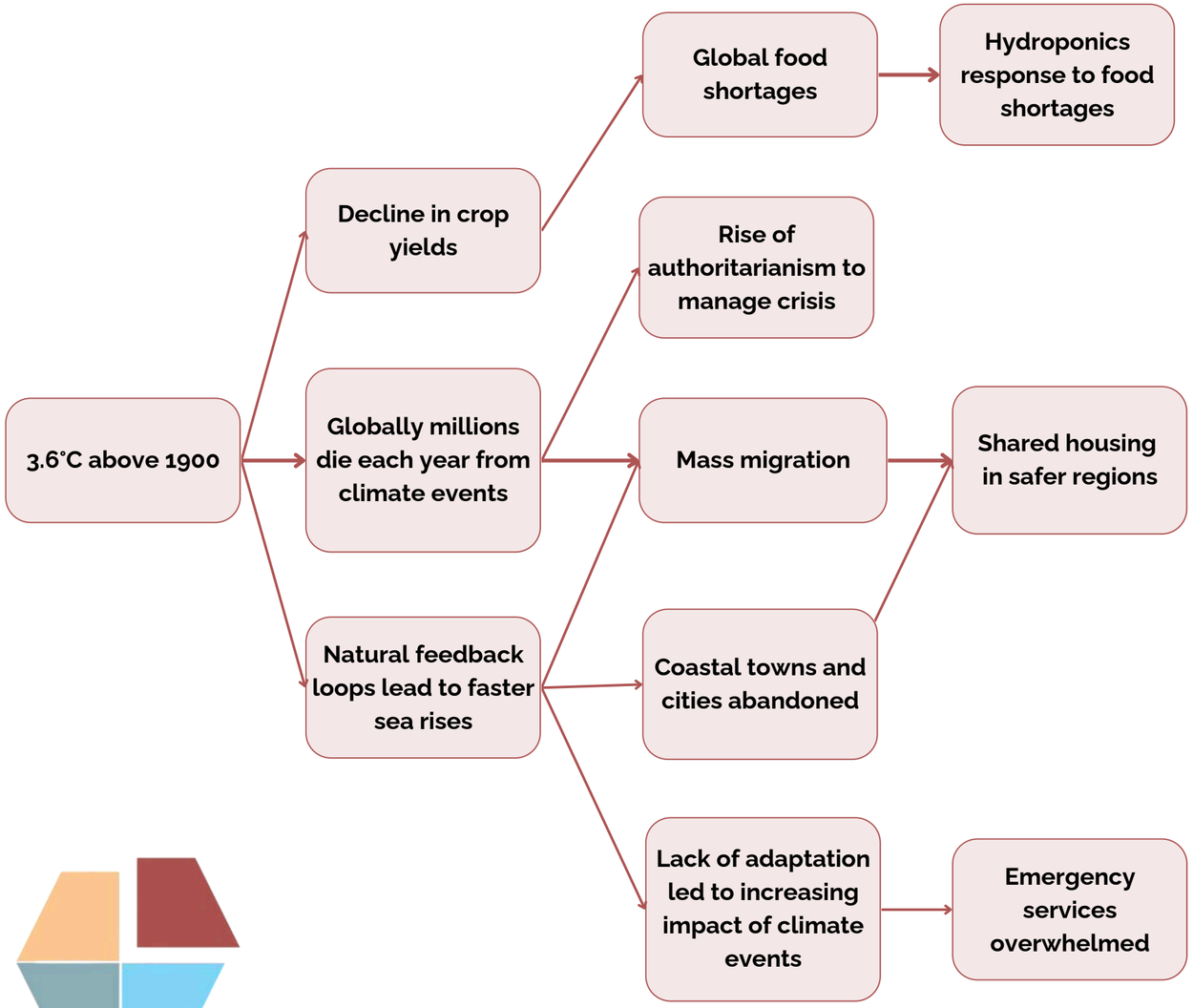


Table 13. Where could the tertiary education sector be in the 2090s?

Teaching	• Learning delivered in bite-size chunks and focused on survival. • Local or online learning as travel is too disrupted • Team learning to ensure complementary skills to deliver benefit to the community.
Research	• Research disconnected from teaching and focussed on emergency response and improvement of population health and safety.
Operations	• Any new infrastructure designed to withstand a one-in-a-500-year risk, acknowledging that the climate will continue to become more severe.
Sector Role	• Traditional universities no longer exist. • Higher education integrated with government and focused on helping Australia to address the new climate challenges.
Staff	• Few jobs in research and much less academic freedom.
Students	• Maintaining physical and mental health as a major issue. Many students suffering from PTSD as a result of extreme weather event.

Table 14. Summary of possible outcomes for universities - 2030s

2030s	GETTING OUR ACT TOGEHER	DRIVEN TO CHANGE	TOGETHER WE SURVIVE	JUGGLING WITH FIRE
Teaching	• Decline in student numbers, leading to four Australian universities failing financially and mergers. • Higher rates of student support for areas of government priority - such as decarbonisation tech. • Short course on climate change included in all degrees. • Move towards blended learning.	• Decreasing demand for traditional education. • Rise of AI teachers and move to staircase learning.	• Decline in domestic student numbers due to scepticism about the value of a degree. • Significant decrease in numbers of international students for all but the Group of Eight Australian universities as a consequence of the rise of Asian universities in global rankings.	• Reduction in domestic demand for tertiary education following reduced government support for students. • Decline in international students due to tighter border controls. • Investment in offshore and online teaching to build resilience.
Research	• Government research priorities focused on STEM, in particular digital technology and health. • Specific fund to commercialise decarbonisation tech. • All research proposals required to meet climate standards. • Increased funding for R&D, recognised as key to long-term prosperity.	• Emphasis on near market research partnering with business. • Focus on decarbonisation of emissions- intensive industries. • Tracking of effectiveness of carbon allowances.	• Increased levels of research funding, with a focus on adaptation as the priority.	• Focus on rebuilding and recovering from climate events, and on vaccines for infectious disease.
Operations	• Rationalisation of property portfolios due to increased building costs from adaptation to climate conditions and declining student numbers.	• Property liquidated due to reduced demand for face-to-face teaching. • Investment in digital technologies.	• Adoption of new models of teaching to reduce costs, featuring more professional teachers and blended learning, as universities downsized in response to decreasing demand. • Decrease in property portfolio and move to local hubs to offset the increasing cost of insurance and energy.	• Downsizing of facilities, which offset rising costs for repairs, insurance and cooling. • Investment focussed on developing central hubs or creating facilities in offshore locations.
Sector role	• Universities regarded as key to achieving carbon goals. • Only 30 universities remain.	• Future of universities role in teaching questioned. • Role in lobbying for a just transition to a low carbon society.	• Academics sought to assist the cross parliamentary group by supporting long- term thinking. • Advocate for effective long-term planning and adaptation to climate change.	• Government support to conduct rapid response research and provide consulting type advice. • Pandemic control through virus testing, leading to closer relations with communities and State government.
Staff	• Fewer staff members following university mergers. • Development of new technical skills to support blended learning.	• Halving of staff at universities as AI takes on teaching roles.	• Reduction in staff numbers, with those remaining living close to university hubs.	• Decrease in staff numbers. • Staff trained in health and wellbeing to support students.
Students	• Students supportive of universities as exemplars in decarbonisation and prioritise climate change.	• Recognition of the benefits of AI teaching, but lacking university community experience. • Students grouped in small clusters with similar interests leading to social echo chambers.	• Move to local hubs welcomed by students as it provided access to cheaper accommodation.	• Campuses regarded as places of safety and care.

Table 15. Summary of possible outcomes for universities - 2060s

2060s	GETTING OUR ACT TOGEHER	DRIVEN TO CHANGE	TOGETHER WE SURVIVE	JUGGLING WITH FIRE
Teaching	• Return to growth of domestic and international student numbers- the latter caused by government drive to counterbalance the ageing population.	• Mainstream teaching delivered by private tertiary educators, instead of universities, using AI teachers. • Only 6 elite teaching universities in Australia for the wealthy. • Demand for courses on AI, healthcare and decarbonisation. • Resurgence of interest in arts and humanities, as more personal time due to AI taking on many roles in the knowledge economy.	• Significant increase in demand driven by rising population size. • Face-to-face learning preferred by students as it provides support from others when dealing with personal challenges related to climate change. • Decrease in confidence in virtual learning due to cyber security and deep fake challenges. • Demand for vocational learning relevant to living in the new climate environments.	• Decline in student numbers as focus is on survival. • Demand for niche areas and vocational qualifications. Modular course offerings to provide flexibility in a heavily impacted world. • Growing demand for short courses on languages and cultural integration following increasing immigration.
Research	• 2.5% GDP invested in research - golden age for research in universities. • One sixth of government funding allocated to research commercialisation in close co-operation with commercial organisations.	• In each state, the research arms of universities merged into Australian Research Institutes (ARIs). • Focus on carbon capture and low carbon hydrogen generation.	• Additional investment in research, including demonstrator research located in hubs, to respond to local challenges. • Focus on hydroponics and biotechnology to ensure food production in the face of a changing climate.	• Strong partnerships with government and business on research to respond to climate challenges. Funding supported by climate levy. • Investment in healthcare leading to Australia creating an effective early detection technology and treatment for cancer.
Operations	• Investment in new teaching and research capacity, as well as in digital capabilities to support blended learning. • Creation or growth of science parks at all the remaining universities.	• All teaching facilities liquidated, except for those owned by the six elite universities.	• Transition to decentralised locations of local hubs supported by increased government funding.	• Investment in centralised campuses to provide refuge spaces for people in a safe environment. • Increased investment in security to safeguard the people who were on campus and to protect the water and food supplies.
Sector role	• Working closely with the government to support the transformation of the economic structure and the nation's economic success. • Important role in both research and the critical conscience of society.	• Key roles in research and critical conscience of society.	• Working with State governments and communities to adapt to the new climate.	• Teaching role in niche areas, and reinforced social role as a community refuge.
Staff	• Benefit from opportunities for significant financial gain through commercialisation efforts – the age of the academic millionaires.	• More professional than academic staff to support digital systems. • ARIs staff focus on research only.	• Staff respected as source of truth and key to adaptation.	• Growth in staff numbers to support integration of immigrants.
Students	• Academics are seen by students as exemplars of a great career path that allows both a contribution to society and financial prosperity.	• A degree from the elite universities guaranteed a role in the new Research Institutes.	• Students benefitted from being part of the local community.	• Universities considered as a place of safety, community and acceptance.

Table 16. Summary of possible outcomes for universities - 2090s

2090s	GETTING OUR ACT TOGEHER	DRIVEN TO CHANGE	TOGETHER WE SURVIVE	JUGGLING WITH FIRE
Teaching	• Continued growth in student numbers driven by population growth and successful careers of those with tertiary education. • Tech-supported learning, allowing all to learn in their native language and in a culturally appropriated way. • Resurgence of interest in the arts and humanities, including languages and cultures, as more people returned to universities after a successful first career.	• Only nine global companies providing AI teaching support to the world. • Growth of face-to-face teaching at the six elite Australian universities. • Teaching focus on how to get the most from AI augmentation.	• Continued increase in student numbers driven by population growth and recognition of the value of students learning and contribution to their community in the university hubs. • Courses standardised to three years and more akin to apprenticeships as students acquire skills through mentoring and practical application within the community.	• Learning delivered in bite-size chunks and focussed on survival. • Local or online learning as travel is too disrupted • Team learning to ensure complementary skills to deliver benefit to the community.
Research	• Universities regarded as pivotal institutions in delivering the next wave of economic opportunities, including cold fusion, self-healing concrete and three d printing of human tissue for replacement organs.	• Increasing research funding for hardening infrastructure and re-establishing communities impacted by extreme weather.	• Focus on carbon capture and ice shelves stabilisation. • Consensus among researchers that strategic adaptation to climate change is needed.	• Research disconnected from teaching and focused on emergency response and improvement of population health and safety.
Operations	• Continued investment in leading quality teaching and research facilities, ensuring buildings have natural shade and air flows to minimise energy use.	• Self-insurance scheme created by the elite universities and Research Institutes, as cost of insurance increases. • Increased teaching facilities space in elite universities to respond to growing demand.	• Move from abandoned to growing towns, where new university hubs are established, enabled by state funding.	• Any new infrastructure designed to withstand a one-in-a-500-year risk, acknowledging that the climate will continue to become more severe.
Sector role	• Key role in the nation's prosperity. • Assistance in policy design for the public sector.	• Development of the leaders of the future establishment of key international connections with global elite. • Academics seen as the sole source of truth in the sea of mis and disinformation.	• Universities as civic institutions, integral to the fabric of the new towns.	• Traditional universities no longer exist. • Higher education integrated with government and focussed on helping Australia to address the new climate challenges.
Staff	• Growing opportunities to stay in academia or move to the public or private sectors. • Academia recognised as a guarantee of great career opportunities.	• Staff at the elite universities and ARIs regarded as highly esteemed and well paid.	• Study limited to hours with tolerable temperatures. Afternoon break as social norm over summer.	• Few jobs in research and much less academic freedom.
Students	• Appreciation of the high quality of experiences and opportunities provided during their time at the universities.	• Varied student experience, depending on whether they are taught by AI or attend an elite university.	• Blurred distinction between staff and students as all learning together to solve the challenges of living in a very different world.	• Maintaining physical and mental health as a major issue. Many students suffering from PTSD as a result of extreme weather event.

POSSIBLE OUTCOMES BY 2090s: BY THE NUMBERS

Table 17. Scenario comparison by numbers in 2090s

	NOW	GETTING OUR ACT TOGEHER	DRIVEN TO CHANGE	TOGETHER WE SURVIVE	JUGGLING WITH FIRE
Student numbers	1.6 million	Decrease in short term to 1.2 million then rise in the long-term to 2.5 million	Decrease in traditional students to 0.4million, but education available to all through AI supported learning	Significant increase to 3.2 million	End of traditional academic teaching pathways
Research income	1.68% GDP	2.5% GDP	1% GDP	4% GDP	GDP no longer used as a metric - research income no longer published
Operations	Campus universities, with online offers	Investments in quality of buildings to provide natural cooling and heating and robustness to events and digital capabilities to support blended learning	Just six traditional campuses, the rest online	Distributed facilities embedded in communities	Central campuses used as a place of refuge from climate events
Sector structure	43 universities that offer teaching and research	39 universities, as four universities fail initially, then increasing growth of the remaining universities	Six elite Australian universities. Eight State level Research Institutes	Closer integration between the universities and other tertiary education organisations as the distinction with vocational training blurs	No traditional universities. Research integrated into the public sector
Staff	130,000	130,000	65,000 staff at universities as AI takes on many roles.	200,000	Few jobs in research. New career pathways include teaching positions in the public sector in integrated organisations.

Roseworthy Solar Farm, The University of Adelaide

SCENARIOS IN DETAIL

GETTING OUR ACT TOGETHER

This scenario explores a possible future where global GHG emissions peak in 2026 and then decline significantly before reaching net zero by the middle of the century. In this scenario, there is cross-party support to reduce GHG emissions and Australia's governments focus on preparing for the long-term.

In this scenario, after an initial decline in student numbers in the late 2020s, student numbers returned to steady growth in the 2030s as the financial opportunities from commercialising research became clear. Universities are at the forefront of economic opportunities in the green economy leading new renewable energy technology, health innovation, and sustainable built environment solutions.

Respect sign at University of Wollongong

2025 to 2029

Society calls for action after more extreme weather events

There was an increase in the number of extreme weather events around the world. In 2027, Europe was hit by a heatwave worse than the 2023 heatwave, leading to more than 60,000 deaths. Europe also saw a second round of intense rainfall and flooding in 2029, resulting in further tens of thousands displaced in Germany, Poland and the Czech Republic as riverbanks failed. The intensity of cyclones affecting the southern states of the United States of America saw a repeat of the 2024 hurricanes in 2026 and 2028. In 2028, a more intense version of the 2023 Typhoon Doksuri created flooding and widespread damage across China, the Philippines, Taiwan and Vietnam, directly impacting over three million people across the region.

The pattern of increasing frequency and intensity of extreme weather events became impossible for politicians across the world to ignore, as social media created the clarion call for change across the globe. Citizens no longer accepted that climate change was a secondary issue to be given second fiddle to more immediate challenges such as inflation.

Australia also saw challenges at home with a second "Black Summer" in 2026 following record periods of temperatures above 35˚C in many states and territories. This led to cross party support to reduce GHG emissions. A national debate was held on options to achieve a decarbonisation of society. There was growing support for immediate action to ensure that Australia achieved net zero GHG emissions by 2050.

Energy supply debate focussed on achieving net zero

The government increased levels of support for large-scale solar power and wind generation, energy storage, and construction of underground transmission lines. This further incentivised domestic uptake, with an increase from a third to half of all homes with solar generation by 2030. Carbon tariffs were also introduced on coal fired power stations, which incentivised a shift away from coal powered production of energy. As a result, the overall percentage share of renewables increased to 90% of all energy generation by the end of 2030.

The debate on whether nuclear would be the only way to decarbonise was reignited, but did not gain sufficient social support for actual change. Ongoing concerns about the financial cost, security of nuclear, and the long-term challenge of dealing with nuclear waste held off action. It was instead agreed to increase pressure to deliver change through a phasing out of all coal fired power stations. The cross-party decarbonisation group set a national target to phase out all coal powered energy generation by 2035.

Demand for thermal coal for export was halved by 2030 in line with increasing international pressure to move away from coal powered energy generation to renewables. The Government started investment in carbon capture to ensure that Australia reached carbon neutrality by the 2050s, despite the challenges posed by difficult-to-solve types of carbon production.

Challenges remained dealing with increasing transport demand

One area of challenge remained: increasing GHG emissions from the transportation sector. An increase in transportation emissions was driven by a continuing 1.5% annual increase in the size of the population, together with an increasing number of domestic flights. States and cities were encouraged to develop local plans to reduce energy demand for transport.

It was recognised that changing urban form to move towards more compact cities and reducing travel demand would take time, and influencing societal expectations to reduce movement would be unpopular if not well targeted.

Cars would therefore remain the main form of movement, but measures would need to be taken to reduce their GHG impact. A new policy was introduced in 2027 banning the sale of new cars with petrol or diesel consumption levels of more than five litres per 100 km from 2030. The legislation also banned the sale of all new combustion engine vehicles from 2035.

Changes set in train to change urban form

Increasing numbers of people working from home opened the door for changes in urban form. Property developers' investments moved away from large city centres to satellite towns. Likewise, businesses increasingly looked for places to locate on the edge of cities. This led to concerns about a hollowing out of the larger cities in Australia.

Plans for investment in infrastructure for the following 20 years were targeted predominantly at growing satellite towns and communities located around the edges of existing cities. This would allow most social and economic opportunities to be accessed within 3-4 km of affordable medium and high-density housing. The goal was to create local communities who could walk or cycle to most of their destinations.

Changing economic structures and fiscal pressure

The decision to move more quickly to a low carbon society saw a rapid decrease in revenues from coal exports, which represented 15% of Australian exports in 2024. International efforts to decarbonise created inflationary pressure as the global costs of energy and transportation rose at twice the rate of inflation. Debate grew on what the future shape of a low carbon economy would look like for Australia.

Investments in decarbonisation and additional state-level support to improve the resilience of infrastructure to the increasing number of extreme weather events meant federal and state-level institutions were forced to deal with budget cuts.

In the 2030s

Teaching market

Domestic student numbers continued to decline, and four universities failed financially in the early 2030s. Caps on international students were removed as the government saw this as a valuable export market and as a way to avoid more universities closing. Government increased funding for tertiary qualifications identified as required to support the climate change mitigation and emissions reductions efforts needed to secure Australia's safety and prosperity and the development of the low carbon sectors of the economy.

There was increasing student demand to study environmental and sustainability focussed courses. Tertiary education institutions recognised the importance of taking a pervasive approach to achieve the nation's GHG reduction goals. A standard module on greenhouse gases and their climate impact was introduced as a requirement for all courses. The Australasian Campuses Toward Sustainability (ACTS) Carbon Literacy Training course was updated in collaboration with 14 of Australia's universities to reflect government and students' expectations. By 2035 it had been adopted by all of Australia's universities.

In addition to the short standard GHG module, a growing number of courses included specific offerings that explored the relationship between their discipline and the mitigation or response to climate change.

Subjects that saw the strongest growth in demand were those that related to the use of technology to reduce GHGs, with Australia's universities being recognised across the world as the place to learn about the latest developments in energy efficiency, renewable energy and low greenhouse gas emitting technologies.

Research market

The government set new priorities for research, with additional funding for three priority areas technologies: support for decarbonisation, and STEM based subjects to support growth in low carbon sectors such as digital technologies, and growing social expectations around healthcare. A specific fund was created to co-fund with industry the commercialisation of low carbon technologies (including GHG removal), digital technologies, and healthcare related products.

The Climate Impact Research Assessment Commission (CIARC) was created, and a requirement was put in place to assess all forms of research for climate impact. From 2032, all research proposals had to get climate approval from CIARC as one of the conditions for investment.

The government recognised the importance of university research for its future prosperity and restored research funding to levels not seen since 2009 of 2.25% of GDP by 2035.

Operations and infrastructure

Tertiary education institutions realised that climate change adaptation efforts were essential to responsibly manage risk and the increasing cost of severe weather events. In addition, commitment to achieving GHG targets became increasingly important to prospective students. As a result, institutions sought to differentiate themselves on the basis of their GHGs sustainability credentials, engaging with initiatives such as Race to Zero and marketing their involvement. University efforts to decarbonise was fuelled by a government competition offering $20m to each Australian university to achieve that target before 2035.

This created a dilemma for the universities in better financial positions as they decided whether to acquire universities at risk of financial failure, while also facing the challenge of dealing with the carbon deficits of those institutions. Despite this dilemma, only 30 universities remained by the end of the 2030s.

Increasing energy costs created an additional incentive to reduce heating and cooling expenses for buildings. Universities took a two-pronged approach. First, rationalising the number of buildings they operated, taking advantage of the decrease in student numbers alongside growing demand for a blended, if not fully online, learning experience. Individual offices became a thing of the past, with open plan and shared office space the norm. AI was used to allocate space for classes and meetings and the time for classes was spread across an increasing number of hours of the day to maximise usage.

Secondly, there was a shift towards all-electric buildings powered by renewable energy sources. Additionally, buildings were modified to support passive heating and cooling using natural air flows and shade.

Sector's role

The government increasingly saw universities as key to achieving its GHG goals and growing economic activity in low emission sectors. Funding was used as an incentive to shape the areas of focus within the universities.

Universities facing financial pressures welcomed the increased funding for research and support for knowledge transfer of low GHG solutions. They increased their prominence as centres of expertise working closely with the energy sector, agriculture, transport, and on low GHG approaches to waste management and industrial processes.

Universities also leveraged government support to grow economic activity in low emission sectors by entering funding partnerships with those sectors. These partnerships included long-term internships, sector specific training, and an open flow of people between the universities and the research arms of businesses.

Staff and student experience (including safety)

Staff rapidly developed skills in using new digital technologies to support the development and delivery of teaching materials. This significantly improved the quality of the student experience, as they welcomed the opportunity to benefit from technology while still being able to speak to and get help from a person when needed.

Staff and students alike were proud of their institutions' efforts to decarbonise. Students valued the stronger connection between their studies and job opportunities resulting from work integrated learning. Knowing that their studies would lead to a job maintained support for full time study, further encouraged by the increasing numbers of commercial sponsorships available, which ensured real world experience throughout their tertiary studies.

Staff, while pleased with the increasing value society placed on them, were concerned about the growing number of university mergers and the decrease in government funding for the arts and humanities.

University of Adelaide graduates

2040 to 2059

Continuation of extreme weather events as global temperature rises peak

The frequency and impact of extreme weather events continued to increase through to the end of 2059 as global temperatures peaked at 1.6˚C in the 2050s. In the early 2020s, the IPCC warned that every 0.1˚C increase in global temperatures would lead to a discernible increase in the frequency and intensity of extreme weather events. This proved to be true, with growing concern that if global temperatures rose further, we would reach the tipping point leading to the breakdown of major ocean currents and the collapse of tropical coral reefs. This would devastate fish stocks globally creating a humanitarian crisis on a scale the modern world had not previously experienced. These concerns provided further impetus to reduce GHG emissions.

Decarbonisation of hard-to-abate sectors has progressed

Australia phased out all coal powered energy generation by 2050. Work continued to progressively decarbonise aviation, agriculture, industrial processes, waste and fugitive emissions (exports of coal and gas), which were still creating close to 110 Mt of CO_2-e annually. While there was celebration of achieving the 75% reduction in net emissions, it was recognised that significant hurdles remained to achieve net zero. Developments using hydrogen rather than coke for steel production were expected to end the use of metallurgical coal, with Australia achieving net zero carbon towards the end of the 2050s.

Concern over increasing pressures from population growth

While GHG emissions per person decreased, Australia's population continued growing from 27 million in 2025 to 37 million in 2050, largely due to immigration. This made it difficult to achieve the net zero emissions target as significant investment was needed to provide the necessary additional infrastructure and housing for the growing population. .

The far right increasingly sought to cause social unrest about the changing ethnic make-up of the nation. Additional measures were imposed to restrict the number of people coming into Australia, with cross party agreement to limit the population size to 40 million people, with a maximum annual increase of 200,000.

Urban form

Investments made in the 2030s and 2040s significantly changed urban areas. Strong local communities developed in smaller towns, with medium-density housing and well-maintained, shared community spaces for recreation. Walking and cycling became the most popular way to get around, at least in the cooler months of the year. Bike lanes became mandatory for all public roads in the 2030s. The widespread use of bikes changed people's attitudes on the road, with the majority now more careful when sharing the road with others. As bikes became the main means of travel, roads were redesigned to prioritise bikes, eventually removing bike lanes to make space for all the bikes. Travel between communities was by electric powered public transport.

Changes in the economic structure

The machinery and skills of the coal miners shifted to mining for rare earth metals as global demand increased for batteries and digital technologies.

Just as the advent of the internet spawned a thousand commercial applications and opportunities, the same happened with AI in the 2030s. AI was embedded in every aspect of people's lives. Australia's investment to upskill in digital technologies paid off. Australia's universities, together with the availability of renewable energy sources, attracted the attention of the global software giants who invested in centres to develop and trial each new generation of artificial intelligence.

The main centres of growth were located close to existing clusters of digital enterprises in the Sydney Arc, the Melbourne diamond, the Brisbane Corridor and the Canberra triangle. The economic success of the companies in these locations created a snowball effect, in these locations and in all other states as businesses and universities alike saw several spin-off companies hit values of a billion dollars on the Australian Securities Exchange (ASX).

Air travel curtailed and the end of combustion engine vehicles

A high GHG tariff was imposed on all international flights coming to Australia in line with the growing international application of GHG landing fees to suppress demand for long-haul flights.

Businesses encouraged more virtual connections in place of domestic air travel as they were increasingly boycotted if they did not demonstrate a commitment to decarbonise. Where flights were taken, more efficient aircrafts using sustainable fuels were used.

From 2035, all new vehicles sold were electric or hydrogen powered, but 25% of the total vehicle fleet was still fossil fuel combustion powered vehicles carefully maintained by owners that had bought these vehicles prior to the cut-off date. In 2050 it was announced that it would become illegal to drive a combustion powered vehicle in Australia from 2060.

In the 2060s

Teaching market

The numbers of domestic students returned to steady growth as students saw that a degree provided a pathway to well-paid jobs. Also, the government actively supported an increase in the number of international students as the country sought to counterbalance the general ageing of the population. Students arrived on airships chartered by the government to provide a lower carbon way to travel to Australia, with study starting on the airships as they move from country to country on their journey to Australia. The government focussed incentives on attracting both domestic and international students to study subjects that supported the growth of the digital economy in Australia and in healthcare.

Research market

The government continued to invest in research at 2.5% of GDP to support the key areas of the economy it was seeking to develop, with ongoing expectation that the money invested in research should deliver a return for society. A sixth of the government's research money was devoted to translation and commercialisation of the research outputs, with a particular focus on carbon removal.

Additional funding was devoted to dealing with research into neuro degenerative disorders as the population continued to age, creating ever increasing strains on the society. Successive governments made a commitment to respond to this challenge.

Close co-operation between universities and commercial partners was part of the fabric of the universities. Commercial enterprises co-invested in near-market research, blurring career paths between universities and the public and private sectors. It was expected that, to rise to the top of an organisation, individuals needed experience in all three sectors.

Operations and infrastructure

The return to growth of student numbers meant that new capacity was needed for teaching. This allowed the sector to invest in new buildings in the growing towns, which supported blended learning close to the communities where the teaching was delivered.

Science parks were created, which allowed co-location of new research facilities alongside emerging businesses, creating thriving centres of opportunity. The culture of academia changed over time as many saw the opportunity to both advance learning and achieve long-term financial security as the businesses they helped to create thrived.

Sector's role

The sector's role became closely aligned with the government, supporting the success of a thriving economy, which supported significant advances in GHG emissions mitigation, digitisation and healthcare. The government also sought advice from the academic community on the institutions needed for the future to ensure a just transition to a low carbon society.

Staff and student experience (including safety)

Students increasingly looked to academic staff, not just for knowledge but also as examples of a life course that could bring significant benefits to society, as well as provide them with a lifestyle to which many would aspire.

The improving financial situation of the universities also meant that the quality of the teaching and research areas was improved, and ensured investment to improve resilience of university facilities to extreme weather events.

2070 to 2089

Global climate below 1.5C

Global temperatures peaked at an increase of 1.6˚C in the 2050s, but by the 2080s they had decreased to 1.4˚C above 1900 levels. Temperatures seemed to have stabilised at that level and there was hope that global temperatures would continue on a slow but steady decrease early in the following century. Latest forecasts indicated a return to early 2000s temperatures by 2150, though not many remembered what the climate was like that far back, when extreme weather events were only just starting to loom large in political debates and actions.

The end of retirement

World population peaked at 10.3 billion in the early 2070s and, after plateauing for a decade, started to decrease at the end of the 2080s. The ageing of the population in developed nations changed the expectations of an individual's working life, with everyone expected to work later in their life due to fewer young people entering the workforce.

This worked well for many, as fewer jobs required physical effort, so failing strength and physical health were less of an issue. Continuing working in the digital economy benefitted the mental health of many, keeping those in knowledge creating roles mentally agile. Retirement was a thing of the first half of the century, the majority seeing the later stages of their career as a chance to give back to society, sharing their wisdom and knowledge from behind a computer screen. While AI could find the information that they found hard to recall, their experience and judgement meant that they could still contribute to society.

Economic growth secured with Australia developing treatments for Alzheimer's and dementia

Australia benefited greatly from its investment in digital skills in the first half of the century. This was followed by a second wave of economic growth driven by investments in neuroscience and the treatment of neurodegenerative disorders. These efforts positioned Australia at the forefront of developing effective treatments for Alzheimer's and dementia. These advancements were timely, supporting healthcare amidst the changing national demographics and leading to a significant economic boost for the country.

Parkville Campus, University of Melbourne. Image credit: Michael Kai Photography

The ongoing growth of Australia's economy and consequent standard of living continued to make Australia an attractive place for immigrants. This resulted in a steady influx of young people eager to settle in a country that they respected for its many successes.

In the 2090s

Teaching market

The number of students continued to grow as more people returned to university at various stages in their lives. This trend was accompanied by a resurgence of interest in the arts and humanities, with many coming back to tertiary education for a second time after successful initial careers. The study of languages, cultures and knowledge systems was seen as vitally important to learn from and embed First Nations knowledges, and harness the best insights and practices brought by the many cultures of which Australia was comprised.

Research market

Society and government once again turned to universities to drive significant technological advances to support the next wave of economic growth. Promising research areas included commercial-scale cold fusion, microbial self-healing concrete, and 3D printing of human tissues using stem cells to replace failing body parts.

Operations and infrastructure

Technology now supported the delivery of all courses, enabling students to engage with materials in their first language and in a culturally matched form.

Sector's role

Tertiary education institutions continued to play a key role in creating new economic opportunities for the nation and career pathways for all who connected with them and their commercial partners. They also played an increasingly important role as the guardians of knowledge as they saw the renaissance of interest in the arts and humanities.

There were close ties between the academic community and the public sector. Universities gained the respect of Ministers and public servants from their support improving the wellbeing of Australians. Consequently, governments looked to academics to provide expert advice on all new policies.

Staff and student experience (including safety)

The increasing frequency of hot days in February prompted all tertiary education institutions to delay the start of the first semester by a few weeks, allowing temperatures to moderate before students began their studies. Investments in shade and natural air flows to keep buildings cool also encouraged staff and students alike to spend time on their local campus.

Cyclist at The Australian National University. Image credit: Lannon Harley

DRIVEN TO CHANGE

This scenario explores a possible future where global carbon emissions gradually reduce to net zero by the 2070s. It is a scenario where the approach of the Australian government between now and the end of the century focuses more on responding to the priorities of the day and delivering success over the next four to five years. In this scenario the tertiary education sector faces significant funding challenges, causing a number of mergers. Research funding is channelled by government and industry into climate disaster recovery, hardening infrastructure for future weather events and renewable energy solutions.

Engineering students, University of Tasmania

2025 to 2029

Australia's government faces fiscal pressures and inequality increases

Australia saw the pattern of decreasing productivity per person continue throughout the 2020s, with very modest growth in GDP of less than 1% per year driven by population growth. Increasing costs of healthcare, costs of responding to extreme weather events in Australia, together with increasing levels of unemployment, led to a tightening of fiscal belts.

Inequity in Australia increased, with more people facing homelessness, housing remaining extremely unaffordable, and many having to relocate as their houses became uninsurable due to increasing flood and fire risks. State governments were spending increasing amounts on buybacks of houses in flood areas including northern NSW and southern Queensland.

GHG emissions continue to grow, with funding needed to support transition in the Global South

While the Global North managed an 8% reduction in GHG emissions between 2010 and 2019, the rest of the world saw an overall 22% increase in emissions. This trend continued in the first half of the 2020s with the Global South calling for the rich Global North to help fund the costs to move to renewable sources of energy. It was estimated that more than $2 trillion dollars of investment was needed per year, but the amounts being provided were closer to $500 billion per year in the second half of the 2020s.

Disproportionate impact of climate change was felt in the Global South

Multi-year droughts continued to plague Northwest Africa for the whole of the 2020s alongside extreme rainfall causing flooding and death in East African countries. Several African countries, notably Tunisia and Morocco, experienced extreme heatwaves with temperatures reaching over 50°C. Cereal production in many African countries was down 10% as a result of these extreme weather events, against a 13% growth in population in this five-year period. Climate change created ongoing humanitarian crisis across the African continent over this period, affecting more than 100 million extremely poor people each year.

Similar challenges were seen in Central and South America and the Caribbean, resulting in more than 50% of the global economic losses from climate related events largely as a result of flooding and damage from hurricanes.

Personal carbon allowances introduced to deliver change

The Global South made a strong appeal to the rest of the world to find a solution that was fair. The Global North was reducing its greenhouse gas emissions, but from very high levels, whilst the Global South was seeing increases from very low levels. The US, Canada and Australia all created emissions of between 14 and 15 tonnes per person, while European countries produced between four and eight tonnes per person. This compared to levels of less than two tonnes per person in many countries in the Global South.

It was not equitable for the Global North to continue with such high GHG emissions and expect the Global South to reduce their own emissions at such low levels. A strong case was made for the introduction of personal carbon allowances to achieve net zero globally in a way that would be equitable.

A debate was held at the UN in 2030 considering the choice of whether the Global North would increase financial contributions to US$2 trillion a year or adopt personal carbon allowances. The debate concluded with international agreement to trial the introduction of personal carbon allowances in 2035 for a period of five-years. The Intergovernmental Panel on Personal Carbon Allowances (IPPCA) was established to oversee the effectiveness and socio-economic impacts of the personal carbon allowance trial.

Artificial Intelligence (AI) advances quickly

There were rapid advances in the developments and capabilities of AI in the late 2020s. In 2030, AI was used to allocate and manage personal carbon allowances for all in the developed world. Australia reluctantly participated in response to pressure from its trading partners in the five-year trial. Despite being reluctant initially, Australia along with all other participating countries - notably South America, who exported food, coal and oil - saw the advantage of this shift as it was the user and not the producer who had to bear the responsibility for managing carbon from these sources.

Initial allocations to each citizen were at the current average amount, but these allowances would decrease by 5% a year with the aim to deliver a 25% reduction in carbon over the course of the trial. An allowance was allocated to all family members irrespective of age.

The AI system also supported peer to peer trading in personal carbon allowance. There was an open market for the sale and purchase of these personal carbon allowances, to allow those wishing to engage in higher emissions activities such as flying to do so.

AI changes the nature of jobs

Advances in Large Language Models (LLMs) such as Claude, Chat GPT and Google's Gemini started to change the nature of white-collar jobs from 2026. Successful use of LLMs to undertake analysis, communicate with consumers and provide personal guidance to individuals saw unemployment rise from 4.2% at the start of 2025 to 6% by the end of the 2020s.

Effective development and deployment of quantum cryptography in 2029 opened the door for the widespread secure use of digital technologies. The technologies use the naturally occurring properties of quantum mechanics to revolutionise data protection, making it impossible to hack data.

In the 2030s

Teaching market

There was a decrease in demand for traditional tertiary education as students questioned the value of what they were learning, when AI could already do many of the tasks they were being asked to undertake for their qualifications. Students did not want to undertake a degree which could take three years to complete when the capabilities of AI were increasing so rapidly. Much of what they learned would be out of date by the time they finished their qualifications.

Decreasing student numbers created significant financial challenges for universities. AI was seen as the solution – both to develop the material and to teach it. The use of AI educators also allowed students to learn in small chunks, building credits towards their qualifications at the speed which best suited them. Students were typically taking six or more years to achieve their qualification, as the AI fitted the timing of learning modules to match the individual's lives.

Research market

Australian universities were searching for new sources of funding and turned to businesses for research partnerships. Consequently, there was an increasing emphasis on near-market research and efforts to commercialise advancements. There was significant growth in capabilities and opportunities to apply AI to improve the delivery of public and commercial services.

Universities also worked closely with mining companies and other emissions-intensive industries to look at ways to reduce their emissions as companies also responded to social pressure for individuals to be able to maintain their lifestyles against shrinking personal carbon allowances.

The universities were also commissioned to track the effectiveness of the new personal carbon allowance and the socio-economic impacts of the scheme. Australian universities worked closely with their global counterparts in the IPPCA on this task.

Operations and infrastructure

The tertiary education sector's property portfolio was liquidated as demand for face-to-face teaching plummeted and institutions saw the end of the traditional models of campus-based life and teaching. Significant investments were made in digital capabilities.

AI was increasingly used to undertake most of the tasks previously delivered by university professional staff. AI was used to support enrolment, advise students, provide personal support when students faced mental health issues and to help teachers develop and deliver their teaching material.

Sector's role

The tertiary education sector played an important role calling for a just transition as the personal carbon allowances were introduced. Companies needed to be held to account for their emissions. The Universities provided strong support for the adoption of the personal carbon allowances and recognition must be given to first nations where companies were locating renewable energy fields on their lands.

The wider relevance and role of the tertiary education sector was challenged in this period as individuals questioned whether it was still needed given the increasing use of AI to support

student learning and the general decline in the quality of the facilities as governments withdrew funding.

Staff and student experience (including safety)

The late 2020s was a busy time for academic staff as they supported the development and deployment of AI teaching capabilities. The success of their efforts led to significant challenges for the staff in the 2030s as tertiary education institutions halved the number of their teaching staff – in response to decreasing government support, decreases in student numbers and the success of the AI teachers. Similarly, professional staff numbers halved in the early 2030s as AI took over many of the roles.

Students enjoyed the benefits of AI teachers, as these teachers adapted to their pace, with no peer-based shame when asking for help or clarification. However, initial trials of AI based teaching were less successful than anticipated as students lacked the benefit of the university community experience. Recognising this, the AI grouped students, who were learning at the same speed and had similar interests, into small groups. This had the propensity to exacerbate existing social echo chambers.

2040 to 2059

Socio economic effects of the carbon allowance introduced

Personal carbon allowances were hailed as a success at the end of the five-year trial and became the primary means of driving global reductions in GHG emissions. Society called for governments in developed nations to increase the levels of energy generated by renewables so that they could maintain their lifestyles and still live within their carbon allowances. Further advances in solar and battery technology delivered significant decreases in the emissions from the deployment of these technologies. The price of solar energy kept falling as global efforts in the developed world were driven by these social pressures.

Successive Australian governments were responsive to this social pressure, which saw renewable energy increase to 75% by the end of the 2050s. Australian governments took a reactive approach to the increasing number of extreme weather events, investing in and strengthening the capabilities of the National Emergency Management Agency (NEMA) which had responsibility to co-ordinate and manage national level emergency responses in support of the States and Local Authorities. But government did little on long-term improvement of housing stock, which remained woefully inadequate to protect people from the rising extreme temperatures and flood risk.

Carbon capture technologies

Businesses saw significant opportunities in carbon capture and storage by pumping carbon underground to form carbonate minerals. Individuals were able to pay companies to capture carbon to increase their own personal allowances. The government was also investing in carbon capture to offset the emissions from farming, creating additional incentives for the development of carbon capture technology.

Australian universities led the world in research on low-carbon industrial process and the safe capture of carbon. This, together with Australia's mining capabilities created a competitive advantage for Australia as international companies looked for investment opportunities in carbon storage. By the 2050s Australia was capturing 150 Mt of CO_2 per year from fugitive emissions, emissions from industrial processes and the remaining non-renewable energy generation.

Autonomous vehicles take over the transport system

Advances in AI, combined with personal carbon allowances, led to a shift away from personal car ownership. Personal internal combustion engine vehicles were replaced by fleets of self-driving electric vehicles. This change supported a rapid reduction in emissions from personal transport by the end of the 2050s. Using this shared pool of cars significantly reduced the overall car fleet size, further decreasing emissions from personal travel.

The AI on individual phones fed into a central system which optimised the movements of the fleets of EVs within towns and cities to meet population needs. Many individuals were willing to give up the data of their diaries in exchange for the freedom it gave them to move quickly in comfort around their towns and cities.

Urban sprawl continues

Autonomous vehicles and AI made it increasingly easy to travel with little effort. The low GHG emission levels of this transport solution allowed people to live further apart, so the space boundaries of towns and cities continued to grow. The government supported short-term demand from developers and the public to build the additional housing needed. Many of the new properties were built in flood plains and or areas previously considered at risk of fire. This occurred despite significant increases in residential insurance cost, as insurance companies sought to recoup expenses from the increasing intensity and frequency of weather events. Property developers offered lower cost insurance for the first five years of ownership to maintain demand.

Electric planes take to the skies

Few wanted to use up their personal carbon allowances on flights, with a return flight on a conventional plane from Australia to Europe typically creating over 7 t CO_2-e [28], with personal allowances in Australia down to five tonnes per person by the end of the 2040s. Consequently, there was a sharp decline in long-haul travel to and from Australia between the 2040s and late 2050s. Electric planes began to fill the market for short-haul flights, with planes capable of carrying 100 passengers over distances of up to 1,000 km operating in the 2050s.

Mental health challenges

There was a significant rise in mental health challenges as many were made redundant by AI replacing their jobs, and some time was needed for them to start new careers. While AI provided many services, it also created an 'always on' society with new paradigms of what was considered personal information and few protections from endless flow of disinformation and criticisms through social media platforms, which challenged friendships and community privacy. While the worst challenges of climate change had been avoided, the new challenge was a "pandemic" of global depression.

Solar aerial images, Bathurst campus Charles Sturt University

[28] Estimated using 2024 emission factors from the UK Department for Energy Security and Net Zero. Emission factors used include radiative forcing and well-to-tank emissions

In the 2060s

Teaching market

The move to AI teachers alongside reductions in education demand and government support saw the development of a commercial market for tertiary level teaching. These organisations were known as private tertiary educators (PTEs).

Teaching was now delivered commercially and was no longer a function of universities. However, experts from the former universities were employed by the PTEs to review course material each year.

Though six elite teaching universities remained, the cost of attendance increased significantly. As a result, face-to-face tertiary education from elite universities became exclusively the preserve of the wealthy.

There was still strong demand for courses on AI, but this was matched with demand in healthcare as well as STEM subjects that would support decarbonisation of industrial processes and carbon capture. Both areas became lucrative job markets.

There was also a resurgence of interest in the arts and humanities as more personal time became available because of the maturity of AI and robotic technologies, which started performing many of the functions seen in the science fiction films of the past.

Research market

Research was then carried out at Australian Research Institutes (ARIs), which combined the research capabilities of the former universities with those of businesses within their state or territory.

One of the key areas of research was carbon capture, aiming for realistic, cost-effective ways to remove excess carbon from the atmosphere. Another growing area focused on addressing AI-induced loneliness and isolation, along with the resulting mental health challenges.

ARIs, while not leading, were also active in the development of technology to create green hydrogen. Up until the 2040s, only grey hydrogen - produced by splitting natural gas and emitting large amounts of CO_2 - was possible, and capturing the resulting carbon was still too expensive. International research focused on creating green hydrogen using catalysts and renewable energy to split water.

Sector's role

The role of the ARIs was a combination of research and serving as the critical conscience of society. The ARIs advocated for social equity, highlighting how the wealthy found ways to maximise societal benefits by using the best quality AI, while most members of the public had access only to the free versions.

Staff and student experience (including safety)

The nature of teaching jobs had changed. Individuals involved were experts in human development and learning, orchestrating suites of digital tools to provide high quality engaging teaching material through AI teachers. There were more professional staff than former academics who supported the digital systems.

Staff working in the ARIs (mostly students who had come through the six elite teaching universities still in operation) enjoyed the opportunity to focus on research. A qualification from one of those universities was an automatic gateway into one of the ARIs for those who wanted it.

Students became customers for life of the PTEs. Buying modules as they needed them to progress in society and in the later parts of their lives buying modules to explore aspects of the world that were of interest to them.

Operations and infrastructure

Only the elite six teaching universities kept all of their operations and infrastructure. The remainder of Australia's universities kept only their research facilities for the delivery of research as ARIs. All of the teaching facilities and campuses of the ARIs were sold over this period.

2070 to 2089

Australia and the world achieve net zero carbon

Australia and the world achieved net zero in the early 2070s. This kept the increase in global temperatures at 1.8˚C relative to 1850-1900. While there was celebration that net zero carbon had been achieved, the frequency and severity of extreme weather events had increased.

There were growing social calls to take action to remove carbon from the atmosphere. This created new opportunities for Australian companies leading the world in carbon capture and storage technologies – though the focus had shifted from carbon capture in industrial processes to carbon capture directly from the air.

International bodies look to the future

International debate started in the late 2080s on setting new goals for the twenty second century, aiming to return to 2020 carbon levels by 2150. This was judged a realistic target, with global population forecast to fall to 9.0 billion by 2150.

Growing impacts and social dislocation from extreme weather events

The increasing frequency of extreme weather events took its toll in Australia. Successive governments short-term focus allowed developers to continue building properties in areas at risk of fire or flooding. By the 2070s, nearly half a million properties became uninsurable as insurance companies withdrew from areas prone to flood, storm, and fire risks to keep residential house insurance affordable for the majority.

This resulted in a collapse of property prices in areas at risk. Those who stayed in fire risk zones saw worsening health outcomes due to frequent fires and consequent poor air quality. While the National Emergency Management Agency responded quickly to events and recovery, there was growing unrest over the number of people regularly affected by extreme weather events and the annual cost of the damage, which had risen to tens of billions of dollars each year.

Resurgence of air travel and international movement

Advances in hydrogen fuel cells and international advances in the 2080s to create green hydrogen allowed the return of long-haul flights and brought back opportunities for international travel and tourism. New opportunities to experience different parts of the world in-person created a wave of interest to explore what life was like in other parts of the world.

Living in an AI enabled world

Society had embraced AI augmentation, and each person had their own “AI agent” which organised their time and activities, managing their health outcomes, social interactions and activities, transportation, household chores and maintenance. While a few rejected AI augmentation, wanting to keep their freedom, most saw AI as providing more freedom by relieving them of many mundane tasks.

Democracy was instantaneous, with AI agents understanding and representing the views of each individual in every decision. AI now took real-time views from society and fed that on to the government of the day to inform their decisions.

While the rapid and responsive nature of national policies was welcomed, there was growing concern that this reinforced short-termism and that no one was considering the long-term implications of issues. Decision-makers instead focused on short-term needs and demands. There was no better example of this than in the growing impact of extreme weather events on individuals who lived on the coast on flood plains or in the fire risk areas.

In the 2090s

Teaching market

There were now just nine global companies providing AI-supported teaching. One of these was supported by the six elite teaching universities that remained in Australia. They joined an alliance of European universities as US, British and Asian universities led the way and started to dominate the market. The government's decision to provide subsidies to those taking their AI learning through Australian universities ensured their inclusion in the European AI teaching alliance.

Face-to-face teaching in Australia remained just for those attending one of Australia's elite teaching universities. The return of long-haul air travel led to a resurgence of demand for face-to-face teaching as students sought opportunities to explore the world as they studied. Connections with European universities led to exchanges of the elite rich with students from continental Europe.

Changes in the nature of work and the way people engaged in society, driven by the pervasiveness of AI, meant that learning how to get the benefits and achieve the most from AI augmentation was at the heart of a tertiary education.

Research market

The ARIs were getting increasing levels of funding from NEMA to develop approaches to harden infrastructure to flood risk and support the re-establishment of communities and businesses that had been impacted by an extreme weather event.

Operations and infrastructure

Some properties became uninsurable, prompting the ARIs and the elite teaching universities to create their own self-insurance scheme. This scheme involved all members sharing the costs of events' impacts that affected the others in their group.

Interest in the work of the ARIs led to the merger of some of the ARIs with the elite teaching universities as students wanted the opportunity to work with and be taught by academics leading the latest advances in science. Some said the creation of these "new universities" was a return to the situation in the 1940s when there was one university for each state. While this was the case for the elite, the development of global AI-supported learning opportunities meant that an affordable and flexible tertiary education was available for all Australians.

These "new universities" bought additional properties to deal with the increase in the number of international students and growing domestic demand. The focus on the 'elite' meant the costs to attend these institutions were high, allowing investment in high-quality teaching and research facilities.

Sector's role

The role of the remaining universities was the education of the elite and the development of Australia's researchers of the future. These new universities also played a key role in building international connections for Australia's future leaders of business, academia and the public sector.

The sector also played a key role in discerning what was true and what was not true as the digital world provided many versions of reality and many different perspectives and stories of the "truth". Academic views were now considered the gold standard, although telling whether you were hearing the information from the actual academic versus their avatar was always difficult.

Opportunities to see and listen to academics speak became the "rock concerts" of the late 21st Century attracting tens of thousands of listeners to stadiums across Australia.

Staff and student experience (including safety)

Work in the "new universities" was lucrative and highly prestigious, as lead academics were now celebrities, considered to be the purveyors of and sources of truth.

Work in the global AI teaching entities was also popular, offering staff opportunities to travel and build international alliances.

The students experience varied significantly depending on whether they were learning at the "new universities" or through the global AI teaching companies.

TOGETHER WE SURVIVE

This scenario explores a possible future where GHG emissions continue to rise globally between now and the end of the century. It is a scenario where the approach of the Australian government focusses on preparing for the long-term impacts of unmitigated climate change.

In this scenario, there was a shift to face-to-face teaching in tertiary education following a series of cyberattacks and weather events that disrupted digital connections. Tertiary education decentralised to local hubs where experts and their students worked closely with local communities to adapt to the new climate conditions. Research largely took place in demonstrator hubs within these communities, supporting the effective local diffusion of innovations to respond to climate challenges.

Planting on campus in the Banksia Woodlands, Murdoch University

2025 to 2029

Fewer extreme weather events obscured the challenges in store

Fewer extreme weather events occurred globally towards the end of the 2020s. However, Australia faced increased challenges with a rise in floods and very hot days during this period. The global decrease in extreme weather events made it difficult for international efforts to press nations to stick to their GHG reduction commitments or to agree on more ambitious decarbonisation goals.

Increasing economic success in developing nations led to a rise in the middle classes with money to spend, further driving consumerism and international tourism. The United States kept its focus on economic growth and national interest over meeting GHG targets. The combination of these two forces led to a continuing increase in global GHG emissions, with few signs of sufficient global appetite for change.

Society calls for the Australian government to take a long-term view

The increase in frequency and number of very hot days in Australia, together with the rising challenges of meeting increasing health care costs, led to strong social support for long-term thinking. Initially, there was concern that changing priorities of different governments would prevent a long-term approach to these issues. However, this social support solidified the need for federal and state governments to work together wherever possible to tackle significant issues.

There was also strong support from the Insurance Council of Australia, driven by growing concerns over the lack of action to reduce flood risk. Properties continued to be built in flood plains where the flood risk was considered a one-in-a-hundred-year event. The Council highlighted that this meant that there was a 50% chance of those properties being damaged by flooding every 70 years, even before accounting for the increasing impacts of climate change. In 2022 the cost of flooding in Queensland and NSW exceeded $3.5 billion. By 2029, the cost of flooding across the nation hit $6 billion.

In 2027, it was agreed that state and federal governments should set out long-term plans at the start of their period in office and engage the public in the development of these plans. A cross-party parliamentary group (Saving Australia's FuturE, SAFE) was established in 2028, with responsibilities to: review each government's long-term plan, audit public sector development of capability to conduct long-term analysis, and deliver reports on long-term challenges as commissioned by the government of the day.

Shape of the Australian economy remains unchanged

Australia's economy achieved a 3% annual growth in the late 2020s after two years of weak growth in 2024 and 2025. This improvement was partly due to the imposition of higher trade tariffs and trade barriers in the United States, which created new opportunities for Australia in Asia and Europe.

The shape of Australia's economy remained largely unchanged, with 15% of the value of exports still coming from the export of thermal and metallurgical coal. As global demand for thermal coal decreased, prices also decreased, which kept demand strong in developing countries. Promises of coke-less production of steel remained a future dream, further raising demand for metallurgical coal.

In the 2030s

Teaching - continuing decrease in student numbers

Despite the 2024 University Accord and the target set for 80% of people to have a tertiary qualification by 2050, student numbers continued to decline. This decline was due to increasing scepticism about the value of a tertiary education's contribution towards future job prospects and a growing interest among domestic students to pursue activities that would have an immediate impact on creating a better future for the planet.

International enrolments also followed a downward trend as universities across Asia climbed in rankings. These institutions became key places for students to build crucial networks for future success, and obtain qualifications recognised by business across Asia.

Most teaching was now in the form of blended learning, with face-to-face teaching limited to one day a week to prioritise learning from home. This model combined the benefit of peer incentive to learn with the flexibility students sought to study where and when they wanted.

Research

Levels of funding into research increased to 2% of GDP in response to a SAFE report. The report highlighted the need to consider how Australia would respond to the growing challenges of adapting to climate change amidst the lacklustre global progress to reduce GHG emissions.

Focus areas included an in-depth assessment of climate change impacts in Australia, exploring options for managed retreat from at-risk areas, and developing novel approaches to maintain food production in the face of increased food insecurity driven by a changing climate.

Operations and infrastructure

Universities responded to the decrease in student numbers by creating lower-cost options based on blended learning. The higher ranked Australian universities partnered with emerging Asian universities to enable offshore teaching.

This shift led to a change in the typical university's asset bases, with central campuses shrinking in size and a greater focus on investment in digital technologies. Smaller teaching spaces were developed closer to communities in Australia and with offshore affiliates, to support blended learning.

The decrease in space needed also helped to mitigate the increasing costs of energy and escalations in insurance costs as the frequency and impact of extreme weather events increased.

Sector's role

The sector became a key advocate and support for long-term planning. The sector's relationship with SAFE strengthened over the 2030s as academics were invited to provide evidence for enquiries, support the development of the capability of the public sector to undertake science-based foresight, and to test the assumptions included in governments' long-term plans.

Staff and student experience (including safety)

There was a decrease in staff numbers as tertiary education institutions had to manage costs with declining student numbers and because of less face-to-face teaching. Among the remaining teachers, some benefitted by living closer to the new local teaching hubs, while others faced longer commutes each day.

Students welcomed the more flexible approach to learning, as it allowed them to work while studying, and to complete their studies at their own pace despite disruptions caused by extreme weather events. Students also appreciated the move to local hubs, which reduced travel time and increased their chances of finding more affordable housing.

2040 to 2059

Global GHG emissions continue to rise

While the number and intensity of extreme weather events across the globe continued to increase, global temperatures had only risen by 1.7˚C in 2040, rather than the 2.1˚C projected in the IPCC's medium-range forecast. This discrepancy led climate sceptics to dismiss the urgency of reducing greenhouse gas emissions and to justify ongoing increase in GHG emissions, despite the rise in extreme weather events in the mid-thirties.

Nations hide the real story on GHG release with "clever" accounting

Many nations changed the way they accounted for land use, land use change, and forestry to appear closer to achieving their GHG emission reduction targets than they actually were. A lack of genuine reductions in GHG emissions was obscured by inflated assumptions of savings through land use capture and the purchase of carbon credits in other countries. This politically driven "sleight of hand" was used to appease growing public concern, while avoiding the challenge of dealing with the social changes needed to reduce GHG emissions.

Intense international scrutiny of the use of carbon credits by leading polluting nations grew rapidly, with genuine emissions reductions failing to materialise despite the global carbon credit market value reaching a record high. By the late 2050s, public support for carbon credits plummeted, leading to the collapse of carbon credit schemes worldwide.

Reefs lost and loss of low-lying island nations

Australia worked closely with New Zealand and the Pacific Islands to challenge the false accounting of carbon credits, as Australia witnessed the impact of acidification and bleaching on its reefs, with 90% disappearing by the end of the 2050s. Rising sea levels in the 2050s resulted in the inundation and loss of low-lying island nations. Their populations were welcomed in Australia and New Zealand, who recognised them as part of the broader Pasifika family. The model of the New Zealand quote system was adopted in Australia, which managed the transition by supporting families to move together and providing services to help them remain connected to the islands they had to leave.

Denying the importance of prioritising climate action became increasingly difficult by the 2050s, as the global climate increased to 2.1˚C above pre-industrial levels, with significant harmful impacts across the world. The lack of action across the world in the 2030s and 2040s to reduce GHG emissions handicapped a rapid response, with insufficient investment across the globe in alternative green practices and technologies to drive the rapid emissions reductions necessary.

A global alliance is formed to respond to the challenges ahead

By the early 2050s, the world was on a "war time footing", collaborating to adapt to climate change. A new international body, the Global Climate Alliance (GCA), was created under the United Nations to support a just response globally to the many challenges being created by the significant climate change impacts.

Focus in Australia was adapting to the challenges of climate change

SAFE's work on long-term issues helped to prepare Australia for the now significant impacts of climate change. From 2035, planning legislation required that new housing could only be built on land where the flood risk was a one in a hundred-year event for flood risks in 2070, based on the latest CSIRO forecast. In response to significant resistance from the property industry, it was agreed that this requirement would be reviewed every three years. Climate scientists supported this review, expressing concerns that the rules might need to be further tightened over time if global temperatures continued to rise.

SAFE led a public debate on managed retreat and considered the wider implications of rising temperatures and other intense weather events on food security, fire risk, liveability of cities and water shortages across Australia. Because of this work, Australia started a process of managed retreat of property from areas at high risk of flooding and bushfires.

In some states, infrastructure was constructed underground to help manage temperature extremes. This was seen as a key long-term investment to ensure that first peoples could remain in some of the areas where there was an increasing number of days of extreme heat or storms.

Food garden at Hobart student accommodation, University of Tasmania

Global food shortages and Australia steps up

Changing climate reduced food availability, with the production of wheat and maize decreasing by 5% globally by the end of the 2040s. While rice and soy both increased by 5% this was not enough to offset the reduction in other grains and the increase in global population to 9.5 billion.

Australia invested heavily in trials with hydroponics in the 2030s and was able to increase food production even in areas that were increasingly affected by droughts, due to the reduction in water needed to grow food using this technique. Australia's export of cereals and other crops grew to an annual export value of more than $100 billion by the end of the 2030s.

Ongoing increase in food export helped support a healthy growth of Australia's economy in the 2040s and 2050s, as Australia responded to the increasing global demand for food.

Mass migration as areas around the world become uninhabitable

There was a significant increase in climate refugees, with tens of millions being displaced annually because of flooding and rising temperatures. In line with Australia's commitment to respond as part of the Global Climate Alliance, increasing numbers of climate refugees sought asylum in Australia. Therefore, the country's population reached 45 million by the end of the 2050s and was expected to reach 50 million by 2070.

Investments were made to provide sufficient housing, with the rapid creation of new towns using pre-fabricated homes. The homes were designed to be easily transported and stacked, and resistant to fire and extreme storms. The smaller size of the living areas and good insulation meant that cooling of the space was practical and affordable. All new developments were in areas where the climate was more moderate, with sufficient water supplies, and reduced risk from bushfires.

In the 2060s

Teaching market

There was a significant increase in student numbers. The significant challenges that individuals faced from extreme weather events, personal displacement and challenges created by the rapid increase in Australia's population meant that there was increasing demand for the development of community.

There was a reversion to demand for face-to-face teaching after ongoing problems with cyber security and the difficulty in distinguishing between real and fake information on digital platforms. The focus was now on vocational learning, where students could learn together how to respond to and support the adaptations needed in their local communities at knowledge hubs. There was close co-operation with First Nations as they played a key role at the community level, supporting adaptation through agriculture, and providing local knowledge and skills in areas such as farming and weaving.

Research market

Investment in research increased to 4% of GDP, with demonstrator research located in knowledge hubs within communities, focussing on understanding and responding to the challenges of local impacts of climate change. Academics worked closely with communities and primary producers in the development of hydroponic facilities. There was also central investment in biotechnology to ensure the best chance of survival of crops and livestock.

Operations and infrastructure

There was a transition to decentralised locations of local hubs supported by increased government funding.

Sector's role

The government recognised and commissioned tertiary education institutions to play a key role helping communities adapt to their new locations, new communities and new environments. Funding was provided to expand local teaching hubs, embedding them in the work and delivery of local services. These hubs worked closely with state and local authorities to agree on local priorities for research and teaching.

Universities worked closely with their state governments to advise how to support social change in a just way and how to maintain the trust and support of the community in face of the many challenges created by climate change.

Universities also supported the creation of the federal level system, which ensured forewarning of extreme weather events, co-ordinated responses to those events, and diffusion of innovations from the many community research hubs across the country.

Staff and student experience (including safety)

There was a significant increase in demand for academics who could teach the necessary vocational skills and support state governments in development of state-level planning and engagement with their citizens. The status of academics grew, taking on almost hero status in their communities as they became the purveyors of important knowledge to ensure communities thrived.

Students benefited from the communities created at the research and teaching hubs, getting a sense of purpose and fulfilment from their work, together with a sense of security knowing the knowledge hubs had been built to keep them comfortable whatever the weather could throw at them.

2070 to 2089

The world's climate had changed

GHG emissions per person were decreasing, but this was offset by the continuing increase in world population resulting in an increase of total emissions. This had catastrophic impacts as global temperatures reached 3.6°C above 1990 levels at the end of the 2080s.

The world stopped talking about the challenge of individual extreme weather events. Instead, there was global acceptance that the world's climate had been irreversibly changed.

The concept of national citizenship ended

Sea level rose by 80 cm, and it was expected to rise a further 10 - 15 cm by the end of the decade. Consequently, 15% of the islands in the Pacific had either become uninhabitable or would be so by the end of the century, displacing more than a million people. Many of them came to live in Australia.

Many parts of Asia became uninhabitable because of flooding, the increase in temperatures and drought. Millions of people were forced to look for a new place to call home each year. The Global Climate Alliance responded with the concept of global citizenship, which was embraced as countries recognised the need to work closely together to respond effectively and humanely to the challenges facing the world. The Global Climate Alliance supported the movement of people to places of moderate climate around the world, with transfers of money to support initial investment in infrastructure and trade, and technology transfer deals to ensure ongoing sustainability.

Some cities and towns thrive while others decay

Australia experienced increasing internal migration as people moved away from climate-impacted areas. People relocated to towns and cities where the Australian government had invested in the 2050s and 2060s, which had more moderate temperatures. These places grew rapidly as displaced global citizens joined those moving within Australia to find refuge in more habitable areas.

This also led to the creation of ghost towns, as generations left areas that had become difficult live in due to consistent and extended periods of extreme heat or flooding. First Peoples were the most adaptive in their response to climate change staying connected to their homes by moving into the underground cities in seasons of extreme heat. Those who were displaced ensured that they brought with them regional treasures to ensure that they kept a new way to connect to their place.

Public transport became the preferred mode of transport, with electric shuttle buses providing regular transport in an air-conditioned environment, ensuring ease and comfort.

Floodwater at Parkville Campus, The University of Melbourne. Image credit: Dean Boothroyd

In the 2090s

Teaching market

Student numbers increased further, driven by the growing population and the rising importance and reputation of the knowledge hubs, which were now seen as an integral and key part of society. Three-year courses remained standard, with students becoming experts in their chosen fields. However, these courses resemble apprenticeships, as students served the community while learning and then went on to teaching the next generation the skills that they had acquired.

Research market

There was concern that sea levels would continue to rise in 2100 by an additional metre, even with a decrease in GHG emissions and global temperatures in the next century, as the ice shelves were unstable. Therefore, research focussed on emissions reduction and stabilising the ice shelves.

Despite an ongoing increase in net GHG emissions, people across the world recognised that close co-operation among nations had helped with adaptation to current levels of climate change. There was consensus that there needed to be strategic adaptation to climate change.

Operations and infrastructure

State and local authorities shared funding of the knowledge hubs, recognising that students deliver local services as they learn in these hubs.

Sector's role

The tertiary education sector remained at the heart of the nation's response to the change in the climate.

Staff and student experience (including safety)

The separation between staff and students blurred, each being on a learning journey as they worked together to respond to the needs of their community.

The time when students learned changed as students only studied during the times of the day when temperatures were tolerable and an afternoon break became the social norm over the summer months for staff and students alike.

Aerial photo of the University of Wollongong's coastal campus

JUGGLING WITH FIRE

This scenario explores a possible future where emissions continue to rise between now and the end of the century. It is a scenario where the approach of the Australian government focuses more on responding to the priorities of the day and delivering success over the next four to five years.

In this scenario, all tertiary education ultimately becomes vocational, with research integrated into government departments, heralding the end of the university sector as we know it. Students learn virtually or very locally as travel is more expensive and disrupted by extreme weather events and society is focussed on survival.

Living with Fire. Image credit: University of Tasmania

2025 to 2029

Greenhouse gas emissions continued to grow

While developed nations gradually reduced their GHG emissions, with an annual average decrease of 1%, this progress was counterbalanced by raising emissions in developing nations. The increase in emissions in the Global South was partially driven by the efforts of the Global North to reduce their own GHG emissions. For instance, trade from the Global North to the Global South of "gas guzzling" combustion engine vehicles persisted as taxes for the use of inefficient cars rose in the Global North.

As populations in developed countries declined, businesses shifted their focus to developing nations. This shift resulted in increased demand for materials and energy to support the expanding markets.

Social media provided a window for people in developing nations into the lifestyles of the middle and upper classes in developed countries. This fuelled the desire in the Global South to have the same standard of living enjoyed by many in the Global North. Consequently, there was an increase in consumerism and rise of a disposable culture in developing nations.

Global temperatures and barriers to immigration rise

In 2029, global temperatures were on average 1.5˚C above the historical baseline. This led to a faster rise in extreme weather events across the world than had been previously forecast.

Southern Australia experienced a devastating multi-year drought in late 2028 and 2029, which reduced crop and livestock yields, requiring food imports and significantly raising the cost of living. Similar droughts were seen in parts of Africa and South America, leading to a growing number of humanitarian crises. This fuelled international tension as food prices rose and the number of climate refugees across the globe increased.

Meanwhile, parts of Europe, Asia and the US saw major flooding in 2027 and 2029. The number of people affected and associated economic costs exceeded previous years, with more than 250,000 people in the US alone affected by flooding, at a cost of more than US $13 billion in 2029. Countries across the world focussed more on their own people, responding to the needs of the domestic population affected by significant extreme weather events.

The US, Canada, Europe and Australia tightened their border controls, reducing the number of refugees across their borders. This shift was driven by a focus on the needs of their own citizens, supported by a surge of nationalism.

Global pandemic returns creating mayhem in areas already dealing with serious extreme weather events

The climate-related challenges that all nations faced were exacerbated by a global health emergency triggered by the emergence of another viral outbreak that threatened to reach pandemic levels, alongside a resurgence of existing infectious zoonotic viruses with the potential to harm agriculture and public health. Nations used these incidents as a pretext to close borders completely to stem the spread of the disease, but also as an excuse to deny entry to climate refugees.

While borders were closed, there was limited opportunity to restrict movement within those countries, resulting in high rates of infectious disease transmission in areas where tens of thousands were displaced by flooding or drought. Hospitals were overwhelmed both in Australia and across the globe, creating social pressure to invest more in health systems and the next generation of mRNA vaccines.

Economic challenges for Australia

Australia saw GDP decline by 5% in the second quarter of 2028 due to the cascading impacts of drought, viral outbreaks and efforts to control their spread, and a sharp rise in unemployment to 8%. The Australian government responded quickly by reintroducing the "Job Keeper payments" and the Homebuilder program, while state governments provided packages to support local businesses. This followed three years of growth at just over 1% in the mid-2020s, resulting in lower tax revenues.

Australian national debt followed a pattern of increases similar to those seen following the 2019 COVID outbreak. The combined borrowing of federal and state governments reached $350 billion in 2028/2029, with national debt rising to just under 60% of GDP by the end of the 2020s compared to 40% of GDP in 2019. Australia did not experience the same level of

economic rebound after this second public health emergency as it did after COVID-19. This was attributed to extreme weather events, which led more people to save money as a reserve in case they lost their jobs because of declining economic activity.

While the Australian Government was widely commended for its rapid action to rebuild damaged infrastructure and its response to the complex climate and health challenges, the economic and social impact of these factors nonetheless contributed to poorer health outcomes, an increase in homelessness, and erosion of social cohesion.

In the 2030s

Teaching market

The number of international students plummeted, and domestic student numbers also declined due to stricter means testing for Youth Allowance. The number of international students coming to Australia did not recover after the 2028 border closures in response to the pandemic. Australian and other leading universities invested more in offshore and online teaching during the pandemic, but further investment was seen as critical for future resilience as borders tightened, allowing increasing numbers of international students to gain a qualification from a high-ranking university without leaving their countries.

Research market

The Australian Government looked to universities to undertake research to respond to the health challenges created by the pandemics of the 2020s, and to improve disaster response to climate-driven weather events. However, overall research funding declined as government budgets tightened.

In addition, government and officials increasingly sought academic advice on global political matters as borders tightened, geopolitical tensions escalated, and nations moved away from commitment to global bodies, instead forming closer relationships on a regional level.

Operations and infrastructure

Declining student numbers in Australia led to a significant downsizing of teaching space at all Australian tertiary education institutions. This rationalisation of property portfolios was also driven by significant increases in costs of insurance, of retrofitting buildings to better withstand the increasing number of weather events and temperature extremes.

Campuses were rationalised to leave just central hubs, which would also serve as places of safety for staff and students against weather events. Australian universities built on international alliances to deliver teaching offshore as movement across borders continued to be restricted.

Sector's role

Federal and state governments increasingly looked to the sector to conduct rapid response research and provide consulting type advice. The focus of rapid response research was on solutions to the increasing number of extreme weather events, and advice to navigate the challenges of both domestic and international politics.

Universities took a leading role in combatting the pandemic by setting up hubs to provide free virus testing and vaccinations. As such, universities expanded their role to support social cohesion as students and the local communities looked to them as trusted sources for mitigating the spread of the virus.

Staff and student experience (including safety)

Numbers of academics declined in line with decreasing student numbers. Those who remained were provided with training in health and wellbeing as students increasingly sought their support for mental health issues, alongside their traditional teaching roles.

Students who remained regarded campuses as a place of safety, both in terms of physical safety from increasing extreme weather events, as well as a place to experience community and receive mental health support from teachers.

2040 to 2059

Global support for the Paris Agreement fades as most nations fail to meet emissions targets

Only 19 of the 145 countries who had set net zero targets achieved them in this period. The high number of nations missing their targets further undermined the incentive for countries to impose difficult changes on their people to reduce greenhouse gas emissions. The majority of nations argued that funding was better spent on adapting to the emerging challenges of climate change in the absence of global mitigation action. Withdrawal from commitments made via the Paris Agreement weakened the role of multi-lateral organisations, and countries stopped providing information on their progress in reducing emissions.

Climate becomes increasingly challenging

The number of hot, dry days increased by more than 50% across the country. For example, NSW saw increases in the number of days above 35˚C inland, from 80 days per year to a third of the year, leading to water shortages, a doubling in the number of fire days, and significant reductions in crop yield. Bushfires devastated much of Canberra in 2047, requiring the temporary relocation of 50,000 people and a redesign of the way the 'Bush Capital' was built. In the 2050s, flooding in Western and Southern Australia caused over $11 billions of damage to commercial buildings, roads and other infrastructure. Victoria saw nearly 10,000 homes flooded in a single year and Sydney suffered from severe flooding on three occasions.

There was growing recognition that these were no longer isolated extreme weather events, but the climate was now inherently more extreme, variable and unpredictable. There was an acceptance that, with the high cost of disaster recovery, previous Australian high standards of living could not be taken for granted. Tens of thousands of people lost their homes, which were now uninsurable. Agriculture changed significantly, with crops continually being relocated to adapt to the evolving climate.

Governments focussed on responding to the immediate challenges of each extreme weather event, limiting investment in long-term change for two reasons. Firstly, funds were directed to the people and businesses affected by each event. Secondly, the rapidly changing climate made planning difficult. For example, investments to improve flood defence in the early 2040s proved to be insufficient as rain intensity and sea level rises over-topped these defences, with dire consequences for developments built in areas that were thought to be protected. The government invested in technology to support early warning systems for increased risks from flooding or storm damage, with offers to extend this support to Pacific Islands.

The impacts of the changing climate were felt more dramatically in other parts of the world. The effects of a 24 cm sea level rise over this period added to other global climate change challenges, with whole villages being relocated to higher ground in the Pacific Islands, and increasing displacement of people from these islands and coastal areas of Asia. This reinforced, in the minds of citizens, the importance of maintaining efforts to minimise further global temperature rises. Parts of Australia also experienced increasing coastal inundation, and frequent cyclones devastated some areas of Northern Australia.

Insurance companies withdraw weather cover from Australian market

The rapid escalation of extreme weather events led insurance companies to withdraw cover for weather-related risks in some Australian regions, including storms, floods or fires. More than a million houses were uninsurable. State governments stepped in to provide minimum levels of coverage for flood and fire risk in these areas. State-level insurance companies were established to provide cover, underwritten by the Federal government. Individuals paid an additional amount on top of their normal property insurance to have access to this state coverage.

National scheme introduced to improve response and support those affected by events

A citizen-wide 2% Income Weather Events Levy (IWEL) was introduced in the early 2040s to collect funds to: invest in emergency services, provide temporary shelter for people displaced by events, offer mental health support for those affected, transition investments for farms adapting to the new climate, support affected businesses, and invest in innovations to improve response to extreme weather events. This levy was raising $15 billion a year by the 2050s.

Consequent investments in the 2040s and 2050s ensured that Australia became a world leader in responding and recovering from extreme weather events. Other countries followed

suit in the 2050s, introducing a weather event levy to emulate Australia's approach in supporting its people as the climate became more hostile.

Regional conflicts escalate

Significant reductions of water levels in the Nile delta, the Mekong delta and in the Middle East in the 2050s led to regional military conflicts over access to water. These conflicts severely hampered engagement in global initiatives as countries withdrew and focussed on their own interests, creating global tensions. Developed nations sought to use these conflicts to secure access to rare metals from the African continent.

War erupted in Asia in the late 2050s as governments tried to divert attention from internal unrest caused by increasing heatwaves and failing crops. While there were international outcries at the human cost of that war, in addition to the many challenges from extreme weather events, some nations used the opportunity to invade and take control of disputed regions. These actions led to a strengthening of existing military alliances, significant increases in spending on defence, and an end to global co-operation.

Decades of two world wars

The 2040s and 2050s became known as the "two world wars", referring to the war between the climate and humanity, and the increase in regional military conflicts. Forecasts of world population growth changed, as twice as many people faced water scarcity and a third of the world had experienced military conflict by the end of the 2050s.

Supply chain challenges led to a rethink in national policies to ensure security of supply

Economic philosophy was challenged during this period as countries recognised that they could no longer rely on the consistency of global supply or global supply chains. Countries developed national strategies for food and water and restricted the movement of any new technology which could be adapted and used for war.

Australia and other countries moved to a "war time" footing, with increasing amounts of the national budgets devoted to military technology and responding to extreme weather events. There was mass immigration into Australia over this period, as millions from Asia and the Pacific Islands sought refuge from war and climate change.

The focus for each successive government in Australia was responding to these immediate and pressing demands, with strong social pressure for investment in military assets, rebuilding areas affected by extreme weather events, creating new homes for those entering Australia, and improving emergency response capability.

In the 2060s

Teaching market

Domestic students focussed on survival rather than getting an academic tertiary education. With long-term reductions in their funding, Australian universities lost their place in the remaining world market for academic tertiary education, as the quality and reputation of international tertiary education institutes increased.

Nevertheless, niche areas of academic tertiary education remained strong in Australia for those aiming to take a career in research in the areas of defence, health and engineering.

Tertiary education institutions began to offer short courses on language and culture for the increasing number of immigrants. They also provided short courses on how to access government services, start businesses, and understanding their expected role in supporting the wider community during extreme weather events. AI was used to capture traditional knowledge to ensure it was preserved and could be applied to help the nation respond to the challenges of climate change.

All other tertiary education in Australia was focussed on the development of vocational skills. Teaching moved from the traditional three or five years undergraduate courses to a modular approach, which was needed to allow students to fit their studies around extreme weather events.

Research market

Universities benefitted from the IWEL income (the Income Weather Events Levy) as the government sought their partnership with businesses to develop innovations in response to climate changes in Australia.

Investment in health research in the 2030s delivered significant benefits. As a result of research in mRNA vaccines, an effective early treatment for cancer was developed. The focus of research then shifted to improving the early detection of cancer to enhance treatment effectiveness. A collaboration between Australian universities and business led to the commercialisation of the new technology, achieving a 10% market share by 2050 with a value of $50 billion. The share of the market increased and by the end of the 2050s the gross value of sales approached $100 billion a year.

Operations and infrastructure

Central hubs expanded as the universities took on a greater role working with state governments to support local communities. The design of these hubs was modified to ensure that they could provide large refuge spaces for people in a safe environment with effective cooling and heating, and significant reserves of water, food and energy.

There was an increase in investment in security to safeguard the people who were on campus and to protect the water and food supplies from pilfering, which emerged as a particular problem during the early 2040s.

Sector's role

Universities tailored teaching and research to reflect areas of greatest demand in responding to the "two world wars".

The community and social role of tertiary education institutions was reinforced. States worked closely with these institutions to make campuses a place of safety for students and the local community during and following major weather events, and to provide housing and support to climate refugees.

Staff and student experience (including safety)

Staff numbers increased to deal with surging demand for language and cultural training for the waves of immigrants. Three categories of academic staff were created: the few who taught the academic courses in the remaining specialist areas, academics who supported the integration of the immigrants, and those who taught vocational courses. The latter two categories delivered their courses in short modules.

Given the economic uncertainty, food insecurity, prevalence of extreme events, and high number of both domestic and international climate refugees, many people experienced mental health challenges. Students saw universities as a place of acceptance given the emphasis placed on supporting integration into the community.

2070 to 2089

Global humanitarian crisis and rise in authoritarianism

By the start of the 2080s, average global temperatures were 3.5˚C above baseline levels, with no sign that temperature rises would abate soon. The number of deaths across the world from storms, heatwaves, fires and flooding counted in the millions every year, and the annual global cost of extreme weather events reached trillions of dollars.

Natural feedback systems were accentuating the increase in temperature and consequent impacts of climate change. Notably, ice coverage reduced more quickly than expected, reducing the amount of light and heat reflected out of the atmosphere. This also led to an increase in the speed at which sea levels rose, and 300 million people across the world were displaced because of coastal flooding by the mid-2080s. Sea levels measured 70cm higher by the end of the 2080s.

Even wealthier nations were reluctant to invest more in coastal flood defence, as concerns rose about the risk of the Thwaites ice shelf melting, which could add up to 3 meters to the level of the sea.

Around the world, the number of authoritarian leaders increased as citizens looked to their governments to provide strong leadership in this time of crises. This was accompanied by global declines in human rights, as governments were forced to make difficult decisions that served the greater good but smaller numbers of individuals.

Worldwide, incidents of international military conflict began to diminish. The biggest challenge, common to all nations, was adapting to a world with an inherently unstable climate that had become unrecognisable compared to the climate at the start of the century.

Australians focus on surviving in a chaotic world

By now, the Australian economy was unrecognisable from earlier times. Unchecked climate change had led to a series of massive economic and social shocks, putting severe pressure on government budgets.

Ensuring a stable food supply for the populace had become a critical priority for Australian governments. Farmers adapted by changing their crops, using hydroponics and indoor agriculture. Despite the introduction of significant government interventions, including food rationing, social cohesion began to break down with the fragile state of the economy. A thriving black market emerged, with food supplies needing to be guarded to prevent looting.

Australia's adaptability was key to its success, as farmers were supported to quickly adapt to the ever-changing climate conditions. Fear of food shortages disappeared with the implementation of a national rationing system for both food and water. Everyone received a fair basic allowance .

Waves of climate-driven immigration into Australia, combined with the forced abandonment of previously habitable areas due to flooding and fire, led to severe pressure on Australia's housing capacity. Single occupancy homes were now long-forgotten memories, with intergenerational living and shared accommodation becoming the normal way of life for most Australians.

As social cohesion continued to deteriorate, the Australian government became increasingly authoritarian to maintain control and social order. Whilst within local communities people continued to support their neighbours, there was growing suspicion of outsiders and a rise in government-sanctioned vigilante gangs to combat high rates of violent crime driven by unrest. These factors contributed to an unprecedented crisis in mental and physical health.

Running repairs as the nation grapples with ongoing disruptions

Australia had the best emergency response system in the world, funded by IWEL, with effective mechanisms in place for early warning, coordination of response care and support for those affected, and investment to rebuild afterwards. However, by the 2080s. emergency service workers were often overwhelmed as devastating natural disasters became the norm. Extreme temperatures and weather events meant that Adelaide, Brisbane, Darwin and other regions were becoming unliveable.

Rather than trying to make every area climate safe when the exact nature of local changes and challenges was unclear, areas that ceased to be habitable were abandoned, with the focus on building new towns as the need arose.

Australia developed skills in “flat-pack towns” to allow rapid construction when required. Flat-pack houses and other typical municipal buildings were built and stored en masse in each state, ready to be erected on a new site as needed. In this way, small new towns were put together in 12 to 18 months.

Competition for the young

The decrease in world population created global competition for the young and for those willing to start a family. Australia kept its borders open to young people to come and live in Australia.

In the 2090s

The tertiary education sector went through a significant transformation, with research and teaching no longer linked to universities. All teaching took place via further education community hubs (often on former university campuses) or online. With declining research funding and research linked to priority policy areas, all research activity was integrated into government agencies.

Teaching market

Almost all teaching became vocational, with students dipping in when they could, learning in bite size chunks the next thing they needed to survive and thrive. Students studied locally or online and did not travel beyond their towns. Community learning replaced individual learning, reflecting the new culture in society. Teams came together to agree the skills they would need for a task and take a complementary set of courses together.

Staying local also reduced the risks of disruptions to travel to and from home and allowed students to continue to be an integral part of their extended family and community while they learned.

Research market

All research was funded and conducted by the government and disconnected from teaching. Overall research funding declined further, except for research on emergency responses. Research efforts focussed on climate impact solutions, agriculture, and improving the safety and health of the Australian population. The latter included research on mRNA vaccines as well as vaccines to prevent the spread of malaria, after Australia experienced the resurgence of this disease.

Operations and infrastructure

Functional infrastructure owned by tertiary education institutions was used by government and local communities for multiple purposes to ensure support for Australians in the changing climate, including teaching, housing climate refugees, and as community hubs.

All new infrastructure was designed to withstand current and future climate looking out beyond 2200, though there was increasing interest in moving key infrastructure underground to ensure adequate resilience.

Sector’s role

The tertiary education sector played a key role in providing vocational education, but universities no longer existed. Researchers were now employed directly by the government, with limited academic freedom.

Staff and student experience (including safety)

Maintaining physical and mental health was a major issue across the whole of society, with many people suffering from PTSD as a result of extreme weather events.

There were few jobs in research and researchers had much less academic freedom. In line with increasing authoritarianism, governments set research agendas and were prescriptive about what outcomes they sought.

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- Members of the ANU Institute for Climate, Energy and Disaster Solutions research cluster on Indigenous peoples, cultures and knowledges.

As tertiary education institutions go about the process of mapping their unique climate risks, continued dialogue will be undertaken to ensure First Nations' perspectives are captured and woven into risk and opportunity analysis.

We acknowledge all who attended and shared with us their thoughts and insights about the future at the 10 workshops that were held to develop the scenarios.

Western Australia Climate Scenarios Workshop

APPENDICES

Appendix A. Australian Accounting Standards Board (AASB) S2, section 22 requirements

Climate resilience

22 An entity shall disclose information that enables users of general purpose financial reports to understand the resilience of the entity's strategy and business model to climate-related changes, developments and uncertainties, taking into consideration the entity's identified climate-related risks and opportunities. The entity shall use climate-related scenario analysis to assess its climate resilience using an approach that is commensurate with the entity's circumstances (…). In providing quantitative information, the entity may disclose a single amount or a range. Specifically, the entity shall disclose:

(b) how and when the climate-related scenario analysis was carried out, including:
  (i) information about the inputs the entity used, including:
    (1) which climate-related scenarios the entity used for the analysis and the sources of those scenarios;
    (2) whether the analysis included a diverse range of climate-related scenarios;
    (3) whether the climate-related scenarios used for the analysis are associated with climate-related transition risks or climate-related physical risks;
    (4) whether the entity used, among its scenarios, a climate-related scenario aligned with the *latest international agreement on climate change* [29];
    (5) why the entity decided that its chosen climate-related scenarios are relevant to assessing its resilience to climate-related changes, developments or uncertainties;
    (6) the time horizons the entity used in the analysis; and
    (7) what scope of operations the entity used in the analysis (for example, the operating locations and business units used in the analysis);
  (ii) the key assumptions the entity made in the analysis, including assumptions about:
    (8) climate-related policies in the jurisdictions in which the entity operates;
    (9) macroeconomic trends;
    (10) national- or regional-level variables (for example, local weather patterns, demographics, land use, infrastructure and availability of natural resources);
    (11) energy usage and mix; and
    (12) developments in technology; and
  (iii) the reporting period in which the climate-related scenario analysis was carried out

[29] https://standards.aasb.gov.au/new-standards-202425-and-earlier-financial-years

Appendix B. Process for the development of the scenarios

A sector-level approach to the development of scenarios was adopted building on the approach used to develop climate scenarios for New Zealand's tertiary education sector

The Australian universities' sustainability teams decided to learn from work completed in New Zealand where they developed a sector-level set of scenarios exploring climate risks facing New Zealand's tertiary education sector. That work was completed in 2023 and was delivered in response to the requirements of New Zealand's XRB (External Reporting Board), which sets accounting standards for New Zealand companies.

There are strong sustainability-related links among many Australian universities, as evidenced in their formalised participation in Australasian Campuses Towards Sustainability (ACTS) to drive and support collective efforts. With ACTS support, a subset of members chose to leverage these existing links and collective approaches to work together to develop a set of common climate change scenarios that the sector as a whole and individual institutions can use to assess climate risks and opportunities. This assessment will support both reporting commitments and obligations as well as strategic planning activities.

A key question was chosen for the scenarios to explore

The first stage in the development of the scenarios was to agree on what question would be most useful for the universities to build the scenarios around. All participating universities were actively involved in this decision.

The universities agreed to consider the question: **"How could climate change impact Australia's tertiary education sector in the 2030s, 2060s and 2090s?"**

Including three-time horizons ensured consideration of the short, medium and long-term changes that climate change would bring. It would highlight the effect that decisions we make in the next five to 10 years will have on our medium and long-term future, supporting good choices now.

Overall process to create the climate scenarios and response

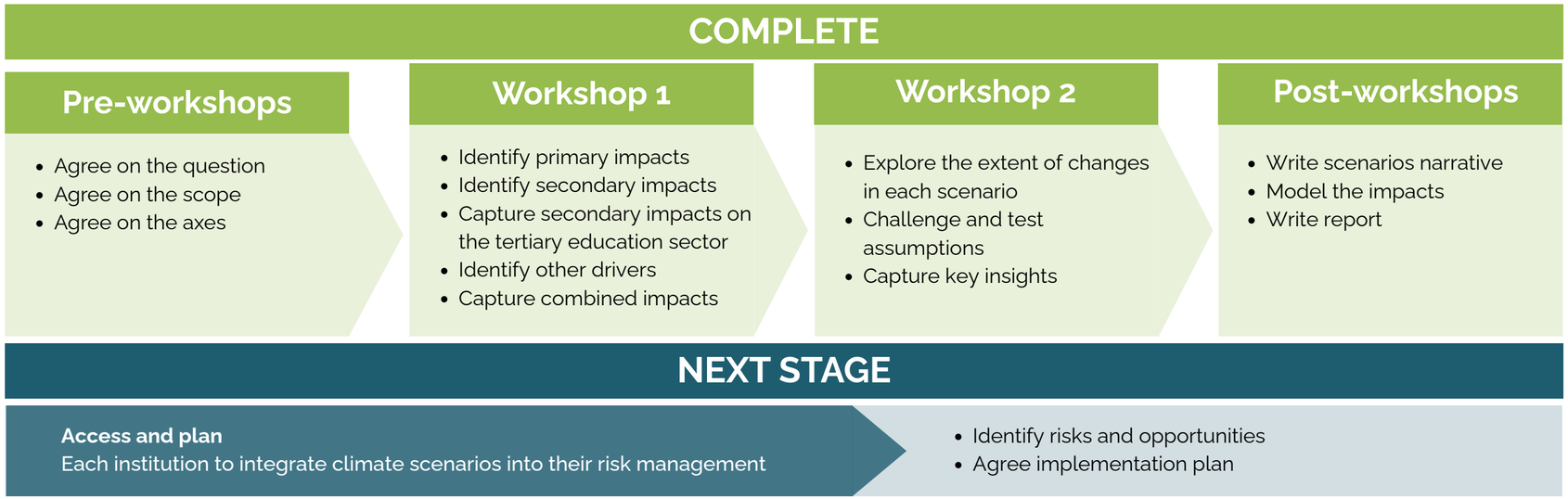


Figure 5. Process flow for scenario development and use

Axes were chosen for the scenarios

For the scenarios to provide the greatest value there must be an underpinning logic for each of the scenarios. The underpinning logic is created by choosing the two drivers of change that will have the biggest impact on the answer to the project question and are most uncertain. These high impact, high uncertainty drivers combine as axes to form four distinct scenarios, each exploring a different combination of these two important uncertainties.

The universities worked together to agree the axes for the scenarios. One axis would consider the range of possible physical changes that climate change would bring, represented by the IPCC warming scenarios, and the other would explore the type of response taken by the federal, state and local governments of Australia to climate change.

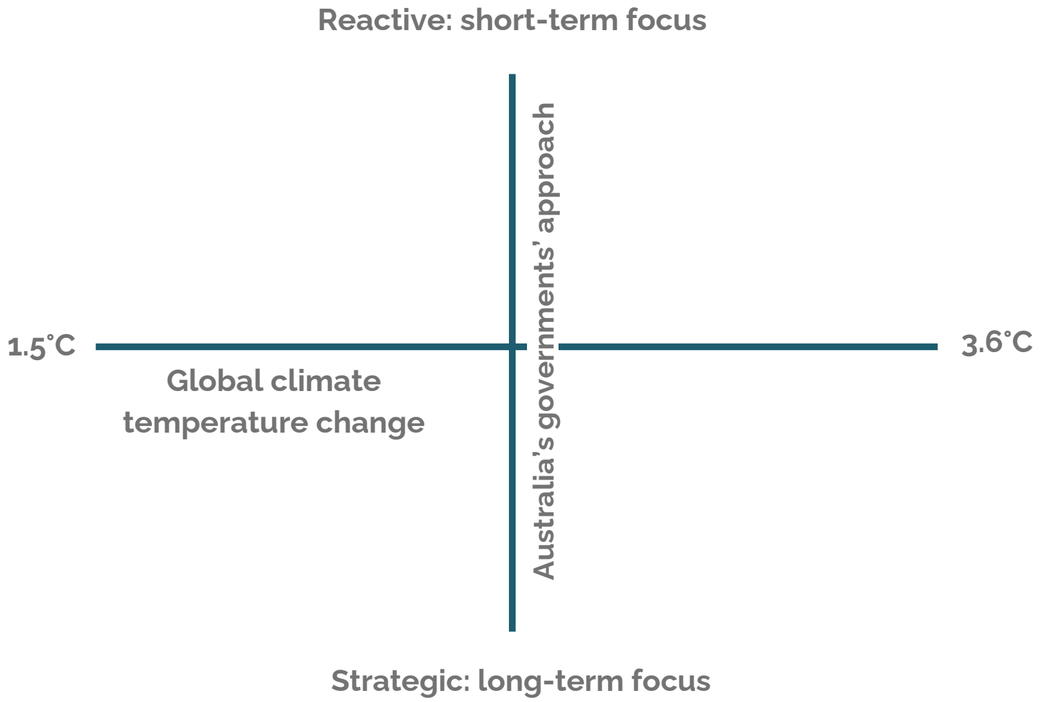


Figure 6. Climate scenarios axes

The United Nations Intergovernmental Panel on Climate Change (IPCC) Shared Socioeconomic Pathways (SSPs), published in the Sixth Assessment Report in 2023, were used to set the range of global warming, and the associated physical changes, for the horizontal axis. The SSP1-1.9 scenario was used to represent the best temperature outcome. Under these scenarios, the world is assumed to achieve net zero GHG emissions by the 2050s and warming is below 1.5˚C at the end of the century. The SSP3-7.0 scenario, with a temperature increase of 3.6˚C by 2100, was selected to represent the worst temperature outcome. Under this scenario, the world is assumed to continue its current pathway with increasing GHG emissions.

The associated increases in global warming for these scenarios in the near- medium- and long-term were set out in the IPCC Sixth Assessment Report and are depicted in Table 18 below.

Table 18. Estimated global average warming (˚C) of the IPCC's shared socioeconomic pathways

	SSP 1-1.9	SSP 1-2.6	SSP 3-7.0
2021 to 2040	**1.5**	**1.5**	**1.5**
2041 to 2060	**1.6**	**1.7**	**2.1**
2081 to 2100	**1.4**	**1.8**	**3.6**

The second axis represents Australian governments' approach to climate change.

The second axes is Australia's governments' (Federal and State) approach to the policies adopted and the investment made in response to climate change. At one end, the government would be reactive and agile, responding quickly to immediate challenges and focussing on the short-term. At the other end, government would be proactive, strategic, stable and focused on long-term outcomes.

The universities agreed on five key aspects of the tertiary education sector to consider in the scenarios

Teaching: for example, what changes will there be to what will be taught, how it will be taught and where? What will happen to student numbers?

Research: for example, what will the priority areas of research be? How will funding be affected?

Role of the sector: for example, will government or society expect the primary role of the tertiary education sector to change from being the creator and guardian of knowledge, which it develops through research and shares through teaching. What other roles might be expected of the universities and what impact might that have on the overall structure of the sector?

Operations and infrastructure: for example, how will it affect the number, type or location of buildings, what will it mean for hours of work, insurance costs or energy usage, transport options

Staff and students: for example, how will their expectations change, hours of work or study and where and how they study, will it affect safety and how will that be managed?

The scenarios were then developed through a series of workshops

Two workshops, each held in five locations, explored what could happen in each of the four quadrants of the scenarios. Workshop 1 was designed to deepen understanding of the future impacts of climate change and consequent implications for the tertiary education sector.

Participants first considered the broader impacts climate change could have from:

- increasing incidence of extreme heat
- increasing droughts
- more fire days
- increase in frequency and intensity of storms
- increases in inland and coastal flooding
- increases in sea temperatures and acidification
- moves to decarbonise

Participants then considered the potential implications for teaching, research, operations and infrastructure, the role of the sector and staff and students.

Participants also considered what else would affect the future of the tertiary education sector over the next 75 years, recognising that climate change is one of many factors that will drive change in the sector. A summary of the eight key drivers of change identified that will likely affect the tertiary education sector is attached at Annex B (slide 34 in Workshop 2 slide set).

Figure 7. An example of notes from Workshop 1

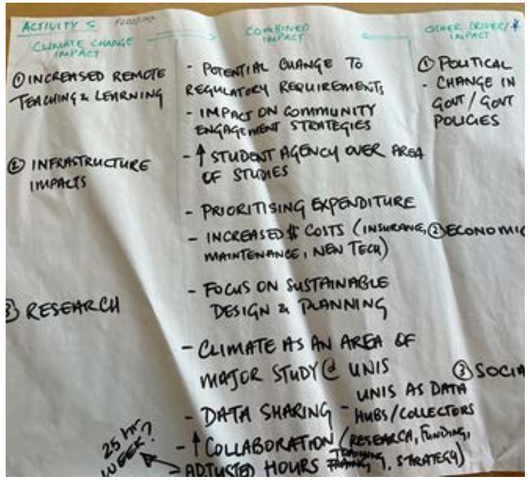
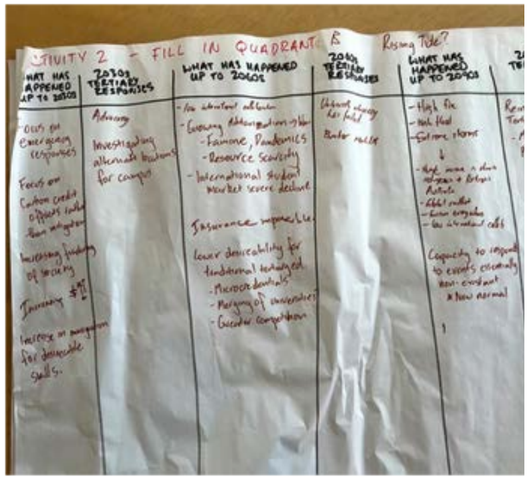


Figure 8. An example of notes from Workshop 2



At Workshop 2, participants worked in groups to weave together ideas from Workshop 1 into coherent and plausible narratives for each of the quadrants.

Both workshops were each run in five different locations, ensuring diverse input and reflection on regional issues: Adelaide, Canberra, Hobart, Melbourne and Perth. In total, more than 150 people participated in the workshops.

The scenarios described are drawn from the collective views of all ten workshops. In addition, Appendix C includes a list of documents reviewed in developing the scenarios. But scenarios alone and unused are of little value. The final stage of the process is for universities to consider the implications of the risks and challenges identified in the scenarios for their strategies. A proposed approach for undertaking this final stage and leveraging the full value from the scenarios has been set out above.

Appendix C. Documents reviewed in development of scenarios

Demographics

- https://desapublications.un.org/publications/world-population-prospects-2024-summary-results
- https://www.ined.fr/en/everything_about_population/demographic-facts-sheets/focus-on/2024-les-nations-unies-publient-de-nouvelles-projections-de-population-mondiale/

Economy

- https://ieefa.org/resources/australian-thermal-coal-exports-decline-further-and-faster-expected-and-demand-south-east
- https://tradingeconomics.com/australia/exports-of-vegetables-and-fruit
- https://www.dfat.gov.au/sites/default/files/australias-goods-and-services-by-top-25-exports-2023.pdf
- https://www.rba.gov.au/publications/smp/2024/feb/outlook.html

Emissions tracking

- https://climateactiontracker.org/countries/australia/
- https://www.cogo.co/
- https://www.dcceew.gov.au/sites/default/files/documents/national-greenhouse-gas-inventory-march-2023.pdf
- https://www.worldometers.info/co2-emissions/co2-emissions-per-capita/

Energy

- https://www.abs.gov.au/statistics/industry/tourism-and-transport/transport-census/2021
- https://www.bitre.gov.au/sites/default/files/is_075.pdf
- https://www.carsguide.com.au/car-news/when-will-petrol-cars-be-banned-in-australia-and-what-will-happen-to-all-of-the-internal
- https://www.energy.gov.au/energy-data/australian-energy-statistics/electricity-generation

Future planning

- https://treasury.gov.au/sites/default/files/2019-03/IGR_2010_Overview.pdf

Health

- https://blog.bccresearch.com/the-global-oncology-pharmaceuticals-market-trends-challenges-and-future-prospects
- https://www.cancer.gov/news-events/cancer-currents-blog/2022/mrna-vaccines-to-treat-cancer
- https://www.cis.org.au/publication/australias-post-pandemic-public-debt-is-there-still-a-problem/
- https://www.rba.gov.au/education/resources/explainers/the-covid-19-pandemic-2020-to-2021.html
- https://www.stantec.com/en/news/2022/economic-impact-of-covid-in-australia

Impacts

- https://climateadaptationplatform.com/what-happens-when-we-cross-the-2c-temperature-limit/
- https://disasterphilanthropy.org/disasters/2024-central-and-eastern-europe-floods/
- https://edition.cnn.com/2024/07/22/china/china-floods-climate-change-intl-hnk/index.html
- https://insurancecouncil.com.au/wp-content/uploads/2022/05/2202May_Flooding-and-Future-Risks_final.pdf
- https://interactive.carbonbrief.org/impacts-climate-change-one-point-five-degrees-two-degrees/index.html#
- https://recovery.preventionweb.net/collections/recovery-collection-australia-black-summer-bushfires-2019-2020
- https://reliefweb.int/disaster/tc-2023-000121-chn
- https://research.csiro.au/slrwavescoast/sea-level/future-sea-level-changes/
- https://scied.ucar.edu/learning-zone/earth-system/climate-system/feedback-loops-tipping-points
- https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool?type=global
- https://unfccc.int/sites/default/files/resource/1.02%20Impacts%20of%20climate%20change%20at%201.5%20and%202C.pdf
- https://www.barrierreef.org/the-reef/threats/climate-change
- https://www.c2es.org/document/sea-level-rise-global-climate-change-a-review-of-impacts-to-u-s-coasts/
- https://www.climatechangeinaustralia.gov.au/en/changing-climate/future-climate-scenarios/global-warming-levels/years-at-1-c/
- https://www.climatechangenews.com/2014/03/27/some-15-of-pacific-islands-wiped-out-by-1m-sea-level-rise-ipcc/
- https://www.climatecouncil.org.au/resources/capital-cities-swelter-through-twice-as-many-days-above-35c-unless-stronger-climate-action-taken/
- https://www.climatecouncil.org.au/resources/impacts-degrees-warming/
- https://www.climatecouncil.org.au/uploads/coastalflooding.pdf
- https://www.csiro.au/en/research/environmental-impacts/climate-change/state-of-the-climate/australias-changing-climate
- https://www.dcceew.gov.au/sites/default/files/documents/risks-coastal-buildings.pdf
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- https://www.euronews.com/green/2024/04/22/glomma-loire-rhine-which-european-rivers-experienced-record-flooding-in-2023
- https://www.foxweather.com/extreme-weather/counties-most-risk-flooding-2024
- https://www.jbarisk.com/knowledge-hub/insights/a-picture-of-future-flood-risk-in-europe/
- https://www.royalcommission.gov.au/system/files/2021-08/interim-observations-rcnda.pdf
- https://www.science.org.au/supporting-science/science-policy-and-analysis/reports-and-publications/risks-australia-three-degrees-c-warmer-world
- https://www.sciencedirect.com/science/article/pii/S0308597X19304622
- https://www.scientificamerican.com/article/antarcticas-doomsday-glacier-is-melting-even-faster-than-scientists-thought/
- https://www.statista.com/statistics/1306270/physical-exposure-to-floods-by-country-europe/
- https://www.theguardian.com/cities/ng-interactive/2017/nov/03/three-degree-world-cities-drowned-global-warming
- https://www.undp.org/sites/g/files/zskgke326/files/2023-01/PNUDLAC-working-paper-40-climate-EN.pdf
- https://www.weforum.org/stories/2024/09/rising-sea-levels-global-threat/

Impacts in developing countries

- https://theconversation.com/seriously-ugly-heres-how-australia-will-look-if-the-world-heats-by-3-c-this-century-157875
- https://wmo.int/news/media-centre/africa-faces-disproportionate-burden-from-climate-change-and-adaptation-costs
- https://www.abc.net.au/news/2020-03-22/ten-year-anniversary-perth-hail-storm-of-2010/12072760
- https://www.cmtedd.act.gov.au/open_government/inform/act_government_media_releases/cheyne/2020/hail-damage-taskforce-wrap-up
- https://www.mckinsey.com/capabilities/sustainability/our-insights/solving-the-climate-finance-equation-for-developing-countries
- https://www.nature.com/articles/s41558-023-01778-2
- https://www.redcross.org.uk/stories/disasters-and-emergencies/world/europe-heatwave-2024
- https://www.un.org/sites/un2.un.org/files/release_ec_report_final_for_web.pdf

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- https://news.un.org/en/story/2023/12/1144617
- https://psci.princeton.edu/tips/2020/11/9/the-future-of-farming-hydroponics
- https://www.aljazeera.com/economy/2024/7/8/in-australia-energy-crunch-prompts-a-heated-debate-on-going-nuclear
- https://www.arcserve.com/blog/what-quantum-encryption-how-does-it-work-and-will-it-save-us-cybercriminals
- https://www.bbc.com/future/article/20240130-wireless-charging-the-roads-where-electric-vehicles-never-need-to-plug-in
- https://www.bbc.com/news/science-environment-34407061
- https://www.bbc.com/travel/article/20241204-could-the-airship-be-the-answer-to-sustainable-air-travel
- https://www.csiro.au/en/news/all/news/2023/august/new-report-maps-australias-emerging-silicon-valleys
- https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage#overview
- https://www.researchgate.net/figure/Hydroponic-averages-compared-with-conventional-soil-yields-Fallovo-et-al-2009-6_tbl2_365573583
- https://www.reuters.com/business/cop/miners-look-carbon-capture-move-beyond-net-zero-andy-home-2021-10-29/
- https://www.sciencedirect.com/topics/engineering/cold-fusion
- https://www.sciencefocus.com/future-technology/future-technology-22-ideas-about-to-change-our-world
- https://www.scientificamerican.com/article/hydrogen-powered-airplanes-face-5-big-challenges/
- https://www.ssab.com/en-gb/fossil-free-steel
- https://www.unesco.org/en/articles/water-crises-threaten-world-peace-report

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- https://universitiesaustralia.edu.au/wp-content/uploads/2022/09/220207-HE-Facts-and-Figures-2022_2.0.pdf
- https://www.abc.net.au/news/2024-08-27/australias-international-student-industry-in-charts/104244340
- https://www.nature.com/articles/d41586-024-03638-1
- https://www.universityrankings.com.au/history-australian-universities /

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