CLIMATE CHANGE SCENARIOS FOR THE AOTEAROA NEW ZEALAND TERTIARY EDUCATION SECTOR
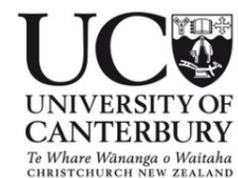
Tertiary Education Sector
Climate Futures Group

Tertiary Education Sector Climate Futures Group

Representatives from the institutions to the right comprise the Tertiary Education Sector Climate Futures Group (TESCFG), which was formed to deliver this project.

The TESCFG acted in the capacity of an advisory group throughout the process of developing this report and will support their respective institutions in future climate planning.

He tuku mihi | Acknowledgements

We would like to firstly mihi to our respective sponsors for their tautoko of this important mahi. By championing this project, we have been able to bring together 12 tertiary education institutions and more than 100 participants to collaborate on what the future may hold for Aotearoa New Zealand's tertiary education sector.

To our expert peer reviewers, we acknowledge the time and commitment that you have shown in support of this project. Your suggestions were instrumental in strengthening this report.

Representatives from the 12 institutions formed an Advisory Group that met regularly to plan for motu-wide workshops, share ideas and knowledge, and provide expert advice on the project. We mihi to them also.

Mihi atu ki a koutou to our project team:
Andrew Wilks (Project Lead), Te Herenga Waka, Victoria University of Wellington
Barry Oglivie (Project Team Member), Te Whare Wānanga o Awanuiārangi
Ray O'Brien (Project Team Member), Te Whare Wānanga o Otāgo, University of Otago
Stacey Broom (Co-writer and Designer), Te Kunenga o Pūrehuroa, Massey University
Melanie Helbick (Project Coordinator), Te Herenga Waka, Victoria University of Wellington

The project team met most weeks over six months to discuss and craft a kete of materials to support tertiary education providers to plan for various climate scenarios. The respectful tikanga underpinning the team's way of working, along with dynamic collaboration, resulted in an enduring momentum to see the project succeed.

Special thanks go to Andrew Jackson for his skills and expertise in facilitating this project. Andrew led engaging workshops that challenged everyone in the room to draw from their own backgrounds and skillsets to connect drivers of change, think long-term, and be creative in imagining possible futures. Andrew also co-wrote the scenarios in this report and much of the supporting material for institutions to use in their own planning.

To the participants who gave their time so enthusiastically during our workshops, your ideas and insights were pivotal in shaping this report.

We also appreciate the guidance and support provided by Jack Bisset and Judy Ryan from the External Reporting Board, particularly as we were developing our approach in the early stages of the project.

We recognise that everyone who has been involved in this project has done so in challenging times and in addition to their business-as-usual work. That so many people have lent their support is a testament to the importance of preparing for whichever scenarios may come to pass.

Sponsors, Advisory Group and Project Team

Te Herenga Waka, Victoria University of Wellington
Sponsor: Reece Moors (Director, Vice Chancellor's Office)
Project Lead (Project Team): Andrew Wilks (Director, Sustainability)
Facilitator/Co-writer (Project Team): Andrew Jackson (Director, Strategic Projects | Independent Contractor)

Te Kunenga ki Pūrehuroa, Massey University
Sponsor: Shelly Turner (Deputy Vice Chancellor University Services)
Advisory Group Member: Dr Allanah Ryan (Associate Director, Sustainability, Policy and Communications)
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Te Whare Wānanga o Awanuiārangi
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Sponsor: Rachel Wetere (Executive Director Strategy)
Project Team Member: Barry Ogilvie (Acting Finance Manager)

Waipapa Taumata Rau, University of Auckland
Sponsor: Simon Neale (Chief Property Officer)
Advisory Group Member: María Baldoni (Associate Director, Sustainable Estate and Operations)

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Sponsor: Megan Skinner (Group Director Strategy & Planning)
Advisory Group Member: Lucy McKenzie (Head of Sustainability)

Te Whare Wānanga o Waikato, Waikato University
Sponsor/Advisory Group Member: Professor Lynda Johnston, (AVC Sustainability)

Te Whare Wānanga o Waitaha, University of Canterbury
Sponsor: Jan Evans-Freeman (PVC Sustainability)
Advisory Group Member: Dr Matt Morris (Sustainability Manager)

Te Whare Wānaka o Aoraki, Lincoln University
Sponsor: Susie Roulston
Advisory Group Member: Patryk Szczerba (Sustainability Co-ordinator)

Te Pūkenga
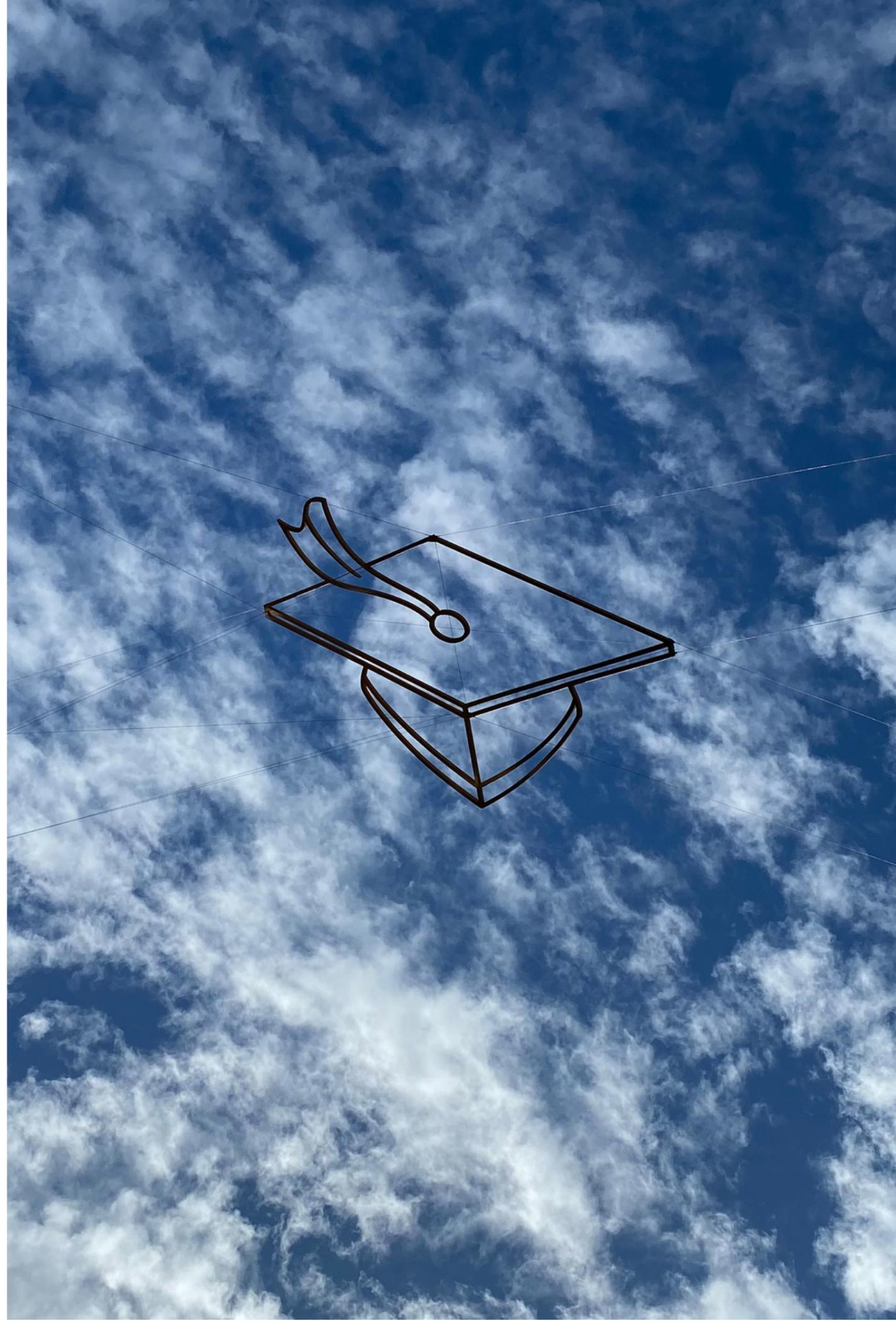Sponsor: Michelle Teirney (Chief Financial Officer)
Advisory Group Member: Dr Ehsan Jacobi (Sustainability Lead)

Te Wānanga o Aotearoa
Sponsor/Advisory Group Member: Shayne Wihongi (Director - Te Karumārama)

Rārangi Upoko | Contents

He whakarāpopotanga | Executive summary

The climate is changing, and the effects are being felt throughout the world. Aotearoa New Zealand's tertiary education sector must continue to champion climate mitigation and a fair and just transition for our communities. The sector must also plan for how it can adapt to the impacts of climate change.

To help the sector prepare, this climate scenarios project is a sector-wide effort to examine the question: **How will climate change impact Aotearoa New Zealand's tertiary education sector between now and 2100?**

It is recognised that the impacts of climate change will be different for each tertiary institution, or even within institutions for those who have campuses in different locations. It was decided, however, that a collaborative approach would provide the sector with a foundation from which to build from when developing their own individual climate plans.

This climate scenarios report is a tool to help each institution with that planning. The scenarios are strategic provocations, rather than predictions. They cover a range of factors and deliberately diverge from business as usual to stretch thinking on how to respond to a variety of plausible futures. More extreme scenarios were considered but, ultimately, the narratives were developed to maintain plausibility and to support effective planning discussions.

The report is the result of a highly collaborative, cross-sector process. The core project team came together from four different institutions. They were guided and supported by both an advisory group of sustainability practitioners and a governance group of senior leaders from across all universities, Te Pūkenga and wānanga.

The insights and ideas used to build the scenarios were sourced from over 100 sector stakeholders (students, staff, iwi, central and local government, business and civil society) who attended workshops across the country. The scenarios have been reviewed by the advisory group for usability and a range of academics from across the country for plausibility.

The uara (core principles) that guided the development and delivery of this project were:
- **Kotahitanga (collaboration)** – all participants in the project worked together for mutually beneficial outcomes.
- **Māramatanga (understanding)** – the project strived to weave together diverse sources of knowledge, including mātauranga Māori, that will provide the most useful insights to enable us to plan for the future.
- **Whanaungatanga (relationships)** – an inclusive approach was adopted to ensure diverse perspectives (specifically including te ao Māori) were welcomed and encouraged.

The climate scenarios have been crafted to be challenging and with the intent to promote discussion. This means that what is described might be intensely personal. By having the difficult conversations now, there is hope that Aotearoa will be prepared for what is to come and that the tertiary education sector will continue to be a vital part of society.

The final section of the report provides a practical framework for institutions to use as part of their climate adaptation planning. Each institution should first adapt and utilise the scenarios in ways that fit their own circumstances.

Recently the External Reporting Board (XRB) established standards to guide the climate-related disclosures of those entities legally required to report.

While the tertiary education sector is not currently required to report, it is still good practice and will prepare the sector for any expansion of legal reporting requirements. As such, this project has been developed with the XRB standards in mind.

The scenarios

Four scenarios have been developed to consider both the physical impact of climate change and the societal response to those impacts.
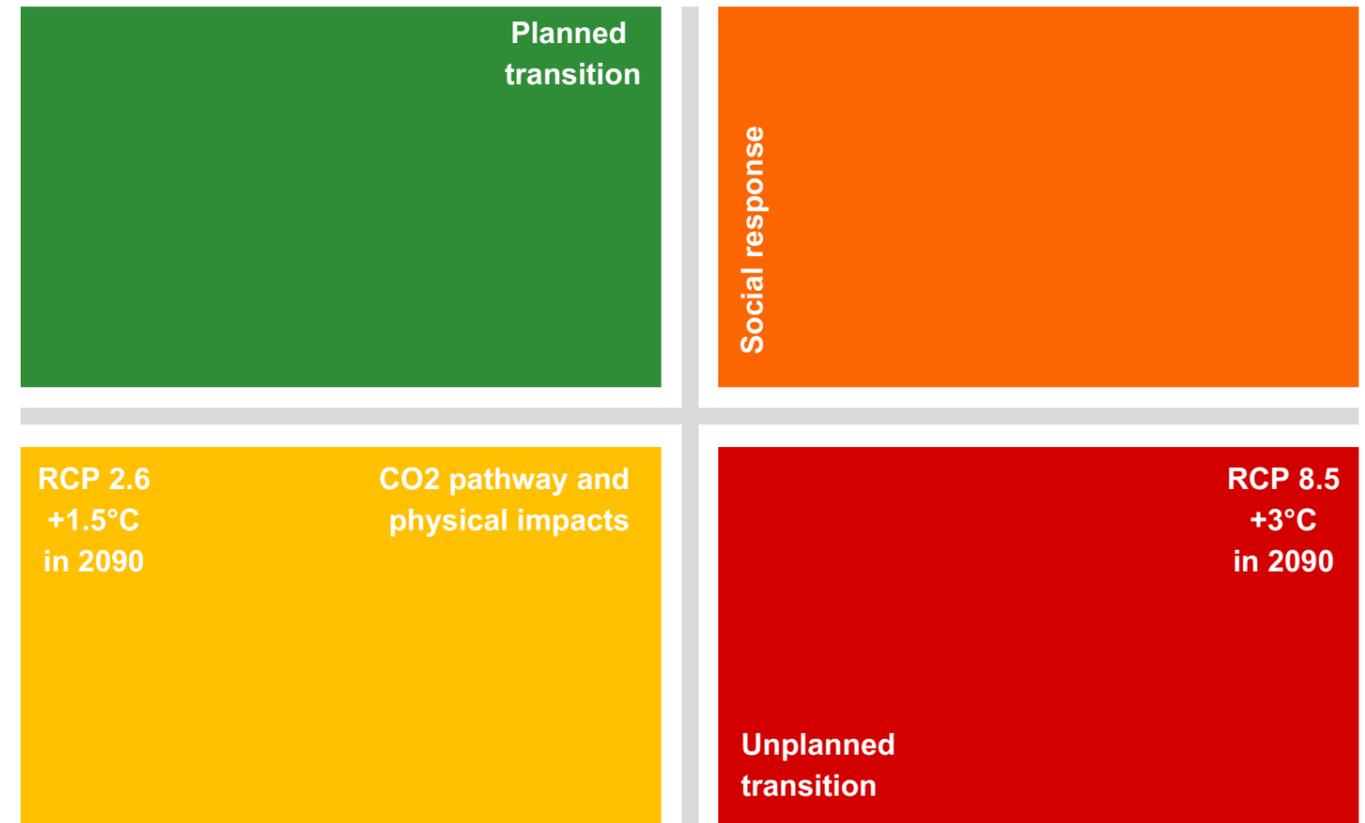
The scenarios which consider a future with **low physical impacts** describe the Aotearoa tertiary sector in a world where global warming has been kept to a minimum. In contrast, the scenarios which consider a future with **high physical impacts** describe the Aotearoa tertiary sector in a world where global warming exceeds three degrees by 2100.

The scenarios which consider a future where there is a **planned societal response** describe the Aotearoa tertiary sector in a world where all parts of society have proactively prepared themselves for the impacts of climate change. In contrast, the scenarios which consider a future where there is an **unplanned societal response** describe the Aotearoa tertiary sector in a world where the impacts of climate change are met reactively and the response lacks coordination.

Each scenario was also described on specific time horizons. In this case, we agreed on key years as 2040 and 2090, which aligns with NIWA's climate change scenarios.

To make the scenarios more relatable and impactful, a series of vignettes have been included. This set of four fictitious characters have been developed by the project team to provide a more personal account of how the scenarios might impact individuals within the sector. They draw from personal experience, but do not depict any real-life individuals.

Scenarios quadrants

Planned transition

Social response

RCP 2.6
+1.5°C
in 2090

CO2 pathway and physical impacts

RCP 8.5
+3°C
in 2090

Unplanned transition

Summaries of the scenarios

Sweet As
RCP 2.6 - Low physical impacts with a planned societal response

Indicator	2040	2090	Indicator	2040	2090
Financial health of the sector	↘	↗	Student numbers:		
Government influence on the sector	→	→	• Total	↗	↗
Public support for the sector	↗	→	• Domestic	→	↗
Innovation and entrepreneurship	↗	↗	• International	↗	→
Student progression to employment	↗	↗	• Māori	→	↗
Location of tertiary learning	H	C	• Pacific Peoples	↗	→

Key: ↗ Upward/Positive trend   ↘ Downward/Negative trend   → Trend maintained
C Campus   H Hybrid   R Remote   L Local

She'll be Right
RCP 2.6 - Low physical impacts with an unplanned societal response

Indicator	2040	2090	Indicator	2040	2090
Financial health of the sector	↘	↘	Student numbers:		
Government influence on the sector	↘	→	• Total	↘	→
Public support for the sector	→	→	• Domestic	→	↘
Innovation and entrepreneurship	↘	↗	• International	↘	↗
Student progression to employment	↗	→	• Māori	↗	→
Location of tertiary learning	H	C	• Pacific Peoples	→	→

Key: ↗ Upward/Positive trend   ↘ Downward/Negative trend   → Trend maintained
C Campus   H Hybrid   R Remote   L Local

Sweet As

2040

There has been strong public support for climate action within Aotearoa. As a result, society has shifted to low-carbon lifestyles.

The tertiary education sector in Aotearoa played a key role in promoting the importance of climate action.

Tertiary education institutes are working collectively to achieve cost-efficiencies, due to tighter funding.

There is also a growth in research centres for climate action, with strong inclusion of mātauranga Māori and connection to the Pacific Islands.

2090

Aotearoa's economy is strong and there has been a boost in government funding for tertiary education. There has also been an increase in student numbers and research investment.

There is a stronger connection between tertiary education, the public sector, and business, which provides a source of talent and a solid career pathway.

Technology development influences changes in teaching practices, but creates cybersecurity risks and eventually leads to a shift back to in-person learning.

She'll be Right

2040

Overall, the economy is weakened and government funding to the tertiary education sector decreases. International student mobility declines, which places further pressure on the sector. As a result of financial pressure, some tertiary institutions are forced to close. Where institutions do remain operational, campuses are downsized.

Teaching is increasingly delivered in regional hubs that also provide opportunities for work-integrated learning. Meanwhile, vocational education is stable.

While there is less government funding for research, there is growing commercialisation of research. Businesses (in particular, Māori businesses) are taking advantage of consumer-driven opportunities in climate action.

2090

There are numerous social challenges across Aotearoa as society reacts to the impacts of adverse weather events. The number of tertiary education institutions continues to shrink, with student numbers being redistributed across those remaining.

Only the best academic staff remain and have attracted international students back in large numbers due to the quality of teaching. This is despite financial pressure resulting in fewer course offerings and larger class sizes.

There is a growing venture capital community associated with each of the remaining tertiary institutes, which is an economic bright spot.

Most research is conducted by Crown research centres.

Summaries of the scenarios

Yeah, Nah
RCP 8.5 - High physical impacts with a planned societal response

Indicator	2040	2090	Indicator	2040	2090
Financial health of the sector	→	↘	Student numbers:		
Government influence on the sector	↗	→	• Total	→	↗
Public support for the sector	↗	→	• Domestic	↘	↗
Innovation and entrepreneurship	↗	↗	• International	↗	↗
Student progression to employment	→	→	• Māori	↗	↗
Location of tertiary learning	H	L	• Pacific Peoples	↗	↗

Key: ↗ Upward/Positive trend ↘ Downward/Negative trend → Trend maintained
C Campus H Hybrid R Remote L Local

2040

Aotearoa is regarded as a safe haven for climate migrants as extreme weather seriously impacts other parts of the world.

There is much greater focus on building resilient infrastructure and planning managed retreat of at-risk communities, including the use of AI for good.

The tertiary education sector becomes a more influential voice in shaping climate adaptation planning for equitable outcomes. Both teaching and research focus much more on climate adaptation, with vocational education being prioritised.

Government funding for tertiary education is constrained, although additional scholarship funding is provided for Māori and Pasifika students.

Mental health of staff and students declines as eco-anxiety becomes more prevalent.

2090

Extreme weather events are causing devastation and large numbers of climate refugees (people who have been forced to leave their homes) arrive in Aotearoa. As migration continues (including climate migration, where people voluntarily choose to move as a result of the effects of climate change), overall student numbers grow.

Aotearoa's cities become much denser, and space is used much more efficiently on tertiary education campuses.

The tertiary sector has become more devolved and integrated with the community. Teaching is done in local communities using applied international research.

Oh Bugger!
RCP 8.5 - High physical impacts with an unplanned societal response

Indicator	2040	2090	Indicator	2040	2090
Financial health of the sector	↘	↘	Student numbers:		
Government influence on the sector	↘	→	• Total	↘	↘
Public support for the sector	↘	→	• Domestic	↘	↘
Innovation and entrepreneurship	↘	↘	• International	↘	↘
Student progression to employment	↘	↗	• Māori	↘	↘
Location of tertiary learning	H	H	• Pacific Peoples	↘	↘

Key: ↗ Upward/Positive trend ↘ Downward/Negative trend → Trend maintained
C Campus H Hybrid R Remote L Local

2040

Extreme weather events are causing infrastructure and food systems to fail, creating challenges for life essentials. As a result, society has become more individualistic, with growing social tensions and inequities.

Tertiary education increasingly is only accessed by the wealthy as fees escalate quickly.

Government funding is drying up and the tertiary education sector is becoming more commercialised. Research funding comes from international corporates and serves offshores interests.

2090

There is wide-spread famine across the world, water shortages and entire nations have had to relocate (including our Pacific neighbours).

Aotearoa's economy is failing, and people are in survival mode.

The tertiary education sector has been privatised and is much smaller, serving only the elite.

The majority who cannot afford the elite institutions can opt for AI education.

Kupu whakataki | Introduction

"Wave of destruction"[1], "misery continues"[2], "caught out again"[3], these were some of the distressing sentiments captured in headlines describing the flooding that battered Tāmaki Makaurau, Auckland and Te Tai Tokerau, Northland in 2023. Climate change is here. There is no denying the devastation that is being brought with it. But we still have time to act, to prepare and to take hold of opportunities.

All sectors in Aotearoa New Zealand are affected by climate change. Engaging in futures thinking, particularly scenarios development, is one way that sectors can prepare for ongoing climate change.

The tertiary sector in Aotearoa and internationally is facing a time of upheaval, with traditional business models challenged by a slew of factors. These include changing demographics, artificial intelligence, and competitive globalised online programmes. There are also shifts in the perceptions of tertiary education as skillsets and competencies that are needed in society change.

Alongside these challenges, Aotearoa's tertiary sector[4] must respond to climate change signals and adapt each institution to create opportunities to achieve our climate change commitments.

Indeed, there is an opportunity for the sector to show leadership through its statutory commitment as a repository of knowledge and expertise and its statutory role as critic and conscience of society (Education and Training Act 202, Section 268). Our adaptation planning needs to consider physical and transition risks and the opportunities that may arise.

The report that follows brings together insights from, and outputs of, a collective project aimed at gathering possible drivers of change influenced by climate change that will impact on the tertiary sector. Those drivers were then used to develop plausible future scenarios for the Aotearoa tertiary education sector.

Throughout this project, sustainability experts, academics, students, public servants, and others workshopped four climate scenarios. The narratives created around the scenarios provide a flexible framework for tertiary education providers to build on to ensure their climate change planning is consistent across the sector, while also adaptable to their own needs.

While it is important that we consider what will advance the individual needs of our institutions, by working together we raise the chances our efforts will endure for Aotearoa's tertiary education community of 2040, 2090 and beyond.

> In addition to this report, a kete of materials will be made available to institutions to support them in using the scenarios in their own planning.

What are scenarios and why use them?

Scenarios are not a tool for predicting the future, but they can allow us to plan for diverse and complex situations, rather than simply react.

" [A scenario] is: a tool for ordering one's perceptions about alternative future environments in which one's decisions might be played out. Alternatively: a set of organized ways for us to dream effectively about our own future. [5] "

" Scenarios are not predictions. It is simply not possible to predict the future with certainty…Rather, scenarios are vehicles for helping people learn. Unlike traditional business forecasting or market research, they present alternative images of the future; they do not merely extrapolate the trends of the present.[6] "

Developing scenarios allows us to think creatively about the future without the constraints of what would likely follow if we continue on our current trajectory. By imagining plausible scenarios for Aotearoa New Zealand's tertiary education sector within the framework of climate projections, we can guide strategic planning now to address future challenges and to realise potential opportunities.

Scenarios are…

Plausible futures

Internally consistent narratives

Tools for creative exploration

Scenarios should be plausible, internally consistent and explorations of future possibilities. They are not predictions of the future or our preference of what we want the future to be like. There are various uses for scenarios, including identifying risks and opportunities, testing the robustness of policies, and developing a shared understanding of the choices we face.

Having a diverse set of plausible future scenarios allows us to test our strategic thinking alongside planning, forecasting and likelihood. Other sectors across Aotearoa have already commenced this work, including construction, tourism, and insurance.
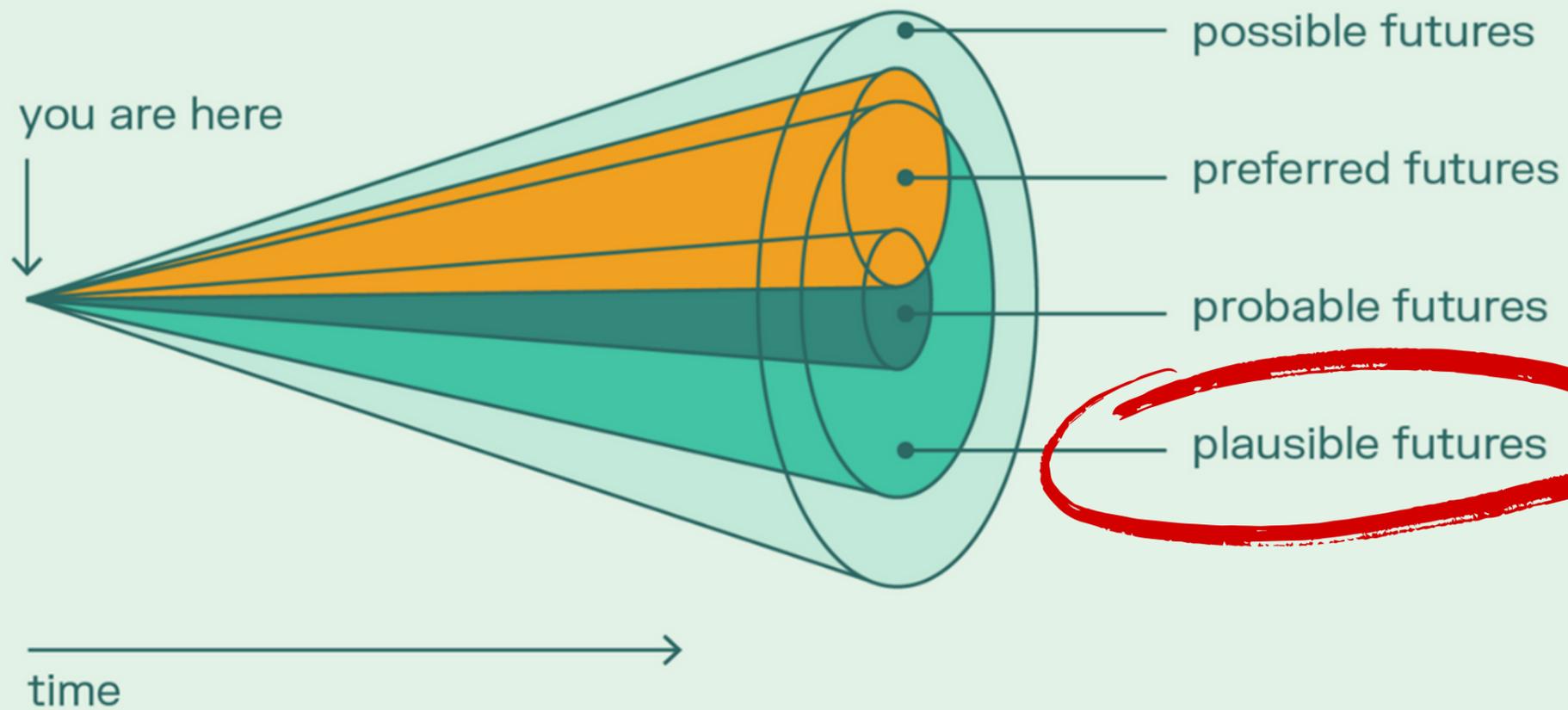
Scenarios are not...
predictions of the future

One way to think about the future is through the cone of possibilities. The scenarios outlined in this report are plausible futures with internally consistent narratives. The scenarios do not describe the most likely future or desired future states.

The narratives have been written in ways that are deliberately provocative. Debating the scenarios is encouraged; however, the debate should centre around which parts of the scenarios apply to your organisation and how best to mitigate or adapt to what is proposed. The debate is not about how probable the scenarios are or which is likely to make the most accurate predictions.

The scenarios are a tool to help institutions to identify risks and opportunities and test the effectiveness of their planned climate adaptation actions.

The Cone of Possibilities

you are here

possible futures

preferred futures

probable futures

plausible futures

time

http://www.delve.com/insights/speculative-design-and-a-cone-of-possibilities

Why now?

Aotearoa New Zealand is projected to be significantly affected by climate change even within the next decade

The effects of climate change are happening already; so from an environmental standpoint, it is clear we need to intensify our actions.

The projected temperature changes for Aotearoa show temperature scenarios ranging from a 0.7°C to 3.7°C increase (relative to the 1986-2005 period), which will result in profound changes in the more moderate scenarios, to catastrophic in the most extreme.

Projected temperatures within Aotearoa were determined by downscaling the results of the IPCC Fifth Assessment global climate models.

The projections show the potential temperature increase under the Representative Concentration Pathways (RCPs)[7] :
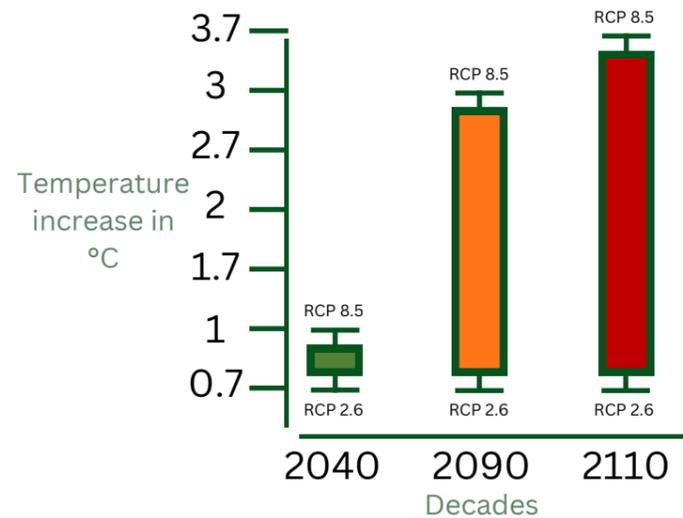
According to Manatū Mō Te Taiao | Ministry for the Environment, the most significant climate change risks for Aotearoa are:

- Risks to coastal ecosystems and indigenous ecosystems and species
- Risks to social cohesion and community wellbeing and exacerbation of existing inequities

- Risks to governments from economic costs and financial system instability
- Risks to potable water supplies and to buildings
- Risk of maladaptation across all domains and institutional arrangements that are not fit for adaptation.[8]

The impacts of these risks will depend on how prepared Aotearoa is and how planned responses can be.

Even under RCP 2.6, it will be necessary not only to reduce anthropogenic greenhouse gas emissions (referred to as carbon emissions in this report), but also to take carbon out of the atmosphere, with the peak being around 2070 and getting better from there. This alone is an impetus for us to halve emissions this decade, and in so doing, provide an exemplar of action globally.

It is prudent, therefore, to also seriously consider how society might respond to climate change impacts over the rest of the century.

Legislative requirements

In light of the mounting environmental evidence, Aotearoa has become a world leader in passing legislation requiring large listed companies and financial institutions to produce climate-related risk disclosures. The External Reporting Board (XRB) has established reporting standards, with the following objective:

66 In providing a consistent framework for entities to consider the *climate-related* risks and *climate-related opportunities* that climate change presents for their activities over the short, medium and long term, the objective of this Standard is to enable primary users to assess the merits of how entities are considering those risks and opportunities, and then make decisions based on these assessments.

The ultimate aim of *Aotearoa New Zealand Climate Standards* is to support the allocation of capital towards activities that are consistent with a transition to a low-emissions, climate-resilient future.[9] 99

To comply with the Standard, scenario analysis must be undertaken. As such:

66An entity must describe the scenario analysis it has undertaken to help identify its climate-related risks and opportunities and better understand the resilience of its business model and strategy. This must include a description of how an entity has analysed, at a minimum, a 1.5 degrees Celsius climate-related scenario, a 3 degrees Celsius or greater climate-related scenario, and a third climate-related scenario.[10]99

Tertiary education providers are not currently required to report against the Standard but can do so voluntarily. This Climate Change Scenarios report is prepared with the expectation that institutions will soon need to comply with the Standard. The report will help guide each institution with their individual climate adaptation planning.

While the current project aligns with the XRB's reporting Standard, it has been tailored to the tertiary education sector with agreement from the XRB.

Aotearoa New Zealand's tertiary education sector

2022 data

Sources: Tertiary Education Commission (https://www.tec.govt.nz/) and Education Counts (https://www.educationcounts.govt.nz/)

3
Wānanga

1
Institute of Skills and Technology*

8
Universities

*Te Pūkenga was the Institute of Skills and Technology at the time this report was developed.

700+

Tertiary education organisations (TEOs), including 212 Private Training Establishments (TEC funded)

378,000
Total enrolments
344,000 domestic
34,000 international

121,000
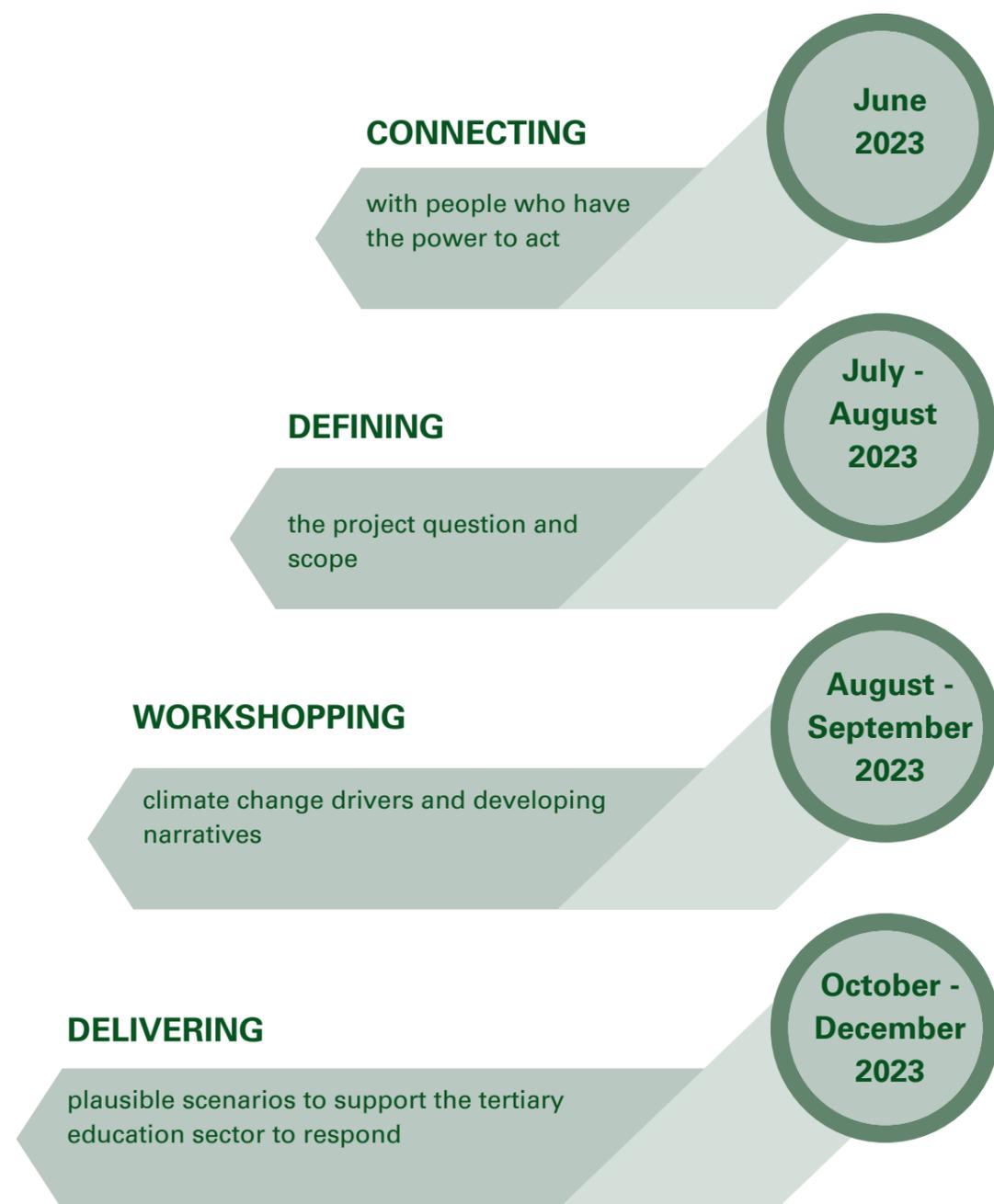**Completed qualifications**
109,000 domestic
12,000 international

$3.68b
Tertiary Investment Funding through TEC
(Investment in tertiary education and supporting the tertiary education and careers systems)

Tertiary education scenario development process

CONNECTING

with people who have the power to act

June 2023

DEFINING

the project question and scope

July - August 2023

WORKSHOPPING

climate change drivers and developing narratives

August - September 2023

DELIVERING

plausible scenarios to support the tertiary education sector to respond

October - December 2023

From January 2024, institutions will consider how to respond to the scenarios and make any necessary changes to their governance, strategy, management and reporting practices.

Connecting:

At the outset of this project, we connected with people with the power to act within tertiary education providers. By connecting early, we were able to secure support from all universities, wānanga, and Te Pūkenga. Most contributing institutions have a senior level Sponsor, an Advisory Group member, and for some, Project Team members.

Defining:

During this stage, we firstly agreed on the question the project would focus on.

> **How will climate change impact Aotearoa New Zealand's tertiary education sector between now and 2100?**

The project is not focused on each tertiary provider, but rather the context around the impacts for the sector. The scenarios are designed to feed into each provider's climate strategic planning processes, so they can produce their own climate-related disclosures. Furthermore, the scenarios may be used for mitigation as well as adaptation planning.

Internationally, much of the climate adaptation planning has been led by the private sector with the Taskforce for Climate-related Financial Disclosures (TCFD)[12] establishing a well-respected framework for assessing and reporting climate risks and opportunities.

Aotearoa has since become a world leader by passing legislation requiring large listed companies and financial institutions to produce climate-related disclosures, with the External Reporting Board (XRB) establishing the reporting standards. Currently, tertiary providers are not required to report; therefore, participation in this project was voluntary.

The framework selected by the XRB is centred around scenario development. While other sectors have developed scenarios on the two axes of Physical Impacts and Transitionary Risk, in consultation with XRB, we replaced the Transitionary Risk axis with the Societal Response. Framing the axis as Societal Response enabled both risks and opportunities to be considered. The scale of the Societal Response axis ranged from planned to unplanned, which is similar to the orderly - disorderly transition terminology used by XRB.

However, a scenario for an 'orderly transition' to a world with runaway climate change seemed inherently implausible; so, instead it was framed as 'planned' to 'unplanned'. The degree of planning focuses on society's climate adaptation measures (less on climate change mitigation measures, which have more of an influence on the physical impacts axis).

The degree of planning for climate adaptation, or lack thereof, is considered at all levels of society around the globe – covering intergovernmental organisations, central and local government, civil society, businesses, iwi, community groups and households.

Each scenario was also described on specific time horizons. In this case, we agreed key years as 2040 and 2090, which aligns with NIWA's climate change scenarios.[13]

This also aligns with the XRB guidance. While we are not currently required to adhere to this guidance; we agreed there was value in doing so.

The uara (core principles) that guided the development and delivery of this project were:

- **Kotahitanga (collaboration)** – all participants in the project worked together for mutually beneficial outcomes.
- **Māramatanga (understanding)** – the project strived to weave together diverse sources of knowledge, including mātauranga Māori, that will provide the most useful insights to enable us to plan for the future.
- **Whanaungatanga (relationships)** – an inclusive approach was adopted to ensure diverse perspectives (specifically including te ao Māori) were welcomed and encouraged.

Workshopping

During this project, we ran two workshops with participants from various backgrounds. Over 100 participants attended the workshops, which were run locally in both the North and South Islands. We used a regionally hybrid model with groups convening concurrently and connecting remotely.

The workshops were facilitated by Andrew Jackson, an expert in strategy and foresight, with extensive public policy experience.

Participants were selected for their diversity in terms of expertise, geography, representation, and ethnicity where that was known.

During the first workshop, the participants developed lists of drivers of change that might affect the tertiary sector and the interactions between them. Participants then examined how those drivers might impact on the tertiary education sector.

In the second workshop, the participants focused on creating narratives for each of the scenarios.

The workshops were a critical feature in the development of the scenarios. The content of each scenario has been drawn from material developed at each workshop and is reflective of the broad range of perspectives and expertise of the participants, using a Participative Futures Design approach. Additional subject-matter experts have been consulted to provide some sense checking for the scenarios, but the material for the scenarios has primarily been generated by sector stakeholders.

Delivering

Our scenarios have been created with the assumption that under RCP 2.6 there will be a temperature increase of 1.5°C by 2090 and 3°C for RCP 8.5.[14] With that in mind, we looked at the physical impacts and societal response within a planned or unplanned transition.

We set the scene for each scenario by summarising the global and local context, before moving into plausible future states in the Aotearoa tertiary education sector, focusing specifically on the general context, researching, and teaching.
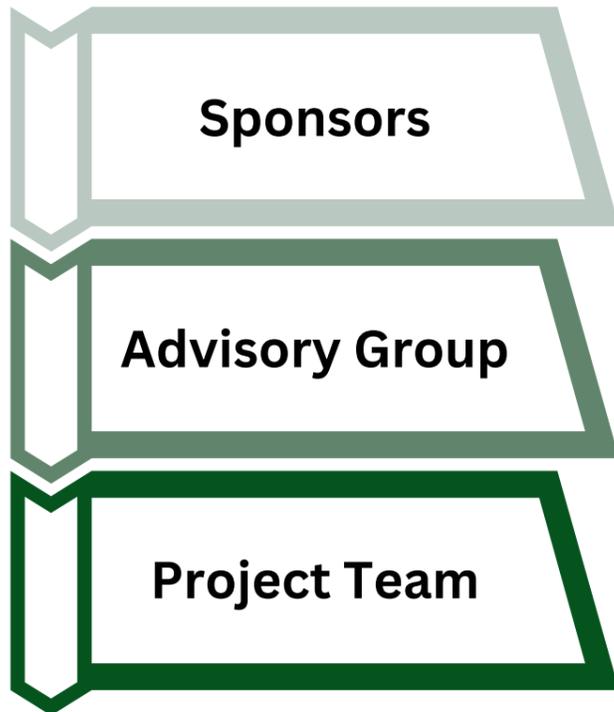
This report outlines four scenarios based on the following axes:
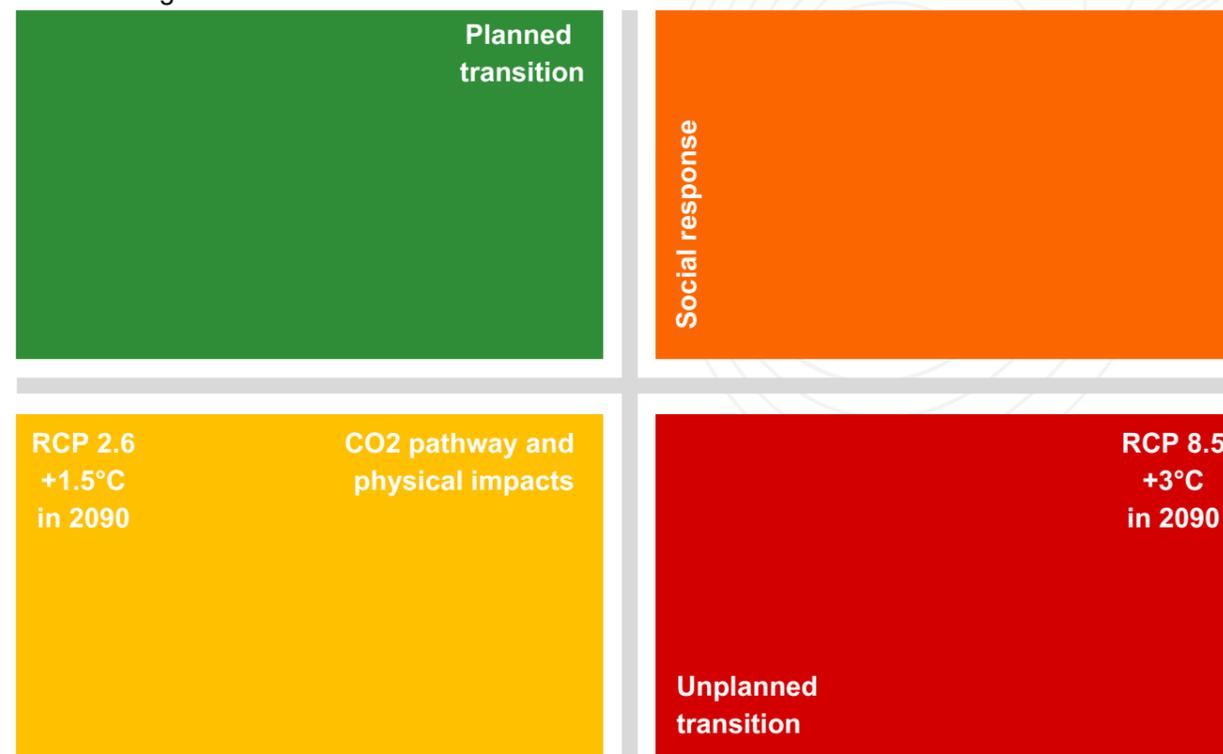
The scenarios have been developed to intentionally stretch thinking beyond the status quo in imagining a plausible future. While the scenarios draw on ideas from experts and reference materials, no one knows what the future holds. Developing the scenarios, involved challenging discussions about how extreme to make them, while remaining plausible. For these scenarios to be of most benefit, they should provoke thought and discussion amongst the institutions using them.

To make the scenarios more relatable and impactful a series of vignettes have been included. This set of four fictitious characters have been developed by the project team to provide a more personal account of how the scenarios might impact individuals within the sector. They draw from personal experience, but do not depict any real-life individuals.

Planned transition	
	Social response
RCP 2.6 **CO2 pathway and** **+1.5°C** **physical impacts** **in 2090**	**RCP 8.5** **+3°C** **in 2090**
Unplanned transition	

Project governance

Sponsors

Advisory Group

Project Team

The project was governed by sponsors from 11 of the participating institutions (all universities, Te Pūkenga, Te Whare Wānanga o Awanuiārangi, and Te Wānanga o Aotearoa).

The core responsibility of the sponsors was to endorse the project question and material drivers to ensure the greatest value outputs. They championed the project to ensure engagement, resources and impact, and held the project delivery team to account.

Advisory Group members were representatives from each of the participating institutions who met at several stages throughout the project to provide advice.

They also provided venues for the regional workshops, liaised with the sponsors at their respective institutions, and ensured the right people were consulted and informed.

Responsibility for project planning, communication across the group, holding the workshops, and writing the final report was the remit of the Project Team.

Within the Project Team, the Project Lead was responsible for management of the team and delivering the full scope of the project on time, to quality, and within budget. The Project Facilitator was the in-house expert in futures work and scenario development and was responsible for developing the process and leading the workshops, while connecting the project to other relevant networks.

External participants were invited to participate in workshops to provide expertise and a broader range of perspectives to ensure the decision-making in the scenario development was robust and comprehensive.

Whiriwhiri-ā-rōpū 1
Workshop 1

During the first workshop, we explored four aspects of the tertiary system and the core drivers affecting them.

These four aspects are not intended to represent a definitive list of the most important aspects of the tertiary education sector, but rather a set of key characteristics through which to view a complex and interconnected system.
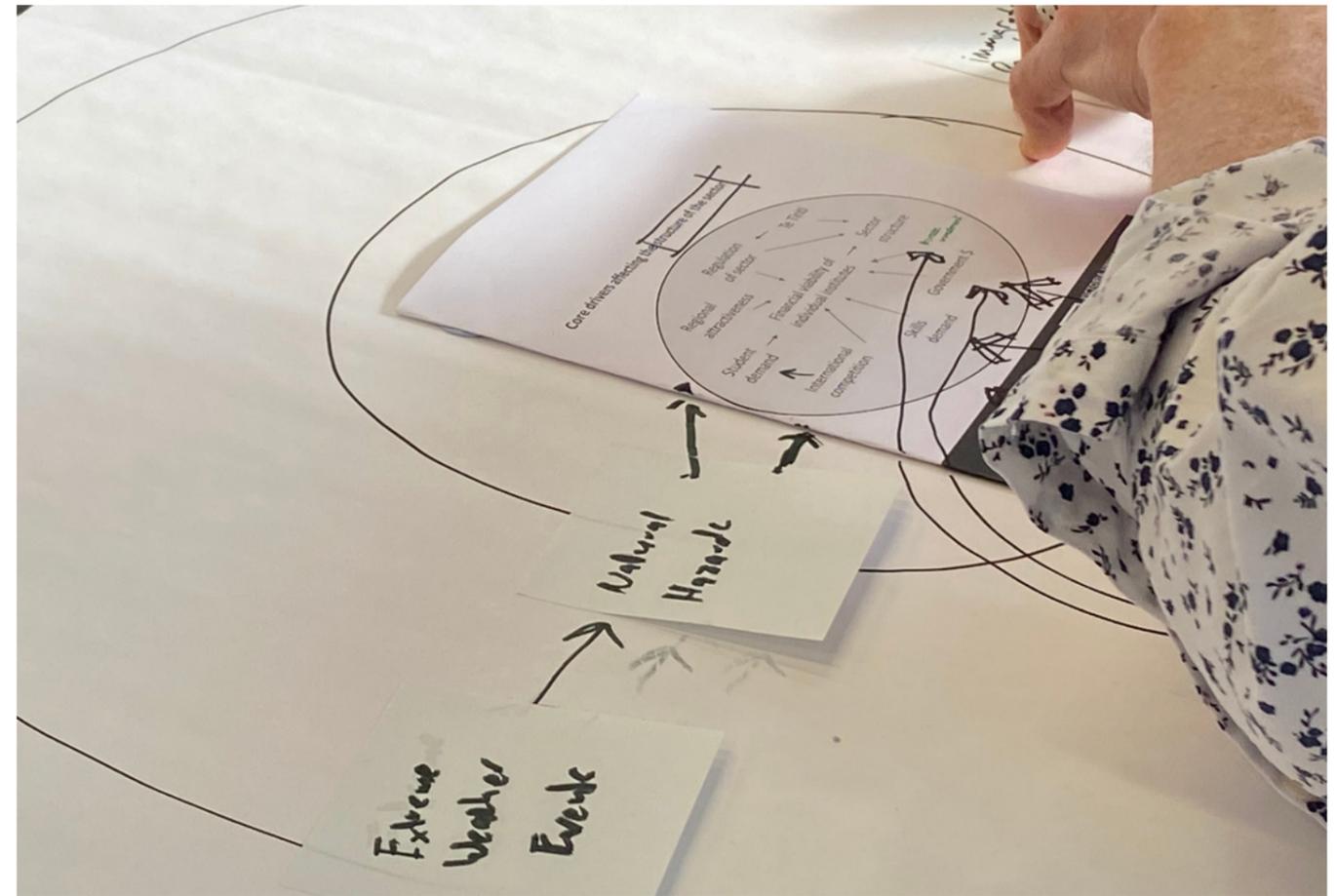
The four aspects were:

- Student numbers
- Form of learning
- Structure of the sector
- Role of the sector

Participants worked together to list core drivers of change that might affect the tertiary education sector and created diagrams that investigated the links between climate change, its primary impacts, and the core drivers.

From the diagrams created, the Working Group was able to collate and synthesise the information gathered to form a picture of climate-related system impacts (see Appendix One).

The core drivers[15] that participants identified were as follows (with political being the most mentioned and primary sector the least):

Political

Social

AI

Financial

Migration

Changing patterns of demand (e.g., skills, workforce, career mobility)

Evolving nature of tertiary education (independent of climate change)

Severe weather events (including infrastructure impacts)

Energy

Ageing

Remote work/study

Technological advances

Digitisation and data sovereignty

Travel

Pandemic

Mental health

Research and development

Primary sector

From most mentioned

To least mentioned

Images captured from Workshop 1

Whiriwhiri-ā-rōpū 2
Workshop 2

The second workshop focused on developing the scenarios. As such, participants were divided into groups to work through the four quadrants that became our scenarios: RCP 2.6 planned (Sweet As) and unplanned (Yeah, Nah) and RCP 8.5 planned (She'll be Right) and unplanned (Oh Bugger!).

Participants were asked to consider what might happen between now and 2040 and then between 2040 and 2090, e.g., megatrends around the world, demographics, economic growth, and investment in a sustainable future. They were also asked to explore what we would be seeing in the tertiary sector in the years 2040 and 2090.

After the workshop, the Project Team synthesised the many scenarios from across the different workshop locations. This process of synthesising did not seek to capture all of the trends and characteristics described, but rather to craft a set of scenarios informed by the workshops, which provided plausible and diverse futures.

Images captured from Workshop 2

Scenarios

Section contents:

Scenarios on a page

Scenario one - Sweet As

RCP 2.6: 1.5 degrees warming with low physical impacts and a planned social response

Scenario two - She'll be Right

RCP 2.6: 1.5 degrees warming with low physical impacts and an unplanned social response

Scenario three - Yeah, Nah

RCP 8.5: 3 degrees warming with high physical impacts and a planned social response

Scenario four - Oh Bugger!

RCP 8.5: 3 degrees warming with high physical impacts and an unplanned social response

Scenarios on a page

Sweet As
RCP 2.6 - Low physical impacts with a planned societal response

Yeah, Nah
RCP 8.5 - High physical impacts with a planned societal response

Planned transition

One contiguous tertiary system designed to meet climate skills and research needs.

Roles of tertiary institutions: Education, applied research, social conscience.

Societal response

Distributed tertiary providers.

Research and training meeting community needs.

Roles of tertiary institutions: Knowledge transfer and social conscience.

RCP 2.6
+1.5°C
in 2090

RCP 8.5
+3°C
in 2090

CO2 pathway and physical impacts

Fewer tertiary providers with a mixed controlled and competitive model.

Roles of tertiary institutions: Education and blue skies research.

AI educators based on best overseas teaching.

Small, niche, private education providers and applied research.

Roles of tertiary institutions: Enterprise and catering to the elite.

Unplanned transition

She'll be Right
RCP 2.6 - Low physical impacts with an unplanned societal response

Oh Bugger!
RCP 8.5 - High physical impacts with an unplanned societal response

Scenario 1 - Sweet As

RCP 2.6: 1.5 degrees warming with low physical impacts and a planned social response

Indicator	2040	2090	Indicator	2040	2090
Financial health of the sector	↘	↗	Student numbers:		
Government influence on the sector	→	→	• Total	↗	↗
Public support for the sector	↗	→	• Domestic	→	↗
Innovation and entrepreneurship	↗	↗	• International	↗	→
Student progression to employment	↗	↗	• Māori	→	↗
Location of tertiary learning	H	C	• Pacific Peoples	↗	→

Key: ↗ Upward/Positive trend ↘ Downward/Negative trend → Trend maintained
C Campus H Hybrid R Remote L Local

Local and global context: 2025-2040

Environmental impacts
Despite international efforts to minimise carbon, global warming hits 1.5°C in 2035. This temperature rise brings with it more frequent severe weather events across the world and highlights the need to invest equally in adaptation and mitigation. With this investment, there is every hope that we can stay on a pathway that will keep global warming below 2°C.

In Aotearoa, by the early 2030s, there are regular coastal and fluvial flood events leading to an active programme of flood management. The nation has been mapped for critical assets at risk of flooding. A decade-long programme of investment in defence to protect critical assets is started.

Invasive species are having a worldwide negative effect, with some estimating that the worldwide cost of this challenge will reach $1 trillion by 2040.

There is strong social support for investment in the protection of Aotearoa's biodiversity and aquaculture.

Social response
There are societal moves away from using and disposing towards a circular economy. The younger generations are favouring second-hand clothes and other items to new and are beginning to shun fast fashion in higher numbers due to their labour practices and environmental impacts.

In Aotearoa, there has been a push toward using more sustainable methods of transport. Although there has been much investment in roading, more New Zealanders are advocating for options like rail and light rail for more convenient connections between and within cities.

With Aotearoa's primary industries hit hard by changes during the 2030s, New Zealanders' food consumption has changed. Milk and cheese are luxury items and red meat is eaten less as the population adapts to what is available and affordable.

The circular economy is not only affecting what people buy, but also what is being built. Designs for new homes, buildings, and towns are including far more sustainable characteristics, such as local crops to serve the town's population.

All new builds are also being designed to meet future climate needs, such as more shade, better thermal insulation, passive heating and cooling, and additional drainage. Housing, in particular, is being built in areas that are not prone to flooding.

Immigration has increased as Aotearoa is seen to be preparing well for its future, with community-based lifestyles that are regarded as aspirational by the younger generations and embrace a much broader mix of ethnicities and faiths.

Economic outlook and political situation
Aotearoa is achieving 100% renewable electricity generation in most years through a combination of investment and society adopting less energy intensive lifestyles, along with notable reductions in carbon-heavy transport and industry.

Achieving these goals has been a costly investment, but there was social support for the higher levels of tax to invest now for a more certain and safer future.

Government has developed an intergenerational fund for climate change, financed by a new tax. The money is invested in a range of programmes – flood defence, compensation towards the costs of managed retreat where it is the primary place of residence, support for biodiversity and research, and trials in crops that suit the changing climatic conditions.

There was initially push back against providing compensation to those having to surrender their properties to higher sea levels, until the decision was taken to restrict this to primary residences.

Some decide to stay, hoping that their part of the coast will not be the next part flooded in what is becoming almost an annual challenge somewhere along Aotearoa's coastline.

The government foresaw the challenges to the primary industries that came to pass in the 2030s, and so worked closely with the primary sector to support changes to the way we farm.

Government retraining programmes minimised impacts on employment and saw people able to retrain and move into new and emerging areas of sustainable local food production.

Emerging technology and innovation
By the late 2030s, Aotearoa's food industries had transitioned to cereals, vegetables and fruit.

Other land is being used to produce renewable materials for buildings and furniture with flax plains now being grown for its use in insulation.[16]

Regenerative agriculture is becoming common practice. Large areas of farmland have changed from dairy or sheep and beef to the production of trees, cereals, fruit and vegetable. There is a boom in oat production on the Canterbury plains.

There has been much greater use of solar PV (solar cells) in micro-grids, and, in turn, greater distribution of electricity generation across the country. This increase has led to more resilience in the electricity network. Price incentives and network controls mean that more electricity consumption has been shifted to off-peak times, minimising the need for new generation.

Cities have invested in public transport systems to support the campaign to reduce car dependence and public transport is being promoted as the first choice for local travel. Nationally, there has been a push for rail rather than roads, and investment and development continue.

Alex, Facilities Manager at an Otago Polytechnic in 2033

I've been working at a Polytech in Otago for 15 years. My job is changing very quickly. When I first started it was just a matter of keeping the buildings up and running, so that there was no disruption to learning. Now I'm trying to balance that with reducing the emissions from heating and cooling the building and dealing with more regular storm damage to some of our older properties.

I've had to get more training and was lucky be a student of a pilot programme for project management specialising in climate adaptation. I can see all the young tradies are now developing these skills right from the start of their apprenticeships. That gives me a fair bit of hope for the future.

Tertiary sector 2040

Tertiary context:

The tertiary sector played a key role in driving social and economic change, especially in providing practical solutions to reduce carbon and options for adapting to climate change. Society recognised the importance of the contributions being made by tertiary providers and strongly supported a larger role for the sector in helping Aotearoa navigate its way through the challenges ahead.

Resources remain tight, with the focus on delivering an effective and just transition to a low carbon society and a nation that is well-prepared to adjust to future climate events.

Efficiency was critical as financial belts were tightened in all sectors to deal with the rising costs of mitigation and adaptation. A new performance measure was expected to be reported on relating to achieving a more efficient sector. This measure required providers to work together to design a future that would ensure the sector's continued contribution to social debate, education and research.

Research
Additional investment was made in research to provide the capabilities needed in key areas of climate adaptation. This included the protection of Aotearoa's native flora and fauna, growing and using crops that better suit our emerging climate, dealing with invasive pests, hydraulic engineering to work with coastal formations to protect critical areas at risk, and using carbon capture technology.

Research Centres have been established in priority areas bringing together the capabilities of the Crown Research Institutes with the regional tertiary education centres producing thriving centres of innovation. This, in turn, has created exciting education and work opportunities in each of the regions that are connected to research innovation around the world.

The Research Centres are well-connected with researchers in various Pacific Island nations and regularly collaborate on projects aiming to increase resilience and support local low carbon economies.

Outputs from Research Centres are informed by mātauranga Māori and researchers carry out their work in ways that are aligned to tikanga Māori and with a view to intergenerational impacts.[17]

Teaching
Government funding for education is lower than previous decades, largely due to funding being funnelled into other areas, such as the response to the regular flooding of the 2030s and the National Flood Management Programme.

There was growth in school leavers in the 2020s, but because the birth rate in Aotearoa slowed, 30,000 fewer primary and secondary school students resulted in a smaller pool of domestic tertiary students by the 2040s.

In response to the economic challenges, the tertiary sector has moved away from a competitive model and is working together to respond to the education needs for the future. There are now more regional centres of tertiary education, which allow individuals to select from a range of vocational and academic qualifications in their region. Students study at their closest centre, with nearly all qualifications offered in each of the regions. Exchange mechanisms are in place where students do need to study specialist subjects in other regions.

The range and types of qualifications have increased and span from two-year intensive degrees to staggered qualifications that can be built up over five to seven years for those who need to work at the same time as studying.

All courses are closely connected to work or community experience – ensuring that all get the chance to improve their interpersonal skills at the same time as developing technical skills.

Funding for these programmes has been ringfenced as part of tax takes, to incentivise teaching and learning in these areas.

The material for courses is developed by centralised capability to ensure consistent high quality teaching material and those teaching are chosen for their excellence in teaching. This has led to a separation between academics who focus on research and those who focus on teaching, particularly those who are teaching programmes supported by public funding.

To ensure resilience, the teaching material is captured digitally, to allow ongoing education even if an event occurs that has a temporary impact on the ability of students to attend their local tertiary institution. Due to frequent disruption from extreme weather events, assessment is more frequently through portfolio of evidence compiled over a flexible timeframe.

While funding is tight, money is prioritised to encourage the tertiary sector to include environmental awareness in the curriculum for all students, with te ao Māori perspectives and mātauranga Māori as the foundation for more courses. There is close co-operation between the government and businesses to understand the skill needs for the future to respond to climate challenges. Pathways are created through scholarships and taster courses to attract and retain students in those areas.

Local and global context: 2040-2090

Environmental impacts
Sea levels have risen by 30cms (compared to 1900) by the start of this period and, even though the world is firmly on target to achieve the carbon goals included in the Paris Agreement, sea level rise is almost certain to reach a peak of 50cms by the end of the century.

This has put about $50 billion of physical assets (buildings and transport infrastructure) and more than 20,000 people at risk of coastal flood events.

Investments in the 2030s and 2040s are proving effective in managing the risks to the critical transport infrastructure. However, more of the individuals who owned properties by the sea – who hoped they would not be affected – have abandoned their properties.

Aotearoa is well-prepared for the steady flow of people leaving their residences, with marae and community centres commonly being offered to temporarily accommodate displaced people. This is supported by the Government Relocation Fund, which was established in the late 2030s.

Social response
The social changes in this time period reflect social values – where consumerism has been replaced by the circular economy and a culture of reuse. Suppliers have responded to the demands of their customers and are now making products to last and second-hand outlets are much more common.

Society has moved toward connecting with each other more traditionally (as opposed to online), valuing investing in the health of the land, and sharing knowledge over possessions.

AI and humanoid robots have had a significant impact on the number of people in physically demanding roles with many people redeployed to more technical roles.

People live longer and healthier lives and there is a resurgence in the Arts.

Economic outlook and political situation
Aotearoa has had a range of successes in its investments to respond to climate change in two areas – carbon capture and protecting biodiversity.

There is a growing international market as other countries wish to buy carbon credits from Aotearoa in the 2040s.[18]

In the 2050s, Aotearoa is a leader in exporting its carbon capture technologies to the rest of the world. Using the technologies to produce compost boosters and building materials, rather than simply pumping it for storage underground has given it the edge over its competitors.

Innovators looking for more ways to reuse and repair have led to creative solutions for some of the problems faced by Aotearoa in the 2030s. One of these innovations is the use of the driers that were previously used to convert milk into milk powder now being an important part of the process to prepare flax for use in low carbon buildings.

Reformation of the primary industries, together with the careful curation of flora and fauna, has also led to Aotearoa as being recognised as a world leader in climate change preparation and adaptation. One of the exciting examples of innovation has been the use of seaweed as a carbon capture and marine restoration technique with significant areas of the coast dedicated to reserves for this purpose.

There has been recognition among important global market segments that food and beverages from Aotearoa have strong sustainability credentials that consumers value, resulting in a premium for Aotearoa food and beverage exports. Iwi enterprises are leaders in taking advantage of these premiums, based on market perceptions of their strong stewardship for the land.

Emerging technology and innovation
Building materials are sustainable with increasing use of renewably sourced natural hardwoods from the 2070s onward – together with flax-based insulation.

Alongside this, Aotearoa is seen by international companies as an appropriate place to trial some of the emerging green technologies, with the use of robots to rapidly build sustainable dwellings and investments in self-repairing infrastructure, which can quickly restore services if affected by a climate event.[19]

Initial trials are in place with materials that can self-repair small cracks in buildings created by use over time or during events such as earthquakes or storm events. Small, sealed capsules containing bacteria are included in the materials. When exposed to water in a crack the bacteria are released dissolving and then sealing the cracks.[20]
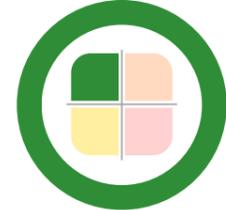
Kahu, Māori student at a Whakatane Wānanga in 2050

Ko Kahu toku ingoa, nō Te Tai Tokerau ahau. E noho ana au i Whakatāne, nā rēira, he tauira ahau nō tetahi Whare Wānanga.
I grew up in Te Tai Tokerau, before moving to Auckland meeting my partner who is from Ngāti Awa. We eventually decided to move to Whakatāne to look after my in-laws and be closer to the wider whānau.

After being here for a while, I decided I wanted to upskill and so I enrolled at the local Wānanga, which educates kaimahi (staff) for the regional energy generator. A couple of my partner's whanaunga (extended family) are tauira (learners) as well, and I have enjoyed hearing more about their tīpuna (ancestors) in the application of the course mātauranga (knowledge). With Ōhinemataroa on one side and the moana (ocean) on the other, living and learning in Whakatāne has made our connection to the taiao (environment) and the impact we can make really clear.

As my partner is caring for ona matua (parents), keeping them safe and well, with access to their hau kāinga and marae, is important. It is different now with more flood embankments and coastal walls to protect homes and the town against flooding and tides. The land they grew up on is different to the land their mokopuna (grandchildren) do. They still have a māra kai (vege garden).

Although it is a journey, I do get back to my marae and whānau in Te Tai Tokerau every couple of months to stay connected.

Shannon, mid-career academic at a Wellington University in 2072

I fell in love with Aotearoa when I visited in my early twenties. The people were so friendly, and I was amazed at how Māori culture was so prominent, particularly when it came to guiding Aotearoa's climate response. Without it, I don't know if we would have achieved the same global recognition for our just transition. So, a few years later when the opportunity to become a Research Fellow at the Centre for Social Movements came up, I jumped at it.

I'm proud of the work that my team are doing. We look at the social dynamics that have caused some campaigns to develop into movements that change the way societies behave and some campaigns to flop. Climate action is obviously an example of the former and I feel like universities have been a key part in fuelling that movement. Becoming a Research Fellow meant I had to give up teaching, which I miss a lot. But I enjoy the research and have great colleagues. It's a shame our work doesn't get the same funding as the technological solutions, but we're surviving.

After renting for several years in Island Bay, we got sick of the southerly storms and constant construction work on the coastal defence system. So, we moved into a new community housing development on the old golf course in Berhampore. I work mostly from home but use our village hub for meetings and catch the train into the CBD when needed.

I've still got lots of family back in Alberta, but moving to Aotearoa was the best decision. Things got pretty ugly back home when the fossil fuel industry collapsed. Here in Aotearoa, we're less concerned about financial wealth and that suits me better. I am part of a great community and feel connected to nature – that's all I need.

Tertiary context

The success of the economy has allowed an increase in investment in public services. Society recognises the important role that the tertiary sector has had in supporting a positive outcome, despite the challenges created by climate change.

There has been an increase in expectation of closer involvement of the tertiary sector in public debate as the critical conscience of society, alongside closer integration with the public sector. A normal career pathway includes movement between the tertiary sector, the policy community, and the private sector. The three communities are strongly networked, which helps in the development of policies that are well-tested in the court of public opinion and well-informed based on the latest research and applicability in the business context.

The business community has recognised that they need to partner with the tertiary sector to ensure that they can continue to grow together and source the talent they need for their future success.

Research

The Research Centres are thriving and opportunities to study in the subject areas of the Centres are sought after, both by domestic and international students. Those who win places know that they will have opportunities to work in the Centres, guaranteeing an interesting and rewarding career that will deliver significant public good.

There has been an increase in private investment in these Research Centres as international investors look for the next opportunity to invest in an emerging green innovation.

While the focus of the Research Centres was previously relatively narrow, they have now been expanded to encourage more interdisciplinary research. The Centres employ experts in a variety of fields from the sciences to mātauranga Māori, ethics, and behavioural economics.

Teaching

The tertiary education sector is still operating as one contiguous whole, with students attending their local centres and having work and community experience included within all forms of education. Student demand for sustainability-related course content is high, especially when those courses are connected to the needs of local communities.

This approach has provided capabilities for both business and communities to thrive and helped to build a strong sense of connection to the local area.

The technology that supports education increased in the 2040s and early 2050 and includes augmented environments, robotics and haptics, which has allowed the same courses to be delivered by the best educators in all the regional centres.

In the 2050s, as the increasing use of technology to deliver education created the possibility of a challenge from international providers who can use the same technologies to give a virtual face-to-face experience from overseas.

A series of major cyber events in the early 2060s saw the information of all students using the tertiary sector's online material released to nefarious overseas organisations, leading to reluctance about continuing with such reliance on digital learning.

This has made the ongoing delivery of all courses in regions a challenge, with calls emerging to remove the zoning approach to tertiary education and allow students to study in the place which best meets their needs.
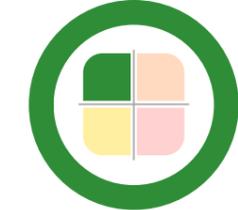
Lani, Pasifika international student at an Auckland University in 2095

Education has always been a big deal in my family. It's seen as a step toward prosperity. It's awesome to be on a journey where I'll soon be in a good position to help my family and my community – this is the biggest thing for me.

Seeing what's been happening to my home over the years and listening to elders in my community tell stories about places that just don't exist anymore, or when they tell stories about how the beaches looked, or the sea life that was around – it's hard to believe it was ever that way. There has been action by my people and other countries, but our land is still so sick, and I want to help.

I chose to apply for one of the scholarships to study at a university in Tāmaki Makaurau, Aotearoa because it seemed like the best option to gain the knowledge I need to make a difference at home. I'm lucky to be able to stay with extended family but it's quite a busy house already. I also have to juggle some part-time work with study, so that I can help out. It's quite a bit of pressure, but it'll be worth it.

I'm studying sustainability, policy and a Mātauranga Māori course and I'm also hoping to get a bit of experience in business as part of one of my electives. I'd love to do some research at one of the Research Centres too because it's pretty much guaranteed to give you an edge when it comes to getting a job.

I truly believe there is hope and that we can heal the land and the hearts of our people. Hopefully, by putting in the hard work now, I can make a difference in honour of those who have come before, to the lives of my people now, and for generations to come. I really feel like that's my purpose.

Scenario 2 - She'll be Right

RCP 2.6: 1.5 degrees warming with low physical impacts and an unplanned social response

Indicator	2040	2090	Indicator	2040	2090
Financial health of the sector	Downward	Downward	Student numbers:		
Government influence on the sector	Downward	Trend maintained	• Total	Downward	Trend maintained
Public support for the sector	Trend maintained	Trend maintained	• Domestic	Trend maintained	Downward
Innovation and entrepreneurship	Downward	Upward	• International	Downward	Upward
Student progression to employment	Upward	Trend maintained	• Māori	Upward	Trend maintained
Location of tertiary learning	H	C	• Pacific Peoples	Trend maintained	Trend maintained

Key: Upward/Positive trend   Downward/Negative trend   Trend maintained
C Campus   H Hybrid   R Remote   L Local

Local and global context: 2025-2040

Environmental impacts

Climate events, such as a serious heat crisis in the northern hemisphere in the late 2020s,[21] large-scale forest fires in many parts of the world, and increased severe flooding in coastal locations have created social pressure for change. Global businesses have responded to the pressure with more low carbon offerings and green consumerism is now the norm.

Social response

There is increasing urbanisation and densification as more people move from rural areas into cities. This creates pressure in urban areas, so buildings are still being constructed on historic flood plains and on the coast.

In the late 2030s, following repeated flood incursions on national transport corridors, investment is made in flood defence along transport corridors and city waterfronts.

There is a resurgence in holidaying locally and travelling by train as flying becomes less socially acceptable. International tourism to Aotearoa also decreases significantly.[22]

Economic outlook and political situation

Central government is arguing that emissions have reduced and are trending down, so no proactive response is required, resulting in a piecemeal response to sea level rise.

There has been a rise of Māori business, as it has been ahead of the curve with changes in the primary sector.

These businesses put guardianship of land and resources at the heart of their operations, [23] which is attractive to investors and consumers alike.

There are continued tensions with interested parties due to the commodification of traditional knowledge and a capitalistic approach to growth.

While the Māori economy has remained stable, the national economy is hit by the combined impacts of reductions in tourism, reduced demand for meat and milk, and fewer international students.

Fund managers look for green investment portfolios,[24] leading to increasing investment in low carbon energy generation and buildings, which use passive solar heating and shade and natural air flows for cooling.

Insurance is harder to get in flood risk areas and is withdrawn in high-risk areas.[25] Homeowners are expected to take responsibility to manage flood risks. Increasing private and local authority demand for temporary flood defence systems is the only option to stand against the occasional storm surges.

Tax revenues decrease with a weakening economy. International pressure drives regulatory change to lower carbon emissions in Aotearoa. Full carbon costs are allocated to all sectors, including the agricultural sector, in an attempt to maintain international credibility and demand for food produced in Aotearoa.

The government introduces new regulations to drive consumers to low carbon transport and energy companies to produce low carbon energy.

Costs of traditional transport and energy both rise significantly.[26],[27]

Public funding is constrained by the government because of lower tax takes and increases in tax rates to manage the increasing costs associated with an ageing population (for example, increasing costs of pensions and rising healthcare costs).[28]

Social tension is growing as increasing numbers of young people face higher tax rates, unaffordable housing, and contributions to pension and healthcare for older homeowners.

Emerging technology and innovation

New battery technology has been developed by the partnerships between tertiary providers and the private sector. This technology uses abundant non-toxic material, which is cheaper and safer and has accelerated the electrification of transport and industry. Aotearoa's heavy vehicle fleet, on the other hand, moves to a green hydrogen fuel source, which is emerging and exciting export opportunity.

There is also more industrial activity based on the use of clean (low carbon) electricity. Previously, Aotearoa had to step away from the international market due to significant labour costs. However, by using a clean energy grid, and subsequent reductions in production costs, Aotearoa has been able to attract manufacturing back onshore.

Alex, Facilities Manager at an Otago Polytechnic in 2033

I'm doing a lot of work getting us out of buildings that are costing too much to run or to repeatedly repair. There are several buildings that our insurance company is not willing to insure, and we just don't have the finances to self-insure.

Some that were damaged in last year's storm are now boarded up until we can sell them or get out of the leases. However, the owners are not keen to end the lease as they quite rightly don't believe they will be able to lease it to anyone again, and the other buildings are just not selling. It's not that long ago we were competing with private companies for these properties.

The tertiary education precinct is looking pretty sad these days!

Tertiary sector 2040

Tertiary context

The number of international students has declined because of the social stigma and prohibitive costs of flying. Government funding to the tertiary sector is increasing at rates less than inflation as the expectation is to see increasing efficiency in the tertiary sector for all areas supported by public funding.

The tertiary sector continues to operate in a 'false competitive environment', where price is controlled, and providers are expected to work together to contribute their expertise to policy development while competing for students and research grants.

Two of the universities have failed financially and the government has followed a programme of rationalising the number of places. In contrast, the vocational education network offers teaching through 12 Institutes of Technology. The reconstituted Industry Training Organisations are seeing increasing private sector support. Assets in the surviving tertiary organisations have been sold off to cover losses. The remaining tertiary institutes have taken the released market share, which has provided temporary relief to resource pressures for those still operating.

Universities have sold off parts of their campuses, so that they can afford to meet the increasingly stringent regulations on carbon efficiency of their buildings within already tight budgets.

All staff at tertiary institutes now work on a hybrid model – with most staff working from shared spaces, hot-desking on campus when needed, but without any personal dedicated spaces.

Some cities are seeing decreasing demand for student accommodation, which together with rising costs of delivering the low carbon student accommodation, means that tertiary institutes are selling off and reducing their accommodation capacity.

A greater proportion of students are seeking to learn locally, as living and studying from home becomes the more affordable option and flying is seen as an unacceptable way to travel to or from tertiary institutions.

Research

Less funding is available for research, but where funding is available it is focussed on carbon mitigation, alternative foods that Aotearoa can produce to sell internationally, and addressing the sharp rise in respiratory illnesses from widespread mould issues in homes due to increased humidity.

Investment in research on alternative proteins has supported an increase in capability in this area, which has attracted a growing number of international experts in this field.[29] Aotearoa is seen as an emerging centre of excellence in this field, in particular, making not only palatable, but also appetizing and highly sought-after protein substitutes.

Two companies have been created with venture capital from this work, which are seeking Stage B funding of between $10m and $20m to expand into international markets. The work of these companies and other potential spin-offs from research in this area are getting increasing attention from international investors looking for green business opportunities to invest in.

Teaching

As less money is available for tertiary education, the range of subjects on offer has decreased and class sizes increase.

Travel is less affordable, and the locations in which in-person education is offered reduces, resulting in an increase in demand for online offerings and in-country teaching of international students in numerous countries around the world.

The remaining tertiary institutes seek to establish centres with local tutors to support the students not able to make regular trips to the campus.

New forms of more interactive learning are developed to compensate for the increase in technological rather than in-person engagement in education.

There is a greater emphasis on work integrated learning (particularly within the climate curriculum) and more connection to industry, as society expects more direct benefit from public investment. There is also more of a focus on engagement and collaboration with iwi and local/regional stakeholders as students and staff stay closer to home.

Wānanga have taken on a greater business/entrepreneurial focus with funding and partnership from iwi. This gives students the opportunity to learn about the Māori economy and provides a pipeline for learners to support and/or work for Māori businesses.

Local and global context: 2040-2090

Environmental impacts

Local adverse weather events continue to occur, creating disruption and raising costs to the individual users and the public purse where public infrastructure is affected.   These include localised flood events and occasional crop failures creating pressure on public funding and inflationary pressures on the cost of fruit and vegetables. This helps to maintain social license to continue tightening legislation to reduce carbon.

There is an ongoing need for regular repairs to infrastructure, including roads, properties and water channels. Upgrades for infrastructure to cope with the increase in climate events is made when it needs to be replaced because of a climate event. Repairs remain the favoured and only affordable way forward as the country is in continual catch-up mode due to the number of weather events.

There is increasing social tension as people lose uninsurable homes by the coast due to increased flooding. Many of the properties by the sea that are affected are second homes, creating a narrative around why the country should not continue to subsidise the rich with sea views. The result of this discourse is that no additional social support is provided for those who lose their second homes.

The number of threatened species increases as the response to climate patterns and events is responsive rather than proactive and preventative.

Saving wildlife habitat is seen is secondary to the threat to human residences.

Social response

Most climate migration (where people have chosen to move because of the effects of climate change) has been across continents rather than across seas. There is, however, a continuing flow of migrants, though this declines as the rest of the world adjusts to new climate patterns.

There has been a reversal of previous moves into cities, as they still face regular disruption from climate events and associated repair of transport infrastructure.

Instead, there are more opportunities to repopulate regions where the costs of living are lower and space is available due to less land being used for farming. An increase in the opportunities for working remotely is an enabling factor in the move away from metropolitan areas.

Urban towns are seen as liveable and self-sustaining communities where locals can enjoy walking and cycling around their area. The revitalisation of urban areas is also supported by the numbers of wealthy foreigners who have bought small holdings in the regions and are investing in their local towns.

A major earthquake, magnitude 8.2 in the late 2040s, caused major damage to one of Aotearoa's largest cities and the associated water and transport infrastructure serving that city.

The earthquake led to significant loss of life. It took 10 years to rebuild the city and reduced the confidence of people to live in cities or travel to Aotearoa.

This event accelerated decreases in immigration and the move away from the cities.

Economic outlook and political situation

Unfortunately, a just transition has not happened. Agriculture, tourism, and the oil and gas sectors were hit hard with the labour force finding it difficult to shift to new employment.

Post the earthquake rebuild of the 2040s-50s, Aotearoa's economy is seeing a resurgence. This boost is the result of research into alternative forms of protein paying off while the country makes the switch from dairy, beef and lamb to large-scale algae-based production of protein products. International demand grows, as other parts of the world face food supply challenges.[30]

Expertise from Aotearoa in building sailing vessels also provides growing economic opportunities as shipping companies seek to minimise the fuel costs of shipping. New materials and hybrid (sail and power) cargo and passenger ships are developed in Aotearoa with offshore licensing of the technology acting as a growing source of international revenue.

Emerging technology and innovation

The last combustion engine car was manufactured in 2039. Only Boeing 787 and Airbus 350, the most efficient of the long-haul plane fleet, are still flying by the end of the 2030s, with all carbon costs included in the ticket price.

The first short haul 24-person electric planes were introduced in the early 2030s and several companies are looking to have their first 100-to-150-person electric planes capable of flying with a range of 1000kms in the early 2040s. The cost of flights is a major barrier to frequent flying.

AI, robotics and humanoid robots are increasingly obvious in the workforce, particularly where the work is either dull, dangerous, dirty or difficult, leading to a need for reskilling many members of the working age population.
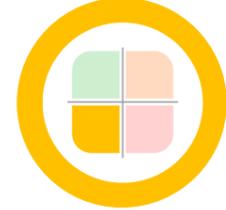
Kahu, Māori student at a Whakatane Wānanga in 2050

My partner and I were living in Auckland, before moving to Whakatāne. Being in Whakatāne is a nice place, but every turn in the weather makes me think about moving further in land, between the tidal walls and geothermal we are always looking at what is next. I don't think we would move back to Auckland but maybe to the Waikato. I would be closer to some of my whānau. We would need to take my in-laws with us, and I know they wouldn't like having to leave their hau kāinga and extended whānau.

If we did move, I could still learn at the same wānaga because of the flexible delivery options. If I moved to Waikato, I could transfer to another wānanga. The kawa and tikanga (protocols) of that wānanga would be different and not as applicable to my whānau, but I could still learn in a Te Ao Māori approach, which is my preferred way of learning.

Work and promotion opportunities in my current employment in agriculture aren't as obvious, so the need to upskill / re-skill is important, particularly if we are going to keep living in Whakatāne. We haven't seen much of the coastal shipping boom like they have in Tauranga but the plant-based options over the hill in Ōhope and Ōpōtiki have been useful to show opportunities. I would be interested in extending my learning into other whenua (land) and moana (ocean) topics.

I met my Kiwi partner while they were on a work placement in Calgary. The placement got extended a couple of times, but eventually the pull of home was too great, so we moved to Aotearoa. It's great. It would be nice to see my family more, but I'd be ashamed of flying home more than once every five or six years.

Coming from a family of ranchers I was hesitant to take the plunge into a vegan diet, but I actually feel better for it. It's also influenced my work. I teach behavioural psychology, and after my university was forced to merge with another uni, there was some pretty serious consolidation of course offerings. So now I just teach applied behaviour change for sustainable futures, and I include a big focus on food choices. They're big classes and mostly online, but there is still plenty of scope for innovative pedagogy. Next month I get a break from the big classes and will teach my first intensive small group class with a small cohort of international students on the boat trip from Hong Kong.

When we arrived in Aotearoa, I really wanted to live by the sea, but we couldn't get insurance coverage, so we ended up buying an apartment in Masterton. It's a neat city, undergoing a real transformation from a farming service town to an urban centre with a thriving art scene. It still gets way too hot in summer though, and the smoke from the forest fires last summer was pretty hard to deal with.

Our kids are both starting to think about whether or not they want to go on to tertiary education. They both want to get in on the tech start-up boom in Aotearoa and have talked about starting their own social enterprise. I'm trying to encourage them to do further study, but they don't listen to me.

Tertiary context

Ongoing financial pressure on the tertiary sector means that only four universities and eight Institutes of Technology are in operation. This has led to a significant portion of provision shifting back to in-person teaching. Some students who are happy with a virtual learning experience instead choose remote learning options from top international institutions.

While the role of the sector is primarily delivery of core face-to-face teaching, the sector is playing an increasing role as the critical conscience of society. The quality of oral and written presentation of the remaining academics, together with the opportunity to communicate to large classes, has increased the influence of the tertiary sector.

The sector is highlighting the loss of biodiversity and the social impact of the responsive approach that the nation is taking to climate events. However, there is a hollowing out of the academic community as resources are only flowing to the areas where there is perceived economic opportunity.

Research

The success of work to develop alternative forms of protein has demonstrated the value of investment in applied research.

The majority of public research funding now goes to Crown Research Centres, which focus on applied research that either delivers solutions to public challenges or can be commercialised, including solutions to various sustainability challenges.

A small number of tertiary institutions go beyond keeping track of the latest research to ensure the quality of their teaching. At these institutions, academic staff use their non-teaching time to complete research and publish papers.

There is a growing venture capital community associated with each of the remaining tertiary institutes. That venture capital community is well-connected with international green funds ensuring that all stages of investment are supported for successful green businesses.

Teaching

Teaching has been commoditised, with large class sizes and only the best lecturers still in place. While fewer subjects are on offer in fewer locations, the quality of all lectures and teaching resources is high. International students have been attracted back to Aotearoa because of the quality of the offering.

Lani, Pasifika international student at an Auckland University in 2095

I've always felt called to help others. It seems like what I was put here to do. But, when I used to look around my village, the people who were in need and the damage to homes could be overwhelming. When my grandparents were still here, they'd tell me about how there didn't used to be as many storms. Over the years, more and more hit each year. Villages have been moved further inland, but that's brought different problems, especially illnesses, which spread quickly among my people.

Since as long as I can remember, I've wanted to study medicine, so I can help the most people as possible. I got a scholarship to study in Aotearoa. I'm lucky that many of my extended family have already made the move , and I'll be able to stay with my auntie and uncle. Their home was damaged by flooding a few years back and they couldn't get it fixed properly. Plus, they already have some of my other family living with them, so it's going to be a bit tight. I'll have to work part-time to help out and maybe look after some of my cousins. I'm really happy to help. I'm just so grateful to have a place to stay.

There is still one university operating in my hometown, so I could have stayed on the island. The thing is, it doesn't offer the specialist medical programme I want to study. It's been hard for the university to attract researchers and lecturers because life is really tough. It's also hard to balance being indoors researching or teaching when you could be outside helping with clean-up efforts or delivering food and supplies to people in need.

It was a tough decision to leave home when so many people are in need now. But I truly believe that being able to offer specialist medical treatment will be the best way I can give back to my community.

Scenario 3 - Yeah, Nah

RCP 8.5: 3 degrees warming with high physical impacts and a planned social response

Indicator	2040	2090	Indicator	2040	2090
Financial health of the sector	→	↘	Student numbers:		
Government influence on the sector	↗	→	• Total	→	↗
Public support for the sector	↗	→	• Domestic	↘	↗
Innovation and entrepreneurship	↗	↗	• International	↗	↗
Student progression to employment	→	→	• Māori	↗	↗
Location of tertiary learning	H	L	• Pacific Peoples	↗	↗

Key: ↗ Upward/Positive trend ↘ Downward/Negative trend → Trend maintained
C Campus H Hybrid R Remote L Local

Local and global context: 2025-2040

Environmental impacts

In Aotearoa, there is recognition that while the country is doing well with respect to food supply, this will become much harder in the future as the climate forecasts show that the northeast will get hotter and drier, and the south much wetter.[31]

It is also recognised that there will need to be increased investment in how to maintain food production as the climates change, with trials of drought resistant crops throughout the 2030s, to ensure that Aotearoa will be able to produce more food than its own population will need in the second half of the century.

Alongside the changes in weather, there are also concerns about increasing soil erosion from storm events.

To address these concerns, Aotearoa is investing in a range of measures, from establishing terraces, to tree planting, and the application of mulch in any exposed areas between plantings. Investments are also being made in the use of drones and Internet of Things devices to monitor soil, to ensure there is little overgrazing.[32]

Societal response

In a world where damaging weather events are rapidly increasing, Aotearoa is seen as a safe haven. With fewer extreme weather events nationally, relatively speaking, international migration is increasing as people from other nations seek a reprieve from excessive heat and food scarcity.

There is an expectation that wealthier countries in the Pacific region share in adaptation costs across the Pacific Islands. Residency pathways have opened up and Aotearoa is welcoming more Pacific Peoples who have been displaced by climate events and loss of lands in their home nations.

The world is pinning its hopes on investments in new technologies as the way to reduce carbon emissions and forecast climate changes. This is leading to a slow pace of carbon reduction as new technology is not living up to all of its promises. An effect of the slow pace of carbon reduction is that societal changes are also sluggish, especially in terms of adapting to living in ways that are not so heavily reliant on carbon.

Economic outlook and political situation

Although there has been a history of reactive retreats due to natural disasters in Aotearoa, pre-emptive measures for managed retreat are now in place. There is strong social support for adaptation and there is intensive effort for different groups to agree on the best approaches to ensure communities are safe and secure. Iwi and hapū lead many of these conversations, particularly around the relocation of marae, most of which were in low-lying coastal areas or near rivers vulnerable to flooding.[33]

The cascade of private insurers withdrawing from coastal areas and areas at risk of fluvial flooding continues. As a result, mortgages in these areas are becoming harder to attain and insurance policies that are available come with prohibitive clauses, especially around premiums and excess.[34]

Internationally, food production is severely impacted, leading to worldwide shortages.[35] Aotearoa's economy continues to remain robust, buoyed by international demand.

Internationally we haven't moved quickly enough – moderate action on mitigation worldwide has led to increasing carbon use for the rest of the century. As such, current policy on carbon reduction remains. Aotearoa is on track to achieve some carbon targets, but will not meet its Paris commitments, reflecting a pattern common across the world.

As the global temperature is on course to see a 3°C to 4°C increase, the focus is now on investment in adaptation. There is increased pressure for action in Aotearoa after a series of flood events (coastal and fluvial) and drought hitting fruit and vegetable production in the Hawkes Bay region in the late 2030s, which has created much more of a social licence for change.

Increasing levels of investments in adaptation over time creates significant pressures on government funding. This sits alongside rising costs from healthcare and pensions, due in part to the ageing population.

The government response is a major driver of improved efficiency of delivery of public services and the introduction of means testing of pensions, alongside successful investment in a move to healthier lifestyles, is moderating pressure on rising health costs.[36]

Emerging technology and innovation

Technological solutions are being delivered later than was hoped and are not matched by changes in social lifestyle or urban design.

Most of the benefits of efficiencies delivered through technology globally are countered with increasing demand.[37]

However, there is increasing use and deployment of AI to understand and model the local impacts of climate change, which is supporting better targeted planning for the changes ahead.[38] In Aotearoa, this is helping to create clarity around the potential impacts on local populations and iwi.

Aotearoa is emerging as an exemplar in achieving culturally appropriate and responsive AI. This has led to international investment in local research centres by several large international companies.

The research centres work by drawing on Māori, Pākehā and international expertise and the increasing interest in AI ethics to ensure that AI reflects Aotearoa's values, rather than only reflecting the cultures of the programmers or funders.

Aotearoa-led AI is grounded in tikanga Māori and indigenous customs, values and protocols and is informed by rigorous analyses of issues such as data and information sovereignty.[39]

The companies investing in the research centres appreciate the value in ensuring AI reflects the historic, current and emerging cultural perspectives and value the work that is being delivered by Aotearoa research centres in providing AI that embeds indigenous ways of thinking.

AI is increasingly used to support the management of the nation's land use by both forecasting and responding to climate events and the allocation of productive land to maintain food supply.

Alex, Facilities Manager at an Otago Polytechnic in 2033

There is only so much budget to spend on our buildings, and as we can't really change the course of climate change it's better for me to invest it in adapting our buildings to deal with extreme weather as much as is possible.

I've had to switch some spaces over for different uses. As there are now so few international tourists, we've shifted that space over for the new engineering programmes that are training flood protection engineers.

The biggest challenge is getting my head around the needs of the new agriculture facility. The old Ag facility is too dry for most of the year, so we have to move it to a coastal area. We're training more and more agriculture students who have migrated from across the Pacific region. This is great because imported food is just too expensive and too unpredictable.

Tertiary sector 2040

Tertiary context

Tertiary education providers have acknowledged the significant climate risks and are investing in research and education to respond to the challenges ahead. Māori and Pasifika communities are disproportionately impacted by climate change and part of the government's response has been to target support, including funding for tertiary education scholarships for rangatahi and Pasifika youth.

There is social pressure to prepare students for the future and their future roles in adaptation. Alongside this is growing recognition that the challenges will be as much to social cohesion and mental health as they are to impacts on physical infrastructure. Pastoral care is a critical service for both students and staff to work through climate anxiety amid rapid and often unpredictable environmental changes.

The focus is increasingly about building resilience of communities in light of impending changes and ensuring that there is sufficient care to support individuals through the pressures ahead.

Climate adaptation is being built into all decision-making relating to tertiary education providers' physical infrastructure.

Tertiary buildings are being modified to minimise water usage and energy, increase shade and natural heat management, and improve drainage to manage higher water flows. Flood plans are also being developed for all buildings.

Campus buildings are increasingly being seen as safe places to go when weather events occur, increasing the role of campuses in local community resilience and emergency planning. City councils recognise the important community role of universities to respond to weather-related challenges and are beginning to co-invest in ensuring emergency response capabilities are robust.

Society is looking to universities more often to be the critical conscience and provide evidence to support the changes needed and to ensure that adaptation planning is equitable. As international migration has increased, it has prompted much greater global co-ordination to recognise qualifications from different countries, which has boosted the international student market.

Teaching

As investment is targeted toward specific areas (as outlined above), funding for education is focused on courses that support those areas. As such, student numbers increased in those courses.

There is also an increased emphasis on vocational education, including advanced micro certification for skills such as engineering, food science, social care and health management, strategy and data analysis, international diplomacy, and languages.

All disciplines have integrated climate response skills and knowledge into curriculum.

Te ao Māori and mātauranga Māori continue to be recognised as key elements of our climate adaptation planning, particularly in bringing essential knowledge to intergenerational planning to support long-term survival.

Core courses grounded in mātauranga Māori, which are developed and led by Māori, are compulsory for all tertiary students.

A rising number of academic courses are no longer offered in-person in Aotearoa.

Local learning groups are being established to maintain the social support needed for many to complete their learning, which is leading to an emergence of distributed learning centres and an increasing role of wānanga in delivering tertiary education.

There has been a slimming of budgets and increased pressure to find lower cost models of education to free up funds for other priorities. Part of these changes included an amendment to legislation which means that universities are no longer required to have research-led teaching.

Vocational qualifications that support adaptation are frequently being seen as more important than academic qualifications.

Local and global context: 2040-2090

Environmental impact
The frequency of climate events continues to rise with yearly coastal flooding and areas at risk increasing each decade. Modelling allows a deeper understanding of the areas most likely to be impacted and the timeframes required for a just withdrawal.

There is relocation of parts of cities at most risk of flooding and that will likely be inaccessible by road in the near future. The expected 2m sea-level rise by the end of the century led to recognition that it is no longer possible to defend some areas of Aotearoa's coastline.

Social
There has been a social wake-up call and the imperative to reduce carbon has finally been mandated, but many think it has come too late. This has led to significant policy and regulatory changes locally and global cooperation has gained traction.

Locally, one of these changes has been the introduction of personal carbon allowances. This creates significant lifestyle changes and helpful redistribution of wealth as a secondary market in carbon allowances grows.[40]

Living space per person has been significantly decreased as the demand for housing for the displaced skyrocketed.

To meet demand for both domestic climate refugees and climate migrants, legislation was put into effect to tax people for empty bedrooms. Practicality now reigns over perfection in standards for existing living spaces.

Communities have become denser as 'safe cities' were created to improve health outcomes and lower carbon. These cities were designed to accommodate more walking and cycling with amenities close by. The speed of construction of 'safe cities' was boosted, and costs minimised, by using modular prefabricated buildings to provide lifestyle pods, ultimately increasing capacity. These new urban areas are self-sustaining with their own power supplies, locally recycled waste, and local water storage systems.

Travel is mostly domestic, as the costs of travel together with climate impacts has seen air travel become taboo and an activity mostly reserved for the wealthy, particularly given the introduction of personal carbon allowances.

Economic outlook and political situation
Aotearoa has moved to a circular economy as the accepted and mainstream thinking for not only the design of policies and regulations, but also the design of cities and their support systems.

The move away from the throw-away society has seen more Aotearoa-made products constructed in ways that ensure they last.

With more limited disposable income, planned obsolescence is less tolerated by consumers and demand for quality products that can be reused and repaired is rising.

Various factors have led to enormous pressure on government budgets. Those factors include:
- repeated repairs of existing infrastructure from storm events
- drought followed by storm events creating significant soil erosion in some parts of the country

- continuing costs of adaptation.

More than $300bn in assets were exposed to the risk of flooding, and while public and private debt funded this in the first half of the century, it was no longer an option in the latter half.

With finances stretched and Aotearoa low on the priority list for financial support, difficult decisions had to be made about where to allocate funding between different public demands.[41]

Adding to the precarious financial situation is the costs of rising populations. International agreements require that Aotearoa take larger numbers of climate refugees. To help offset the financial impacts, international agreements on immigrants' rights are coupled with guaranteed trade agreements.

International relations and trade agreements are complicated by the growing global unrest and geopolitical instability.

Increasing frequency of climate events have led to impacts on social cohesion as individuals struggled to adjust to life in such an uncertain world.

Civil tensions are especially high and more eco-terrorism and extremist activity is being seen globally.[42]

Despite this, some countries do continue to collaborate on adaptation, particularly through food reciprocity agreements, which is where nations guarantee exchange of food when another country faces shortages due to climate events.

In general, society has returned to more active lifestyles alongside simpler diets.

Despite the challenges of climate change, we are seeing an increase in life expectancy in Aotearoa.

Emerging technology and innovation
Advances in AI technology has seen its emergence as a powerful tool in weather forecasting.

The new AI systems provide meteorologists with faster and more reliable data to make weather predictions. By using new AI models, such as deep-learning algorithms, meteorologists are able to give people more time to prepare for extreme weather events. [43]

With coastal environments being battered the world over, more people are opting to use eco-engineered seawalls. The technology used to create these 3D printed structures enables them to morph seamlessly into the environments they are placed. In contrast to the more traditional hard seawalls made from concrete and masonry, which can negatively affect the natural environment and can, ironically, lead to more erosion in other areas, eco-engineered seawalls can help to restore health to the local marine ecosystem.[44], [45]

Kahu, Māori student at a local Wānanga in 2050

My partner and I have just completed our move to Hamilton from Whakatāne. I have enrolled at the local Wānanga to try and secure a work skills placement with the local iwi enterprise. Fortunately, I have been able to continue my Wānanga studies because of their online delivery options and noho-based (block course) activities.

We would have loved to stay in Whakatāne but the coastal flooding and tidal risk became too much, especially as businesses had to relocate to accommodate. The government is doing things now, but it's been a challenge.

Mine and my partner's whānau have also had to move around, so it's harder to keep in touch with what is happening with our the extended whānau in person.

My in-laws have remained in Whakatāne which is a concern but they want to stay close to support their hau kāinga and remain connected to the whenua. I'm not sure how long they can stay there but being in Hamilton means it's not too far to get back to them. Between the road tolls and the cost of energy getting to them isn't getting any cheaper.

Unfortunately, where we live now doesn't have much space, so we don't have the option to have them stay with us, even for visits. My partner would like us to move back to Whakatāne but it just isn't a good option for us at the moment. We have kept up having a box mara (garden) to try and eat more fresh food. The Wānanga programme has helped us learn new ways for our whānau wellbeing.

Thankfully, being at the local Wānanga has allowed us to connect locally as they have a campus here in Hamilton. Having a Wānanga hāpori (community) to be a part of like we did in Whakatāne is good, and there is a real mix of people from all over the motu (island) and the Pacific.

I've gone back to my home marae once this year, keeps me connected.

Shannon, mid-career academic at a Wellington University in 2072

I was sick of the summer heat waves and the huge political divides in Alberta, so I decided enough was enough and moved to Aotearoa. After a few years of picking up jobs where I could, I finally got another academic role in Wellington. Now I'm well-settled and can't afford to fly back to Canada if I wanted to.

Since moving to Aotearoa, I've shifted disciplines from sociology into psychology. That wasn't really my choice, but the Universities in Aotearoa only focus on a few disciplines and there aren't many sociology roles going. Now I focus on eco-anxiety and climate grief, which are huge issues around the world. A lot of our students are climate refugees from across the Pacific who are wanting to help their compatriots. Some of the stories I hear are pretty harrowing and I have to be careful about managing my own well-being. Last year I had to take extended leave to manage my own mental health.

Our University has sold off most of the campus, so now most of my teaching and the public counselling service we deliver is run out of a local community centre – when we can get a time slot! It's a fancy new facility built to the latest resilience standards, so it's in hot demand.

I originally bought a cute little cottage in Petone but was forced to abandon it (and only got partial compensation!). Now I'm in a very basic mass housing unit in Avalon that was built on top of the new flood banks of the Hutt River. After several devasting floods, the government finally invested billions in the flood defence system and now they're already concerned they didn't build high enough.

All of us in the housing block have been relocated. None of us have much money, but we all help each other out. I like the multi-cultural dynamic and we have a lot of communal facilities, like the hydroponic gardens and the solar collector. We can't rely on the city infrastructure and supply chains, so we try to be as self-sufficient as possible.

Tertiary context

There is much less money available for the tertiary sector as public investments are made in adaptation. Tertiary funding is primarily to support its role in climate adaptation. The decrease in government funding to institutions has not been offset by the increase in student numbers (because of migration).

To work within the financial constraints, new models of operation and funding continue to be developed as tertiary providers partner with local authorities in supporting communities to adapt.

Space is at a premium within tertiary institutions. Large physical campuses are no longer affordable, especially as insurance has been withdrawn. Some buildings cannot be maintained due to flood risk and other campus buildings have been abandoned entirely.

Teaching and research staff share desks as optimised space becomes the norm. Digital systems support the allocation of all public space across a wide range of tertiary activities. Tertiary teaching space, schools and other properties are used in the evenings to learn practical skills and to support blended learning.

Campus accommodation and sheltered areas are regularly used to house people affected by climate events.

Research

Universities, however, do keep physical spaces to deliver goal-led interdisciplinary research which responds to issues emerging from the significantly different climate and associated challenges.

There are major investments in knowledge transfer between communities, and universities play a key role as the holders and sharers of knowledge.

Knowledge transfer centres are created that seek to harvest the best international research, which could be applicable in Aotearoa's context. The centres also capture innovations and successes from across the country and disseminate the appropriate lessons and knowledge to communities where it is most needed.

Teaching

Aotearoa no longer has eight universities, Institute of Skills and Technology and wānanga. Instead, it has become an evolving network of connected communities, which share knowledge and resources locally and internationally.

Teaching is community-led and delivered locally. Local research is focussed on finding solutions to immediate challenges. Local learning groups and centres also provide a place of local support and community. Teaching focuses on providing the skills needed for communities to flourish. It includes an increasing focus on reuse and repair skills as communities seek to operate within the circular economy.

Lifelong learning is the norm, in response to changing skills needed to address rapidly changing climate conditions. There is a continued increase in vocational training. Much of the vocational training provided is centred around developing skills that align to the circular economy. Repair and creative reuse of parts and supplies is favoured above replacement.

Academic tertiary education is largely based on overseas material that is provided digitally. Local communities enable flexibility by offering in-person learning to those doing similar courses during the day and into the evenings, which supports the blended learning model.

There continues to be significant demand for tertiary education, due in large part to immigration. There are changing multicultural and language needs within Aotearoa. Tertiary communities are very diverse because of increased immigration and learning resources being provided in many languages.

This leads to much more investment in language and cultural training for all educators.

Aotearoa also takes advantage of the arrival of teachers from overseas to respond to the increasing demands.

Lani, Pasifika international student at an Auckland University in 2095

I had to apply to study in Aotearoa a couple of times because there aren't as many universities as there used to be and it's pretty competitive. I decided to study politics, finance and national emergency management. I feel like the combination of skills I'll get from these courses will allow me to be part of the big picture, long-term planning for my hometown and will still give me practical leadership skills in responding to emergency situations.

I've been staying with my auntie and uncle in Tāmaki Makaurau since making the move to Aotearoa. They have a lot of other family also staying with them and it can be a bit tricky to study at home with so many people around. I've found it easier to stay on at the local learning centre after my lessons to do quiet work.

I got a scholarship to study, which was awesome, but the stipend isn't really enough to live on. Being able to learn close to home makes it a bit easier to fit in part-time work around my studies too. I don't have to travel very far, which means I can pick up extra hours when they come up.

It's hard to keep on top of everything. I just wish I could see my family, but it's far too expensive to fly home. The internet in my hometown is patchy, so we just have to make do with a phone call here and there. I know I've made the right decision to be here, and it'll be for the best. It can just be so hard to be out of touch with my parents and siblings, especially when storms hit. I just keep faith that they will be okay.

Scenario 4 - Oh Bugger!

RCP 8.5: 3 degrees warming with high physical impacts and an unplanned social response

Indicator	2040	2090	Indicator	2040	2090
Financial health of the sector	↘	↘	Student numbers:		
Government influence on the sector	↘	→	• Total	↘	↘
Public support for the sector	↘	→	• Domestic	↘	↘
Innovation and entrepreneurship	↘	↘	• International	↘	↘
Student progression to employment	↘	↗	• Māori	↘	↘
Location of tertiary learning	H	H	• Pacific Peoples	↘	↘

Key: ↗ Upward/Positive trend   ↘ Downward/Negative trend   → Trend maintained
C Campus   H Hybrid   R Remote   L Local

Local and global context: 2025-2040

Environmental impacts

Some of the critical issues affecting the world, either directly or indirectly, are air pollution, inaccessibility of clean water, and lack of basic sanitation. The concentrations of air pollution in some parts have rendered cities almost uninhabitable. Where those cities do continue to be populated, severe health problems plague their citizens.[46]

Globally, there is competing demand for water, with increases in demand for domestic use, manufacturing, electricity production, and technology. Without access to clean and safe drinking-water, millions of people are dying annually of preventable illnesses.

The development of more clean drinking-water sources and improved irrigation has been stymied in many countries as national funds are funnelled into reacting to health crises and international investments slow.[47]

Locally, agricultural practices have continued largely unchanged, so freshwater quality has continued to deteriorate and underground aquifers are running low. As in the global context, the local demand for clean water is ramping up. Water scarcity is a growing concern in some areas, which is having a demonstrable effect, especially on vulnerable members of communities.

The 'Clean Green' image the nation was once known for is heading towards becoming a relic of the past.

Exotic harvest forest blocks are increasingly at risk of fire and pests that threaten both wildlife habitats and the forestry industry. Stoked by intense winds and drought ravaged conditions, wildfires rage in wider areas, and have come disturbingly close to neighbouring townships.

Floods that occurred once in one hundred years are now happening more frequently. With their destructive forces, the floods often render hundreds of properties at a time unsafe and beyond repair.

Displaced communities must then scramble for already scarce housing.

Societal response

There has been a focus on social challenges during this time period as inflation continues with a rolling series of recessions and a major depression in the late 2030s.

Food prices continue to rise as climate events and ongoing international unrest lead to regular strikes as inflation outstrips wages. This affects food supply and the ability to maintain stable supply chains.

More people are working remotely, so there has been a quietening of cities as it is no longer financially sustainable for retail outlets to remain in major city centres. Retail moves to satellite centres around major cities, which also become the locations for evening and weekend entertainment.

Capacity to travel by car in cities has been reduced as bike lane networks are completed. Despite this, Aotearoa is still a car dependent society.

There was investment in new roads connecting towns and cities in the late 2020s to respond to growing demand, but this has added to the maintenance burden as climate events have led to significant damage to Aotearoa's transport infrastructure and subsequently costly repairs.

Insurance costs have also risen significantly, affecting both personal and business properties at risk of flooding. Government inaction to respond to the threat or develop a credible approach to managing retreat has accelerated the pace at which insurance premiums have risen and increased the number of areas where insurance for flood risk is no longer available. This is affecting several important areas in Aotearoa's major cities.[48]

Economic outlook and political situation

The struggling economy has led to tight public funding, which is also being applied reactively to respond to climate events as they happen. Aotearoa has seen national debt slowly creep up with less than expected tax takes, while encountering increased financial pressures to pay for climate events. The cost of healthcare has also risen as the already stretched public health system seeks to respond to ever more calls of support for mental health impacts brought about by personal financial pressures and fears about climate change.[49]

Financial challenges are compounded for those affected by climate events. This leads to increasing levels of inequity as those with little to no savings face the challenges of high levels of inflation and fewer job opportunities.

Social tensions are starting to emerge as questions are raised by those affected by climate events as to why their taxes are being used to support those new to the country and not the health and wellbeing of its established citizens.[50]

Debates are taking place more often between those advocating for carbon reduction and those suggesting that factors directly connected to survival in the here and now should be the primary concern, with climate change a secondary consideration.

There is a rise in some social groups seeking compensation from the government for the effects of climate change events on their properties due to government inaction.

Trust in government is diminishing as the nation's financial situation worsens and, as a consequence, civil unrest is bubbling very close to the surface.

Emerging technology and innovation

As many different groups use digital platforms to communicate, it becomes increasingly hard to determine what is fact and what is fiction, which also adds to societal tensions.

AI has continued to evolve at pace and has moved from being a tool used by workers to pushing humans out of some areas of work entirely, particularly in transportation, advisory roles, and call centres. Many well informed and energetic people are losing their jobs to AI, which creates a highly educated group in society advocating for change.[51], [52]

As the numbers of jobs lost to AI rises, so too does stress associated with more technological dependency. There have been various concerns about suspected biases within AI programming leading to unethical decision-making; as such, the role of AI as the solution to many of the world's problems is becoming more contentious.

Alex, Facilities Manager at an Otago Polytechnic in 2033

It's been a major challenge just to find space for the number of students we have. With unemployment at the highest for years we're seeing lots of students wanting to train up for climate resilient careers.

This challenge is made worse by the number of buildings we need to close. Some have been closed due to flood damage that we can't insure for anymore, and some we have to close temporarily because they reach unhealthy high temperatures in the summer. I need to get the timetables team to understand that this is just the new norm. May we need to change the dates for terms?

This would all be so much worse if a lot of the lessons were not online, but with all of the practical learning we can't go fully online like most of the universities.

I'm due to retire in the next five years. I hope that's still possible, but the pension investment fund looks really shaky. The other day I thought about how I would recruit a replacement. Their job description and the skill they will need are nothing like those I was recruited for.

Tertiary sector 2040

Tertiary context

Challenging economic conditions have prompted society to question why so much money is being poured into the tertiary sector. Direct funding for universities has declined as the funding model moves to providing individual tertiary education allowances. The allowances only cover a small portion of the costs of a fulltime course. The Government is prioritising other areas above tertiary education and is less interested in management of the sector, instead reducing restrictions within the sector. Consequently, tertiary providers have been forced to find their own way in the tough economic environment.

The tertiary education sector is becoming more commercialised, as the elite education centres are attracting international attention and the research centres are attracting funding.

What funding is available is being used to invest in the practical skills, which cannot be delivered by AI or robotics. This investment is also serving the steady flow of unskilled climate change refugees and it is being used by successive governments as their response to concerns about the increasing social costs of immigration to the nation.

There has been a significant reduction in the space that the tertiary sector needs due to the drop in students studying in-person and fulltime. Only the best teaching spaces and student accommodation is kept, and the remaining estate is either sold, repurposed, or left dormant. This allows for better quality experience for the elite students who are studying fulltime and on campus.

The research spaces are being taken over by the private research centres that are being established across the country.

Research

Public money for blue skies research has dried up and the private sector has been selecting the choice parts of Aotearoa's research capabilities. Those in the international business community who are looking ahead and see the climate pathway that the world is on are gravitating toward more remote areas to operate from. As a consequence, they will be less likely to be affected by growing global tension.

Aotearoa is starting to see an inflow of investment and relocation of international research capabilities. The quality of the academics relocating to work in Aotearoa-led research centres creates an environment where the best researchers are available to those attending the elite tertiary institutes.

University research is more and more devoted to addressing problems being faced in the large population centres of Europe, Asia and the Americas. A larger share of research revenue, for example, comes from participation in Horizon Europe programmes and there is little knowledge transfer to New Zealand research end-users who are financially constrained.

Teaching

As the government no longer fully funds the tertiary sector, it has lifted pricing restrictions. While this keeps the providers' doors open, the sector shrinks in size and becomes market focused. A smaller sector means that only the courses that attract students to pay the growing costs of fees are offered. This accelerates the move to offer bite sized learning, which over time can be built into a full qualification. This makes some tertiary education accessible beyond the wealthy elite.

This situation creates three tiers of students: The small number of wealthy elite, who can afford the traditional model of extended periods of in-person study; those who work and study in-person on a part-time basis; and those who rely on overseas virtual delivery.

Local and global context: 2040-2090

Environmental impacts

The steady increase in extreme weather events both nationally and internationally over this period has created social challenges of an order of magnitude never seen before.

Frequent flooding events across the world are putting port cities at major risk and are damaging key infrastructure in metropolitan areas and global supply chains are failing to meet demand.

World crop production has decreased by 30 per cent leading to widespread famine. Aotearoa has also seen a decrease in crop production, along with more threats to biodiversity, as both local and invasive pest species increase dramatically. The invasive species have affected both land and marine life.[53]

The environmental impacts on Pacific Island nations have been catastrophic and while Aotearoa and neighbouring countries have supported efforts to mitigate the effects of weather events and sea-level rise, and contribute toward managed retreat costs, these are no longer options for some nations. As such, Aotearoa has increased the number of Pasifika migrants it allows into the country annually, providing support where it can to enable people to better adapt to life in Aotearoa after experiencing the trauma of losing their homelands.

That trauma is also being felt within Aotearoa's boarders as coastal and flood-prone areas become uninhabitable. Some Māori communities who have preferred to move into a more marae-based lifestyle are now having to make heart-wrenching decisions around parting with ancestral lands, including marae and urupā. There are efforts being undertaken locally to preserve sacred places where that is possible, but the situation in some areas is dire, with safety of people ultimately being the priority.

Social response

The world population continued to climb, before plateauing at 10 billion in the 2080s, while Aotearoa's population increased to 10 million, largely due to the influx of climate refugees. Tensions have grown over the years as cultures clash and there is a feeling of a loss of national identity.

There is also tension between employed individuals who can afford the resources necessary for a decent life and those who must rely on the state, often continuing to live in areas with the highest risk of climate events.

Reduction in state support sees a move away from the nuclear family to an extended family unit who shares income, assets, and knowledge. The family units are typically in older age brackets as people are opting to have fewer children. This familial structure helps to provide support for elderly and disabled family members. The sharing of property also ensures that space is fully utilised.

There is a crippling housing crisis in Aotearoa as the population tops 10 million. The cities that were hollowed out in the first half of the century now become the shanty towns of immigrant communities.

In contrast, there are more gated communities where the wealthy seek preservation of their lifestyles and safety away from the intense problems plaguing society.

Social aspiration for the average New Zealander is heading toward portable, flexible lifestyles to be able to quickly adjust to change. This is growing recognition that there is little point in acquiring more assets, only to risk them needing to be regularly repaired, replaced, or ultimately washed away.

Mental health concerns are at an all-time high as people face relocation, financial burdens, and having to live with less. Sadly, this is also contributing to the erosion of social cohesion, with increases in crime and lawlessness.[54]

Economic outlook and political situation

After spending decades fighting to change the outlook for the coming years, while being faced with continued global overconsumption, overpopulation, and very little climate progress, Aotearoa's government has clarified its position on the way forward: Aotearoa will focus its efforts on adaptation.

This change in position comes as a blow to the nation, but communities are tired. People are in survival mode. It is seen as time.

Central public funding is too stretched to respond to the scale of regional climate events. Regions question the value and costs of centralised national administration and eventually decentralisation occurs.

Despite low funding and resources, this move allows regional administrations to channel support to where it is most needed.

However, decentralised administration does bring with it competition between regions to attract data and research centres, innovation hubs and manufacturing facilities and with those who are successful being better able to support their communities through jobs creation and positive movement in the local economy.

With large national insurers no longer a viable option, regions have begun to self-insure. To ensure that regions are only protecting their own people, border control points have been instituted.

Toward the late 2080s, there is international interest in the wealth being generated and held in successful regions within Aotearoa.

As a result of this interest, these regions are negotiating a mutual defence union and associated investment in defence capabilities and international alliances.
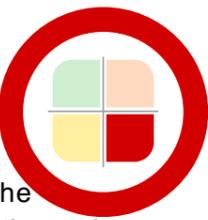
Talks between the mutual defence union and potential international alliances are fraught with complexities, however, given the global geopolitical environment. With warring factions the world over, each competing for food, water, and scarce resources, the political domain is harder to navigate than ever before. These warring factions have disrupted Aotearoa's food and fibre export markets, with some previous high value markets closed to New Zealand producers.

Emerging technology and innovation

While the country is divided along geographic lines, there are also divisions between those who have accepted AI and those who have preferred to rely on community and their own abilities to navigate the changing world.

The effects of this division have been especially felt in regions with local governments who have not embraced AI.

With more data centres preferring to relocate to Aotearoa's cooler climate and more stable environment, regions who have turned away from AI opportunities have lost valuable economic benefits for their people and towns.

For some, though, AI is seen as a detriment to communities because of its broad use across many sectors and the effect that has had on the job market. Public service jobs, which were once a viable career option for people with varying backgrounds and skills, have been condensed with multiple desk-based roles now being filled by AI.

Although this has led to efficiencies and different types of job creation (specifically in IT), it has contributed to many highly skilled individuals being unemployed.
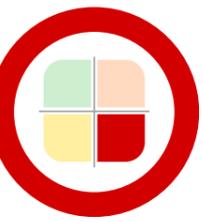
One of the key areas where AI has been effective on a national level, however, is in reducing food waste from 33 per cent to 10 per cent. The increase in plant to mouth management played a critical role in mitigating the challenges of food supplies in the 2060s. This coupled with food rationing throughout the 2060s and 2070s helped to ensure the security of Aotearoa's food supply by the 2080s.

AI is also being used to provide more accurate forecasts of future climate events, allowing a responsive approach with pre-event evacuation and protection of assets in the areas affected.

Kahu, Māori student at a local Wānanga in 2050

My partner and I have lived in Auckland for years, I get home to Te Tai Tokerau from time to time, usually for birthdays or funerals, not really much else.

Last year, my in-laws moved up from Whakatāne to live with us. They don't like being in the big city and would much rather be back in Whakatāne. They miss the hau kāinga, and their marae, even though they understand that they couldn't stay down on the coast. Although we aren't too far from water, it's not the same, and the crowds of people make it tough for them to be part of a community. We have a hydroponic garden now, which helps with produce etc., but it's not the same as what they had.

Being in Auckland has meant that my whānau is closer, but we don't get back to our marae, really. I've missed several tangihana (funerals) just because it was too difficult and expensive to get back there. We did get to watch the service being broadcast but it's not the same as being there in person, and helping out.

I am studying part-time at the local Wānanga hub, which has labs and other communal facilities. We meet with our kaiako (tutor) once a fortnight in person, and meet online in between, we hope to be able to have a noho marae later in the year.

We are getting along with life, but it is different. We are here in Auckland and have found a new extended whānau in this region - we all look after each other and help the local iwi and hapū when we can.

Shannon, mid-career academic at a Wellington University in 2072

The rise of online study options from the big global institutions really hit Canadian universities hard. I lost my job, but I loved academia, so I looked around the world for other opportunities. I found a role in the Psychology department at my current University and convinced my partner to move halfway around the world. We've been here ever since.

My love of academia has faded over the years. I haven't had a pay rise in years and my teaching load steadily increased. My university has just been sold to EduTech, and their model is to sell education to wealthy students. To be fair, they do plan on focussing on education for climate solutions, which is admirable, but I hate the elitism.

So, I've finally made the move and taken a job for a company that develops holographic AI companions. I'll be helping to make the companions more human-like. There is a booming market for them as social isolation is a huge problem resulting from all the climate events devastating communities around the world. Just last year we had four different coastal towns around Aotearoa inundated from different storm surge events. Hundreds were killed and tens of thousands of people were left homeless. If only they'd done something about climate change 50 years ago!

On a positive note, we've been adopted by a lovely kiwi family. They lived in the CBD, but decided the constant flooding and crime made it unsafe for the kids so moved out to Johnsonville. They had a spare bedroom so offered it to us and we jumped on it. Now their parents have moved in too, so it's a bit of a squash, but we don't have any other options. We feel lucky that they've been so kind to us. There is a real backlash against immigration now and all the climate refugees. It gets pretty ugly sometimes, but I think we avoid the worst of it.

Tertiary context

The most critical change to the tertiary sector is that the few surviving tertiary institutions have now all been sold off and the sector is now run through private companies, rather than as public sector entities.

Private institutes provide short courses and practical skills training, which allows small cohorts of students to upskill while they work, with the first few years of these short courses paid for through the individual tertiary allowances. There are only 30,000 students enrolled in these private institutes across the country – a dramatic reduction in the size of the sector.

The need to have small campuses has allowed the private tertiary sector to condense its estates. The high prices it can charge for attendance is allowing the sector to adapt its buildings to the range of extreme climate events, with good shade and air flows to manage hot days and thermal insulation to manage cold days. Energy is also generated on shared sites with research centres in gated tertiary enclaves.

Campus buildings are required to be built well above sea level and are designed to deal with high wind speeds and intense rainfall. Academic areas have their own water storage and space to grow crops as micro exemplars of circular usage of resources.

Research

Research funding is solely provided by the private sector. However, a proportion of the funding is ear-marked to respond to national challenges to maintain the public support for these elite institutions.

As tertiary education has moved toward being a luxury option afforded to society's elite, and with research centres being privately owned and managed, course offerings shift away from mostly climate-related topics to a reintroduction of the arts.

This further sets tertiary researchers apart from the everyday struggles of the majority of the population.

Teaching

Several small elite private 'universities' have grown in quality and international reputation. These organisations have specialised in a select few academic areas only wealthy New Zealanders can afford to attend, which further exacerbates the massive inequities across society. The elite private universities have aligned the areas they teach with the demands of the private research centres, which have grown in Aotearoa. Attendance at one of these elite private universities is seen as a guaranteed pathway to a secure and well-paid career.

Many individuals who cannot afford private education are turning to AI. AI educators are provided by international universities and institutes and are supported by augmented reality learning packages. One-on-one AI support, which goes at the pace of the learner, has dramatically increased the success rates of those relying solely on online packages.

The network of international elite universities jealously guards the development of the AI educators. Controlling the development of AI education ensures that while they provide a sound education it is not at the level of premium education, which helps to protect the status of private institutions.

He kupu whakatepe | Conclusion

The scenarios presented in this report give insight into what might be ahead. Some points may have resonated more than others. If they have been provocative, then they have succeeded in their task.

Mitigating the effects of climate change is still vital in order to achieve a future with warming kept to a minimum. This will take collective effort and there is a critical role for the tertiary education sector to play in reducing emissions and pushing for wider change.

It is clear that the real possibility for runaway climate change needs serious consideration. A much warmer world will give rise to very different ways of living. Although it is hoped that the high physical impact scenarios will not be the future, we must still prepare for that eventuality.

As noted, there are starkly different effects on the tertiary education sector through each scenario, from serious risks to ways of teaching and learning to irreparable damage to infrastructure and estates. In contrast, opportunities have presented themselves in the form of embracing mātauranga Māori, building connections with communities, local learning, and partnerships with businesses, local government, and research centres.

One of the common themes in most of the scenarios is the decreased role of on-campus teaching and learning.

Advances in technological offerings, whether through international online education or the emergence of enhanced AI, is an area that needs to be worked through immediately.

Societies will be seeking innovative solutions to the various challenges brought about by new ways of living. The tertiary education sector has much to offer and must be in a position to seize the opportunities as they arise.

The sector should also prepare for financial conditions to worsen as tertiary education shifts and adjusts to different student numbers, potentially much smaller campuses, and competition from offshore education providers.

The effects of climate change will be felt differently throughout the nation. Geography will be a significant contributing factor to what ensues. This means that each institution will be impacted differently and will need to plan accordingly.

What follows is part of a kete of material to support and guide institutional planning. With future-focused strategic planning, Aotearoa's tertiary education sector can continue to thrive for generations to come.

Using the scenarios

This section outlines some suggestions about how to use the tertiary sector climate change scenarios to support the development of actions for individual tertiary institutions.[55]

Step 1	Understand the nature of the of the climate change scenarios and what they can be used for.
Step 2	Identify the risks and opportunities that are relevant for your organisation based on the scenarios.
Step 3	Agree the top 4-6 climate risks and opportunities that your organisation should prepare for.
Step 4	Agree on the organisation's response to the priority risks and opportunities.
Step 5	Review the risks and opportunities identified against the organisation's existing risks.

Step 1: Understanding the scenarios

As has been discussed at the beginning of this report, scenarios are not predictions of the future or our preference for what we want the future to be. Instead, they are plausible, internally consistent explorations of possible futures. The scenarios can be used to identify risks and opportunities, test the robustness of policies, and develop a shared understanding of the choices we face.
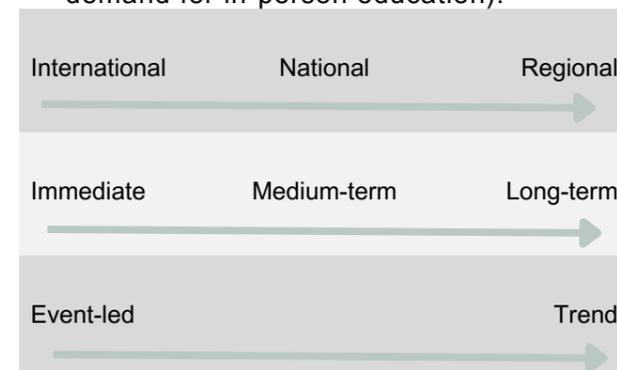
When using the scenarios in institutional planning, some parts may be of more relevance than others. This is particularly the case where institutions are located in contrasting geographical environments, i.e., flooding may be the primary concern in one area, while drought is for another.

Institutions are encouraged to identify which pieces of the scenarios are most relevant, which pieces they may need to change and which they may need to elaborate on. Ideally, this process will be completed in collaboration with iwi and local stakeholder groups to ensure the scenarios work for them.

Step 2: Identifying risks and opportunities

There are many different types of risks. Climate change risks and opportunities can be considered in terms of:

- broader international risks (e.g., global recession) through to risks specific to tertiary providers (e.g., regulation of the tertiary sector).
- those which are more immediate (rising cost of flood insurance) and those which are on the longer-term horizon (increasing international immigration of climate refugees)
- those which are the result of an event (e.g., coastal flood) or those which build up over time (e.g., changing levels of demand for in-person education).

International	National	Regional

Immediate	Medium-term	Long-term

Event-led		Trend

In using the scenarios as part of strategic planning and/or climate change-specific planning, institutions are encouraged to agree the strategic climate risks and opportunities that are most relevant for your organisation.

Strategic climate change risks are defined as those which **may make it difficult, or even impossible, for an organisation to achieve its objectives and strategic goals.** Strategic climate change opportunities are those which could help your organisation achieve its goals and strategic objectives.

The scenarios are designed to stimulate an assessment of risks and opportunities. They are not comprehensive narratives of all that could happen over the next 75 years.

There may be risks and opportunities, especially those that are specific to particular institutions that are not explicitly covered within the scenarios.

Step 3: Ranking climate risks and opportunities

Once your institution has a set of prioritised risks and opportunities, these can be ranked based on how likely they are to materialise and the level of impact they will have on the organisation.

A matrix approach will be helpful to plot the risks and opportunities on. An example of such a matrix is below:
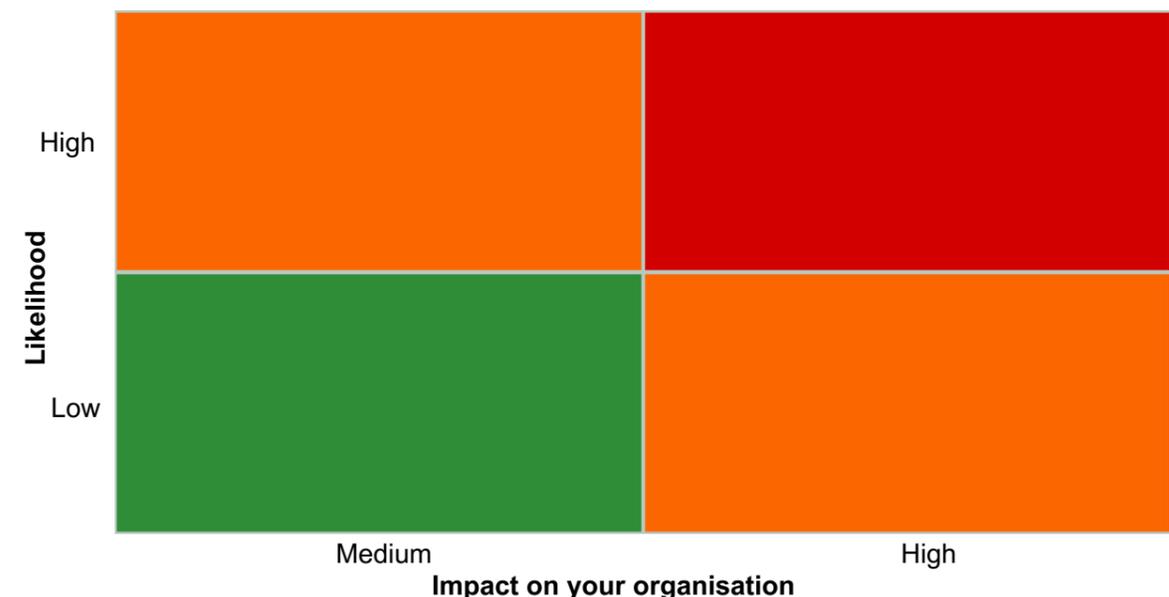
There are risks and opportunities that are present across multiples scenarios, and this indicates that they are either more likely to occur or that they are already existing issues with growing trends or one that is already front of mind for society. These are areas that may already be captured in institutions' planning processes.

Step 4: Agree how to respond to the priority risks and opportunities

At this point, institutions are encouraged to determine the best approach to mitigate the risks and take advantage of the opportunities identified in the steps above.

Consideration should be given to the risks ratings identified in Step 3, the time horizon required to implement mitigation measures, and roles and responsibilities in that implementation.

In exploring the nature of the impacts of risks that institutions may face, it can be useful to use a framework, such as Grace LaConte's 5 Types of Strategic Risks, which includes: reputational, financial, competitive, governance, and operational risks.[56] LaConte suggests that governance is the most critical strategic risk, in particular, the need to have an unbiased perspective of the organisation's operating environment and the challenges within it. Institutions may wish to consider the processes around how best to approach risk mitigation, which leads directly into the final stage.

Step 5: Consider the implications for strategic planning and risks processes

During the final stage of planning using the scenarios, institutions will be challenged to consider some of the tough questions around how mitigating the risks and taking up opportunities fit within already existing planning and processes, and what might need to be updated and adapted.

Examples of the sorts of questions institutions may wish to ask include[57]:

Governance
- Is your institution's governing body overseeing climate-related risks and opportunities?
- How flexible is the institution's operating model to adapt to changing student numbers, ways of learning, and locations where teaching and learning can take place?

Strategy
- Do you have a climate action plan, which is aligned to and referred to in other planning documents?
- How competitive is your digital offering and how important is it for your future success?
- Do you have the capability to meet increasing demand for training in areas such as hydraulic engineering, biodiversity, future crops, effective application of AI, and social resilience?
- Are your campuses at risk of coastal flooding?
- Do your campuses meet carbon expectations and are they well-suited to future weather patterns?
- Do you have plans for cooperation with other tertiary education providers?
- How well have you progressed on issues like engagement with your local council on the use of shared space and the use of your campuses in emergencies?

Risk management
- Are climate-related risks detailed in your institution's risk register?
- Have you discussed future risks and opportunities for the land beneath your campuses with iwi?

Metrics and targets
- Does your institution have appropriate metrics and targets to manage and assess climate-related risks and opportunities?

This is by no means an exhaustive list but provides some guidance around the types of questions that institutions can start asking. The discussions had around these questions will tie into various existing planning processes, such as institutional strategic planning; teaching and learning strategies; strategic asset management planning; campus development planning; continuity planning; organisational and departmental risk registers; health, safety and wellbeing policies and processes; and estates and facilities policy development.

By agreeing early on what the major concerns are in relation to climate change, and incorporating consistent messaging around risks, mitigations, and opportunities into organisation-wide planning processes, institutions will be allowing the best possible chance of future success.

End notes

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Using the scenarios:

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Photos:
All photos used in this document are from Canva, Pexels, personal photography, and the Te Herenga Waka Victoria University of Wellington Sustainability Photo Library.
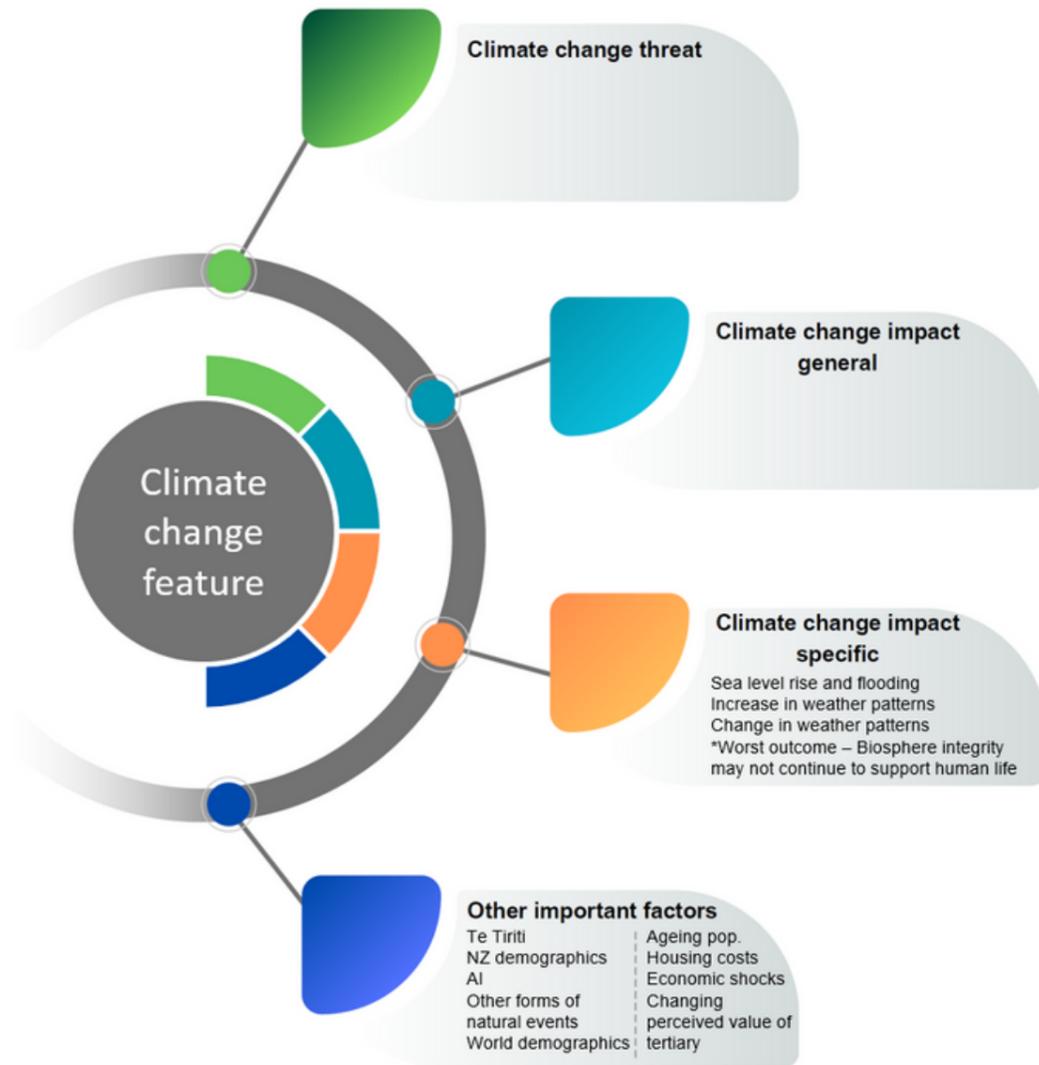
Vignette avatars:
The avatars alongside the vignettes were partly AI generated (via Canva) and partly created through digital art using Procreate.

Scenarios system impacts

Climate change feature

Climate change threat

Climate change impact general

Climate change impact specific
Sea level rise and flooding
Increase in weather patterns
Change in weather patterns
*Worst outcome – Biosphere integrity may not continue to support human life

Other important factors

Te Tiriti	Ageing pop.
NZ demographics	Housing costs
AI	Economic shocks
Other forms of natural events	Changing perceived value of tertiary
World demographics	

Primary Impacts

- Social pressure for change

- Social pressure for change
- Economic disruption
- Unstable government
- Habitat lost

- Polarisation of views
- Distrust in information
- Shift in power brokers
- Increasing inequity
- Geopolitical conflict

- International coastal flooding
- Pacific Islands inundated
- Domestic coastal flooding

- Domestic flooding

- Wind damage
- Heat/cold human health
- Heat cold crop damage

- Crop viability changes
- Increase in food pests
- Increase in human disease carriers

- Tech dependency

Secondary Impacts

- Policy and regulatory changes to reduce carbon
- Investment in new technology
- Rising cost of energy
- Rising cost of air travel
- Sector decarbonising
- Te ao and tikanga Māori

- Regulatory changes
- Degrowth and inflation
- New economic models (e.g., doughnut)
- Socioecological aims from investments

- Investment in technology
- Investment in social cohesion
- Mass unemployment
- Increase in insurance and other costs
- Increase in cyber threats
- Effects on Māori and Pasifika disproportionate
- Military conflict
- Military investment and blocks
- Supply chain vulnerability

- Mass migration
- Social cohesion affected
- Rising houses prices
- Rising social support costs
- Mass influx of Pasifika
- Cost for barriers/relocation
- Insurance withdrawals
- Impact on mental health
- Stranded assets

- Impact on communities

- Regional impacts
- Challenge to social cohesion
- Transport infrastructure and services disrupted
- Mass migration
- Increased mortality
- Reduced availability of food
- Impact on social cohesion

- Change in food available
- Mass migration
- Reduced availability of food
- Impact on social cohesion
- Economic and social impacts
- Increasing frequency of pandemics

- *Purpose of learning strategic response to climate, funding models aligned to this
- *No more carbon-based travel

- New capabilities
- Inequities (have and have nots of best AI support)
- Economic and social impacts
- Increasing international competition
- Changing patterns of learning
- Changing location of learning
- Changing affordability of learning
- Changing investment in tertiary

Direct Impacts

COST PRESSURES
- New operating models e.g., specialist teaching and research
- Increasing costs from supply chain vulnerability
- Increasing costs dealing with risks
- Increasing compliance costs for universities providing support
- Increase costs, insurance, energy etc.

STUDENT DEMAND
- Fewer international students/students no longer travelling
- Change in student demand with economic disruption
- Tertiary just for the rich, as tertiary unaffordable
- Increased emphasis on Māori and Pasifika
- Periods with no students because of war
- Increase or decrease in international students due to conflicts
- Increased in student demand from migration
- Pasifika education demand as island lost
- Work for food comes before study for the future
- Survival comes before study for the future
- Changes in demand due to world demographics
- Changes in demand due to ageing
- Changes in demand due to housing costs
- Changes in demand due to economic shocks
- Changes in demand due to changing employer expectations

STRUCTURE
- Consolidation with Australia, as money is tight
- Sector consolidation as costs escalate
- Tertiary institutes fail/sector consolidates/assets consolidated
- Wananga increase market share
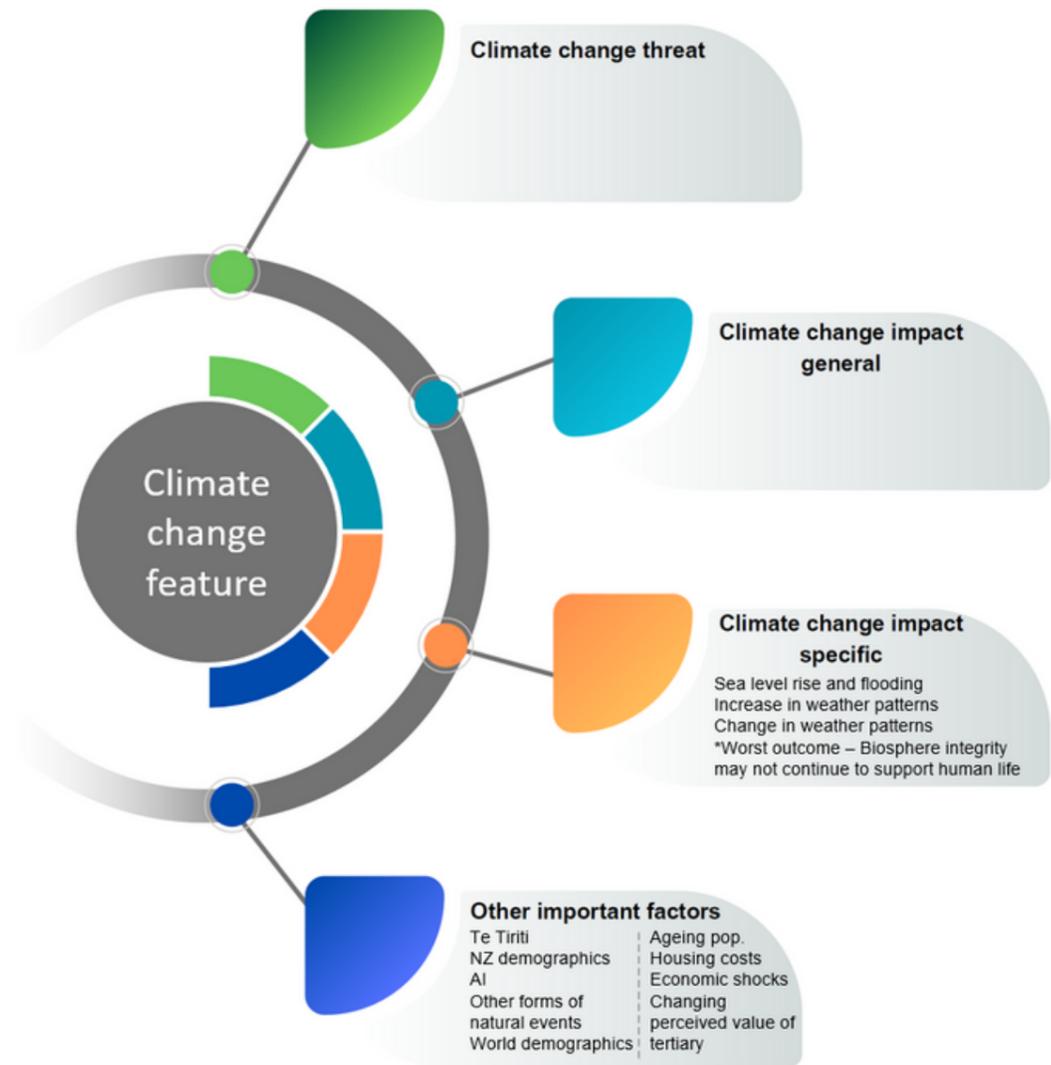- Wananga integrated with other tertiary

SKILLS
- Demand for new skills for climate response
- Increase in demand for digital learning to reduce carbon from travel
- Demand for multi-disciplinary and market responsive training
- Government setting skills balance with associate tertiary places
- Work-based learning increases for climate industry
- Education to support transformation, emphasis on necessary skills and knowledge transfer
- Smaller bundles of learning – practical, not academic
- Change in skills needed due to AI
- Te ao and tikanga Māori curriculum increase

FUNDING OF TERTIARY EDUCATION SECTOR
- Cost pressures on tertiary institutes as $ go to climate response
- Decrease in tertiary funding as $ go to climate response
- Increase in funding to deliver solutions and social support and change
- Increased funding for Māori and Pasifika education

Scenarios system impacts

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Climate change impact general

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Sea level rise and flooding
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Climate change feature

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- Changing affordability of learning
- Changing investment in tertiary

Direct Impacts

ROLE OF THE TERIARY EDUCATION SECTOR
- Applied research demand – government directed
- Social conscience role – just transition
- Public expect more direct benefit from tertiary
- Social conscience role – source of truth, reduce polarisation
- Applied research demands for islands
- Social conscience demand for islands
- Increasing role of tertiary supporting community outcomes

- Research on localised responses
- Community stability becomes a draw and role for tertiary
- Applied research on new crops
- Applied research on new pests and disease
- Applied research to respond to challenges, dispersed academics
- Supporting local solutions in collaboration with communities
- Change perceived value of tertiary
- Increased role of tertiary to carry and communicate tikanga
- Te ao and tikanga Māori based research

FORM OF LEARNING
- Offshore centres or collaborations to reduce travel carbon
- Language implications from mass migration
- Universities swamped – using more local and distance learning
- Localised tertiary education responding to climate challenges
- Integrated learning systems allowing anytime study
- Reduced confidence in face-to-face due to travel disruptions
- Increased use of online and AI
- Replace existing channels of learning due to AI
- Commoditisation of learning
- Reduced costs of learning, democratising education

STUDENT WELLBEING
- Wellbeing challenges for students and staff as coping with personal climate impacts
- Wellbeing challenges for students and staff

OTHER RISKS
- Data management and sovereignty issues from cyber-attacks expected
- Inequality as immigrants (illegal) not able to access tertiary
- Increase in student demand from the Pacific Islands