Opportunities for education in a changing climate

Themes from key informant interviews

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Rangahau Mātauranga o Aotearoa

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NZCER's research project "Educational policy and practice for a changing climate" explores what kinds of changes or adaptations our education systems may need to make in the immediate and short-to-medium-term future in response to climate change. This report outlines findings from one component of the project: in-depth interviews with 17 individuals with a range of viewpoints on climate change and education in Aotearoa New Zealand. Five priority perspectives were identified for this phase of the research: youth (aged 16–25); educators; Māori; Pacific New Zealanders; and people with an academic, system, or policy perspective. The interviews provided an opportunity to explore diverse, contextualised views. However, the views of the key informants are not intended to be generalisable or representative. In other parts of our project, we are using surveys and other methods to gather a wider set of views and insights about current thinking and practice around climate change and education.

Everyone we interviewed shared at least one thing in common—they were all concerned about climate change and its impacts for Aotearoa New Zealand, and believed it was important for the education system to be responsive. The perspectives and practice examples shared in this report suggest there is scope for growth and development in the way that schools and wider education systems in Aotearoa New Zealand engage with, and respond, to climate change. The practice stories shared by key informants suggest that localised innovation and change is possible, particularly when young people and communities are mobilised, engaged, and informed about the causes and consequences of climate change, and what they can do to make a difference. However, wider system structures, norms, and mindsets play a role in enabling or limiting the extent to which young people and communities can engage effectively with climate change.

Intergenerational and "big-picture" thinking motivates people to respond to climate change

Interviewees saw climate change as a "big-picture" issue, involving complex interacting systems, and intersecting worldviews. They acknowledged that it could be challenging, both intellectually and emotionally, for people to engage with the complexities and interconnectedness of climate change. Some interviewees had thought a lot about how to effectively support and empower people of different ages and backgrounds to see the "big picture" as well as seeing what they can do to make a difference. Interviewees' own motivations to respond to climate change stemmed from a variety of personal experiences and backgrounds. A linking theme was their sense of moral, ethical, and intergenerational obligation and responsibility, to past and future generations, as well to non-human beings.

The impacts and consequences of different worldviews, including cultural worldviews, were prominent in interviewees' explanations for the deeper drivers of climate change and environmental loss, as well as their views on potential solutions and ways forward.

Interviewees anticipate a web of interconnected impacts on Aotearoa New Zealand

Most interviewees' expectations about climate change matched recent published scientific, economic, and policy analyses. They anticipated a web of interconnected impacts, including physical/environmental impacts such as sea level rise, flooding, drought, and other extreme weather events. They expected climate change to have impacts on non-human species, as well as social, cultural, economic, and health impacts for people—some of which are already being experienced in some communities. Māori interviewees discussed specific impacts for Māori, including on mahinga kai. Specific impacts for Pacific New Zealanders were also discussed, including how their lives are affected by climate change impacts in Pacific nations as well as within Aotearoa. All interviewees also talked about climate change having unequal impacts for different people and groups, and the relationships between climate change and other social and economic inequalities.

Climate change needs to be more visible as a priority across the education system

Most interviewees thought that climate change is not currently a clear or visible priority for the education system in Aotearoa New Zealand, although there are pockets of interest and innovation across the system. Where climate change was a focus within interviewees' schools and institutions, this was often attributed to individual teachers or students choosing to make this a priority in their setting. Interviewees identified the need for clearer signals "from the top down" that education can—and should—engage with climate change.

Interviewees could see many opportunities for education that are yet to be fully realised across the system

Most interviewees highlighted the important role education can play in nurturing the potential of diverse young people to engage in positive, solutions-focused climate learning and action. Many interviewees talked about the importance of supporting young people to develop their ideas and visions for a sustainable future, and to identify actions they can take towards realising that future. Many interviewees discussed the value of students' involvement in collective, place-based approaches, and community-wide responses to climate change. At the same time, interviewees identified the need to scaffold learners to ensure that they were building knowledge in key areas. Interviewees also talked about the development of students' ethical thinking, systems thinking, and critical thinking, and ability to question and challenge established norms and systems that may work against the goals of sustainability and a safe climate future.

Interviewees also talked about the importance of focusing on new kinds of career opportunities and pathways associated with a transitional economy, and the shift to a low-carbon future. They argued that schools should be helping to make clear what learning and qualification pathways students can take to move into these areas, and get young people engaged and excited, rather than disengaged, depressed, or feeling like they have no future. Interviewees suggested the interdisciplinary and cross-cutting nature of sustainability and climate change lent itself to approaches that integrated across school subjects and disciplines. However, challenges were noted for integrated and cross-disciplinary teaching and learning when subject separation is more common. Finally, interviewees suggested a more coherent systemic response to climate change would require strong alignment and prioritisation within education sector policy and practice, as well as planning and co-ordination between education and other sectors.

1. Introduction

> **If we let science drive policy – which I think we should – then let's let it drive our pedagogy too, and move away from this idea of 'do you believe in climate change?' to a position where we say, 'climate change is happening'. It's our moral obligation as educators to prepare our young people for this, and to give youth a role in leading this change.**
>
> (Tertiary educator)

NZCER's research project "Educational policy and practice for a changing climate" explores what kinds of changes or adaptations our education systems may need to make in the immediate and short-to-medium-term future, in response to climate change. The project, which began in July 2019, is guided by the high-level research questions in Table 1 and uses a mixture of methodologies including literature reviews and document analysis, key informant interviews, and surveys.[1]

TABLE 1 **Overarching research questions guiding the project**

1. According to national, international, and indigenous perspectives, how could Aotearoa's education systems and policies respond to climate change?
2. To what extent is climate change considered an urgent issue or priority in the education system (for schools, kura, and in terms of system-level educational policy and planning)?
3. What can be learned from kura Māori and kaupapa Māori approaches and responses?
4. What are the implications or impacts of student-, school-, and community-led climate responses for the educational system in Aotearoa New Zealand?
5. What might education look like in Aotearoa New Zealand if climate change mitigation and adaptation were factored into policy and practice across the system?

1 All publications from the project will be available at https://www.nzcer.org.nz/research/climate-change

This report outlines findings from in-depth interviews with 17 individuals with a range of perspectives on climate change and education in Aotearoa New Zealand. Five priority perspectives were identified for this phase of the research:

- Youth (aged 16–25)[2]
- Educators
- Māori
- Pacific New Zealanders
- People with a system view (e.g., academic, sectoral, or policy perspective).

Some interviewees were able to speak from more than one of these perspectives. Each person also brought additional perspectives (e.g., speaking as a parent/grandparent, scientist, school trustee, youth council representative, descendant, or future ancestor). The interviews provided an opportunity to explore in-depth, diverse, contextualised views. However, the views of the key informants are not intended to be generalisable or representative, nor are they only points of view that are worthy of exploration. In other parts of the project, we carry out surveys[3] and syntheses of national and international literature to present additional perspectives.

The interviews were carried out between October 2019 and March 2020 (see Appendix 1 for methodological details, including participant selection). Of the 17 interviewees:

- Eleven identified as educators. This included primary, secondary, and tertiary teachers, and people facilitating sustainability or climate change education within the community. The educators' specialist domains included earth sciences, early childhood education, teacher education, social work education, kaupapa Māori education, sustainability, and disaster recovery and resilience.
- Nine people identified as having a system view. This included researchers and academics, people working in national networks or organisations whose roles gave them insights into activities happening across regions and systems, and people with depth in indigenous cultural knowledge systems (mātauranga Māori, and Pacific knowledges).
- Four interviewees identified as Māori, including one youth and three educators. One of the educators was also a scientist, and two were facilitators working with schools, kura kaupapa Māori, and marae.
- Four interviewees identified as Pacific New Zealanders, including people with Samoan, Tongan, and Fijian backgrounds.
- Three interviewees identified as youth aged 16–25, including one who identified as Māori. Two were high school students, and one was a university graduate.

Everyone we interviewed shared at least one thing in common—they were all concerned about climate change and its impacts for Aotearoa New Zealand and believed it was important for the education system to be responsive. Most were directly involved in some way with climate change mitigation and adaptation activities, and most also had a greater level of knowledge about climate and sustainability science and policy than might be expected of the general population, due to their involvement in research, teaching, and/or activism in these areas.

2 We acknowledge the importance of seeking children's views, knowledge, experiences, and opinions in relation to climate change. The reason for not including younger children as interviewees in this phase of the research was primarily methodological, as it would require different methods and consent processes. Recent research that provides important insights about climate change and young people's concerns and hopes for the future include the New Zealand-based Youth19 survey (Fleming et al., 2020) and a systematic review of research on children's voice in climate change education (Rousell & Cutter-Mackenzie-Knowles, 2019).

3 See Bolstad (2020a) for findings from a 2019 survey of primary and intermediate schools teaching in English medium, and Bolstad (forthcoming) for findings from a 2020 survey of English-medium secondary and composite schools.

Other reports and articles from this project have outlined the current scientific consensus on anthropogenic climate change, how the international community has responded to date, and the role that education is seen to play at a global level in supporting mitigation and adaptation efforts (see Bolstad, 2020a, 2020b). This report draws out themes from key informant interviews, and shares stories from their practice that illustrate localised educational responses to climate change in different settings.

Overview of chapters

CHAPTER 2 discusses the challenges and the opportunities that interviewees could see at the "big-picture" level. Interviewees also talked about their own relationship to climate change, and what lay behind their own sense of obligation to take action.

CHAPTER 3 discusses the impacts that interviewees expected climate change will have for Aotearoa New Zealand.

CHAPTER 4 discusses how interviewees think education is currently responding to climate change.

CHAPTER 5 outlines the big opportunities they could see for a systemic educational response to climate change.

CHAPTER 6 shares five practice stories that illustrate how climate change and sustainability education and action can be enacted in different contexts.

CHAPTER 7 discusses the implications of the findings and next steps for this research project.

2. Seeing the big picture

> **I think that's one of the most important things to do—asking yourself the question, what consequence does this have on our planet? What consequence does this have on our society?**
> (Māori secondary student)

The people we interviewed tended to see climate change from a "big-picture" perspective. They recognised there were multiple interacting systems at play, including complex earth systems (e.g., atmospheric, oceanic, and biological) and complex human systems (e.g., economic, political, social, cultural, and health). They also discussed the wider historical, economic, technological, and cultural drivers that have shaped current relationships between humans and the environment.

Many interviewees pointed towards systemic and integrative ways of thinking as the keys for finding sustainable solutions to mitigate and adapt to climate change, and ultimately work towards a better future for people and the planet. This chapter discusses the challenges and the opportunities that interviewees could see at the big-picture level. Interviewees also talked about their own relationship to climate change, what drove their own sense of obligation to take action, and the worldviews that framed their thinking.

The challenges and opportunities of seeing the big picture

Interviewees acknowledged that it is not necessarily easy to see climate change in terms of the "big picture", or to understand how multiple complex systems interconnect. Some interviewees had undertaken a significant amount of research and independent study to deepen their understanding about climate change and sustainability. Some had professional roles as educators or facilitators in these domains. Many had thought a lot about how to effectively educate and communicate climate and sustainability knowledge with others in their professional and personal lives. Some spoke to the challenges of providing accurate information to encourage knowledge-building, acknowledging

the psychological and emotional impacts that climate change knowledge can trigger. Some had experienced feelings of distress, anxiety, depression, frustration, or anger as they learned about the causes and potential consequences of climate change, and the historical, political, and economic drivers. Understanding how everyday activities can be linked back to climate change and environmental impact meant that it could be hard to not be thinking about it constantly.

> Once you understand climate change impacts in the global, connected sense, [you see it] everywhere you go, [and that everything] from the supermarket to putting on the TV, to eating food, to drinking coffee is connected [to climate change]. (Tertiary educator)

Some interviewees felt frustrated that they could not seem to enable other people to see things as connected.

> I go ARGHHH because I see the bigger picture … How do you get people to connect the dots? How do you [help them] connect colonisation to climate change? How do you [help them] connect mātauranga Māori to climate change? (Community educator)

However, most interviewees also expressed feelings of hope, optimism, and even excitement about the opportunities that climate change presents for changing "business as usual". Again, stepping up to the big-picture view, interviewees pointed to recent social and political events that gave them the sense that many people are interested in acknowledging and addressing climate change, and were ready to make changes. Several interviewees thought that the needle of public consciousness had started to shift, with the visibility of school climate strikes, recent events such as the 2019–20 Australian bushfires, and more frequent media reporting on climate change issues.

> What surprised many adults [about the climate strikes] is the change in tone, we're not talking about climate change as something that is going to happen but that is something that is happening now. It's reached that critical point where people have realised 'it's here now, we've got to do something about it now' and quite often people don't act until there is that urgency. (Primary educator with a systems-level role)

Most interviewees suggested that widespread and rapid change *is* possible when there is a will for it, though some were feeling more optimistic than others that this would happen to the extent they felt was needed.

Sense of urgency and intergenerational obligation to act

Many interviewees felt an overwhelming sense of urgency around climate action. Those who were most directly involved in climate and sustainability action voiced frustration that solutions and changes that are needed are not being put into practice, or not quickly enough.

> The urgency that I feel and that a lot of people feel, but the lack of urgency and understanding that a lot of [other] people also feel. People are still having discussions on 'is it human-induced, is it this, is it that'. I don't think we have time for those discussions. And that's quite distressing. (Sustainability educator)

> As time goes on more people are becoming aware, the literature and the jargon, but we are a million miles away from doing stuff on the ground. The education of this subject isn't catching up, and the solutions that come from it [aren't being acted on]. (Community educator)

Many interviewees also expressed a sense of intergenerational obligation to act on climate change and wider environmental issues. Some spoke of their sense of moral obligation as educators, parents, or grandparents.

> I've got two kids, my son is 14 and my daughter is 10, and they are probably my main motivations for starting that journey in the beginning. (Tertiary educator)

> I was chatting with a few youth and students, and [said to them]: the current government certainly accepts that climate change is real and are taking steps to address it, and so what parts of the zero carbon bill are not delivering on the challenges that you are articulating? And why are we marching today? Their response was 'not enough, not fast enough'. And so from that I felt, okay, as someone who is sometimes in a place of influence, what can I do to make it quicker? (Māori tertiary educator, scientist)

Some interviewees said that climate change factored into their own decisions about having, or not having, children, as well how they thought about supporting children or grandchildren they already had.

> I'm planning on adopting because I'm so concerned about the world that we're creating at the moment. I wouldn't want to bring someone into it. (Youth leader and educator, university graduate)

> As a dad I think well what should I be investing in? Should I buy some land [inland?]. I'm not going full prepper. But what does it mean to say I have a property [in a coastal area] that will be greatly impacted by sea level rise? What is it to prepare for that? (Person with a public sector/systems role)

Two interviewees with Tongan and Samoan backgrounds talked about the obligation to respond to the concerns of elders in their respective communities.

> The older generation in particular are really concerned. (Tongan New Zealander, researcher)

> Having spent 10 days in Samoa recently, it's really resonated to me the significance of climate change on a much more personal level. Driving around the island and going through some issues that we have had in our village around customary lands. I've had a whole week of talanoa with elders in the village. I think taking the time to actually stop and listen and record some of those narratives also from the elders about shifts and changes in the water—particularly because the water has risen quite considerably around our village. (Samoan New Zealander, researcher/ tertiary educator)

Some spoke about their obligation to care for the world in both directions: as a descendant of those who have come before, and as a future ancestor to generations yet to come.

> That's always been one of the underlying drivers of kaitiakitanga, as best as I understand: are we being a good ancestor? And a conceptual description of kaitiakitanga is trying to revitalise mauri. And a definition I've heard of mauri is 'ma-uri' or 'for my descendants' which is a different framing, but the same word as being a good ancestor. (Māori tertiary educator, scientist)

Some cited spiritual or religious bases for their commitments to environmental or social justice. Finally, several interviewees also talked about Aotearoa New Zealand's moral and ethical obligations to the people and nations of the Pacific.

> We are a Pacific nation—we also have an ethical obligation to people and place, land and waters [of the Pacific]. (Samoan New Zealander, researcher/tertiary educator)

Worldviews

Interviewees discussed the consequences of different worldviews on human relationships to climate and the environment (see also Leichenko & O'Brien, 2019). Worldviews that position humans as having dominion over the natural world—variously described as Western, capitalist, patriarchal, "dominant", and colonial—were discussed as significant drivers for current environmental and climate problems, as well as social and health problems. Criticisms of Western/capitalist/colonial worldviews included "commodification" of the natural world, short-term-gain thinking, individualism, and valuing and privileging human interests above everything else. The prevalence and embeddedness of these worldviews in many of our present structures and systems was discussed as a challenge and constraint. Some interviewees also talked about the economic and political interests that are provoked by challenges to these systems.

Worldviews that position humans as part of the natural world, needing to live in balance with nature—such as indigenous worldviews—were discussed as holding many solutions for better ways to live within the natural world.[4] Māori interviewees talked about tikanga and mātauranga Māori providing frameworks for living sustainably, including protocols that help to maintain balance over what humans take from the environment, and what they give back.

> I think that Westernisation has gone down the route of pure and utter efficiency. There is a saying: 'Doing the right thing usually isn't the easiest way." And efficiency is about us doing things the quickest and easiest way possible. But I think doing the right thing is doing the hard thing—not chopping down millions of trees in one go, [instead] letting the earth regrow itself and bring itself back to its strength, because it's our most important resource. (Māori secondary student)

Similar ideas were expressed by a Samoan interviewee.

> In a Samoan view, there are only certain times of the year you can fish for a certain type of fish. It's what they call tapu or sacred, but there's an honouring of that. In doing that, we're allowing that cyclic process of renewal to occur. (Samoan New Zealander, researcher/tertiary educator)

Indigenous worldviews, including Māori and various Pacific worldviews, see non-human parts of the world as having mauri (life force), sharing a common whakapapa with people (Kawharu, 2010; National Science Challenges, 2018), and having inherent rights, value, and agency beyond their value to humans. Several interviewees talked about the need to reframe environmental discourses to re-centre bigger-than-human entities and ways of thinking.

> If we can give people a sense of, thinking in timescales beyond human timescales … a lot of indigenous teaching models and mātauranga modes of thinking already tries to teach beyond the individual, and think in terms of whakapapa, iwi, and landscape … (Samoan New Zealander, researcher/tertiary educator)

> For us everything has a whakapapa, not just a physical genealogy but everything has a story of where it came from. It didn't just come from nowhere. In te ao Māori, our ancient belief system like Ranginui and Papatūānuku, Te Ao Marama, our atua, and everything in our environment we relate to our atua. Not just myths, they are legends, they are the things that really help us understand our connections. It just helps us understand how the world works in a simple way, in a different way. (Māori sustainability educator)

Many Pākehā interviewees also saw the benefits of indigenous thinking, and how supporting these ways of thinking would benefit New Zealand.

4 See also https://unfccc.int/news/values-of-indigenous-peoples-can-be-a-key-component-of-climate-resilience

> I think if we were looking at how New Zealand could benefit from that—those values of giving back to the land, being Kaitiaki, living simply within our means, those are things that are almost missing from society. (Pākehā secondary student)

Some interviewees also added words of caution about the need to support indigenous knowledge and people without "romanticising" or "appropriating" knowledge that was not their own, or inappropriately forcing it into non-indigenous or colonial frameworks.

Science, mātauranga Māori, and Pacific knowledges

Māori interviewees, and those with Pacific backgrounds, talked about how observing and adapting to natural environmental and climate changes have long been part of their ancestors' experiences in Aotearoa and the Pacific.

> Māori have experienced the impacts of climate change in the past—the sinking of islands, Polynesian atolls will sink through time, they also experienced a climate change which was merely a factor of shifting from the tropics to sub-temperate environments. And then they experienced the little ice age. So although those climate change impacts were the opposite of what we're expecting now (i.e., they were cooling events, not warming events), the knowledge systems and the practices that developed out of those knowledge systems of living with part of the environment meant that you were attuned to change and that you could record it when it first occurred, and that you could make considered decisions around what to do once it had occurred. (Maori tertiary educator, scientist)

However, all saw a role for contemporary scientific knowledge in explaining and communicating the causes and mechanisms of anthropogenic climate change. A key message was that, while science could *explain* climate change and other environmental issues, additional forms of knowledge, including cultural knowledge and values, were a valuable source of responses, practices, and solutions.

> [Science can explain how] increased greenhouse gases are magnifying the background natural climate change. Once that's been contributed through science, what we do at that point we can learn a lot from Mātauranga … the aspirations of many Māori to exercise kaitiakitanga might well result in deciding, hey we should probably re-construct a wetland here or plant out this fence out to here. And although the driver behind it was in an understanding that sequestering carbon and ameliorating the impacts of flood events will mitigate climate change, it is nevertheless an ancillary outcome. I think that's where you draw from both Mātauranga and science: if we combine the science knowledge with kaitiakitanga practice, we can start adapting and mitigating. (Maori tertiary educator, scientist)

> If you speak to older Pacific peoples, they will share how they use certain cultural practices and traditional ways of addressing climate change, which I don't think is acknowledged within mainstream or Western spaces. (Tongan New Zealander, researcher)

One person suggested that more funding needed to go towards solutions, not just research to better understand the problems.

> And as much as I respect Western science … there has been a big chunk of funding directed to studies to kind of explain things that, as Tangata Whenua, we already know these things. They are written in our songs, we already have whakapapa, we already know about the connections … All this money has gone to the study of Myrtle Rust, Kauri dieback, and it's to understand what it is, but we are still not getting to the solutional side of things, the cure for these things. (Māori sustainability educator)

Politics and the global challenge

A final big-picture theme was the scale of the political challenge inherent in addressing climate change on a global scale.

> What drives economics has to change, politics need to change. Huge systemic things need to be completely transformed. Yes, the research tells us many things, but as long as the politics remain the same, and those are the main drivers of life, we will always be putting band-aid solutions on the wounds we have created. (Samoan New Zealander, researcher/tertiary educator)

Some expressed cynicism based on what they saw as inadequate response both at national and international policy levels. This included perceiving much "talk" and not enough action, and low prioritisation of climate change and environmental issues across public sector planning.

> Climate change for a lot of people is an in-the-future thing. And working in the public sector, there are a lot of things that are broken 'right now'. And the political environment in which you sit means that unless you are indicating a focus on that [right-now stuff] you get batted sideways. (Person with a public sector/systems role)

Globally, many talked about the widening divisions between political viewpoints, and how climate change was becoming enmeshed in political discourses that promoted "for or against" thinking and "extreme views".

> Climate change won't care where you are, it needs global solutions. I think that that's part of the problem. (Secondary educator)

Some interviewees were worried that growing political schisms and increasing resource scarcity would increase global conflict and further entrench divisions within national politics. However, many still felt optimistic and hopeful that the way humans live on the planet could change for the better.

> If we live in harmony and balance with the environment, and if we understand and respect the environment as our relations, our elders, our parents, the very thing which sustains us. I think that if we as a collective global society understand and take on those concepts pretty quickly—we don't have a lot of time—then things can change pretty radically too. And we can certainly really start putting the anchors on climate change. (Māori sustainability educator)

Summary

Interviewees saw climate change as a "big-picture" issue, involving complex interacting systems, intersecting worldviews, and challenges for those seeking to grapple with the intellectual and emotional dimensions of climate knowledge. Their own motivations to engage with, and act on, climate change stemmed from a range of personal experiences, knowledge, and backgrounds. A linking theme was a sense of moral, ethical, and intergenerational obligation and responsibility, to past and future generations, as well as to human and non-human beings. The impacts and consequences of different worldviews, including cultural worldviews, were prominent in interviewees' explanations for the deeper drivers of climate change and environmental loss, as well as their views on potential solutions and ways forward.

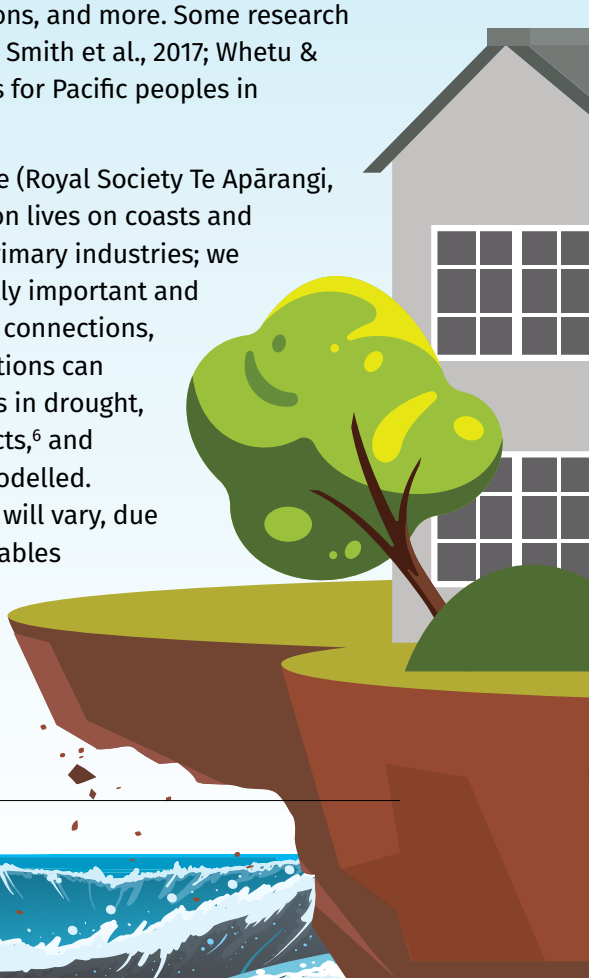
3. How might climate change affect Aotearoa New Zealand?

I think the next impacts we'll experience will be in lower income communities and coastal communities. Coastal communities are obviously dealing with erosion, sea level rise. Lower income communities, particularly those who are working in the primary industry and industries dependent on weather and the seasons, will potentially have unemployment severity.

(Tertiary educator)

The recent *Environment Aotearoa 2019* report (Ministry for the Environment & Stats NZ, 2019) notes that climate change is already affecting Aotearoa New Zealand, and will impact "all aspects of life" (p. 100). An increasing number of analyses are investigating what these ongoing and future impacts may be (Royal Society Te Apārangi, 2016), including impacts on human health (Royal Society Te Apārangi, 2017), land, ecosystems, oceans and fisheries (Law et al., 2018), freshwater, coastal communities (Rouse et al., 2017; Smith et al., 2017), New Zealand's global connections, and more. Some research focuses specifically on impacts for Māori (Kanawa, 2010; Loutit, 2014; Smith et al., 2017; Whetu & Whetu, 2019) and an emerging body of research is looking at impacts for Pacific peoples in Aotearoa New Zealand.[5]

Aotearoa New Zealand has several key sensitivities to climate change (Royal Society Te Apārangi, 2016): we are surrounded by ocean; most of New Zealand's population lives on coasts and floodplains; our economy is tied to weather and climate-sensitive primary industries; we have unique ecosystems that are socially, culturally, and economically important and already under pressure; and we are strongly reliant on international connections, including for trade, tourism, and migration. Region-by-region projections can forecast which parts of the country are likely to experience increases in drought, flooding, coastal erosion/sea level rise, or other environmental effects,[6] and the social, cultural, and economic impacts of these effects can be modelled. However, the specific impacts and risks for people and communities will vary, due to differing levels of vulnerability and exposure to climate risks. Variables



5 See, for example, https://www.mpp.govt.nz/news-and-stories/supporting-the-mental-health-needs-of-pacific-climate-change-migrants/

6 See https://www.mfe.govt.nz/climate-change/likely-impacts-of-climate-change/how-could-climate-change-affect-myregion

such as age, education, income levels, housing, and sociocultural networks are among the factors that affect how different groups can respond to climate stresses (Royal Society Te Apārangi, 2016). Risk and impacts will also vary based on the extent to which adaptation and mitigation plans and strategies are implemented at local, national, and global levels.

Most teachers and school leaders surveyed by NZCER in 2019 and 2020 said they expect climate change will have moderate to major impacts in the places where their schools and communities are located, within their students' lifetimes (Bolstad, 2020a, forthcoming). We asked key informant interviewees how they thought climate change would affect Aotearoa New Zealand. Māori interviewees were also asked about how they thought climate change would affect Māori, and Pacific interviewees were asked about impacts for Pacific peoples both in Aotearoa and in the Pacific. Most interviewees identified a web of interconnected impacts, including physical/environmental impacts, impacts on non-human species, and social, cultural, economic, and health impacts for people.

> Even if we stay below the 1.5 degrees of warming, we're still going to see a huge change in the way our society functions. (Secondary school student)

All interviewees also talked about climate change having unequal impacts for different people and groups, and the relationships between climate change and other social and economic inequalities.

Physical/environmental impacts

Interviewees anticipated a range of physical/environmental impacts including sea level rise, coastal flooding, surface flooding, droughts, wildfire, storms and other severe weather, and increased soil salinity. Some interviewees had specific expertise in these areas.

> Increased storm intensity will lead to more frequent flooding, landslides, flash flood [and] debris flow—a flash flood that's been beefed up with incorporating sediment, rocks, and stones into it. So that's got far more destructive power than a regular flood of water. We're going to start to see more and more of those. (Māori tertiary educator, scientist)

Some interviewees had connections with places that are very likely to experience (or are already experiencing) some of these effects.

> We already see it affecting people in terms of sea level rise in South Dunedin. There is already ponding and all sorts of issues with the water table. (Sustainability educator, school facilitator)

> My immediate thought goes to my home, my ancestral home in the Bay of Plenty. And I immediately think of our coastal communities and sea level rise. And so I think how will our whānau be affected? (Māori sustainability educator/facilitator)

Negative impacts on biodiversity and the loss of non-human species were also seen as very likely.

> I think we are going to lose species, definitely. (Sustainability educator)

Impacts on food systems, food production, and food security

Several interviewees were very concerned about the impacts of climate change on food systems, and the consequences for people's food security.[7] They expressed concern about crop failures due to changing climate conditions, and interruptions to current food supply chains due to increased incidence of natural disasters. These threats to food security were identified as having greater impact for people on low incomes, and smaller or more remote communities.

7 This refers to the state of having reliable access to a sufficient quantity of affordable, nutritious food.

> If there is a long period of dry weather in South Auckland … It is becoming harder to grow vegetables … potatoes, carrots, so there might be a shortage in the shops and then the price will go up, and it might be alright for people on high incomes but for people on low incomes it will have more impact. (Secondary teacher)

> This last week with the rain event on the West Coast, the bottom half of the South Island was cut off for a few days because roads were closed. I should not have been surprised, but I was about how fast the supermarket shelves got emptied.[8] There will be real issues with food security with more weather events that will be closing roads and closing off transport routes, even if it is only for a very short time. (Sustainability educator, school facilitator)

Māori interviewees noted specific ecological, social, and cultural impacts for Māori that result from degradation of mahinga kai through climate change and other environmentally damaging activities.

> For us as Māori we do connect to our stories, and to our mahinga kai, because it is part of who we are. It was the reason why our ancestors married, it was the reason why our ancestors ended up in certain areas and regions, it was all about the mahinga kai, our native species, our food security, food sovereignty. (Māori sustainability educator)

> If we're losing top soil, we're losing land to grow māra, vegetables, we're losing sections of forests, then some of our communities that are dependent on naturally available food sources, through hunting or through growing, agriculture, then they'll be impacted. At the same time there'll be big impacts on kaimoana, more sedimentation, pollution, shifts in localised currents impacting the harvesting areas of crayfish, pāua, things like that. (Māori sustainability educator)

Climate-linked migration

Most interviewees discussed the worsening impacts of climate change for Pacific nations, and other parts of the world. They expect New Zealand will see increased climate-linked migration from the Pacific, and other parts of the world affected more severely by climate change. Some felt that New Zealand wasn't doing enough to support people in the Pacific, pointing out that Pacific communities in New Zealand and in the Pacific are already experiencing the social, economic, and cultural impacts of climate change.

> We have Pacific Island families that are coming here to get away from the impact of climate change and other complications in the Pacific Islands already. (Primary teacher)

> It will affect migrant communities such as Pacific peoples more. Those who migrate to NZ as an opportunity to seek change in employment and education for themselves and their families. (Tongan New Zealander, researcher)

Several interviewees talked about how this also impacted mental health and wellbeing for Pacific peoples, and other migrant or refugee communities who, as one put it, "have gone through a crisis that has made them shift and migrate and have become detached from their usual place and culture".

> We already see it in some of the kids that come into my class—being individuals who are 10–11 years old and completely separated from family in the Pacific Islands, sent over to extended family and they're dealing with that grief of separation, but also the pressure of having to be the one that has to go to school in New Zealand and get residency and go to university. (Primary educator with a systems-level role)

8 This comment also foreshadowed what occurred in supermarkets the first week of New Zealand moving to a Level 4 national alert in response to the COVID-19 pandemic in March 2020.

Some interviewees questioned whether New Zealand was adequately planning and preparing for a climate-impacted future in which the New Zealand population could look very different, and communities would be facing new kinds of challenges.

> I think there's going to be a lot of dislocation for people—and what does that mean and how does that get managed in a way that is fair to people and that supports communities to rebuild? (Sustainability educator)

Economic impacts

In addition to rising food prices, several interviewees expected to see rising insurance costs, and some areas potentially becoming uninsurable.

> I think we will start to see pretty soon insurance companies making decisions about whether they'll insure coastal property. Even in proximity to the coast and where it lies above sea level. (Māori tertiary educator, scientist)

Some talked about vulnerabilities in New Zealand's economic future, particularly the dependence on certain industries and markets that may not be sustainable as the climate and environment change.

> I think the economy will definitely slow down. We're really vulnerable, and so reliant on dairy that that will really damage our economy unless we diversify. It seems like we're going to have to change that if we're going to stay viable. A big concern is that it will obviously affect jobs and people. (Tertiary educator, social work)

> What industries will die away? How does climate change affect the economy? (Person with a public sector/systems role)

Interviewees expected that New Zealanders will feel the effects of changes to global economies and climate-linked impacts on production and supply chains, and potentially a major change in global travel and transport. While those on lower incomes were expected to be most impacted, some interviewees noted that even those with higher incomes may still find themselves needing to readjust their expectations.

> When you've got used to your diets being available cheaply, of good quality [through global supply chains]—that will change. What [will it mean for us] to not have access to things we've become accustomed to? (Person with a public sector/systems role)

Disproportionate impacts for vulnerable groups

All interviewees described climate impacts as having disproportionate impacts for different people. Some groups—particularly those with greater economic stability, and in areas less directly affected by physical impacts—were likely to be more insulated, at least in the short term. This was raised as a potential barrier for mobilising people to take action on climate mitigation and adaptation now.

> A lot of those things aren't going to impact our middle class, and in that middle class we need to sense the consequences of all of this to take more meaningful action. (Tertiary educator)

Those on low incomes would struggle to absorb increased food prices and other economic impacts. Income inequalities in Aotearoa New Zealand also disproportionately affect Pacific peoples and Māori, and the intersectionality of impacts was noted.

> I'm thinking about Auckland in particular and the high number of Pasifika and Māori families that come from lower income households—I think it's going to disproportionately affect them. (Secondary educator)

> We know that people who are financially struggling can't make the same choices as those of us who are privileged enough to have enough income to say, okay, I'm just going to buy fruit and veg and this special protein, and become a vegetarian. (Secondary educator)

Families already experiencing stresses and complex social issues linked with income inequalities were also described as more vulnerable to climate-linked impacts, and often also had less bandwidth to engage with environmental and climate action due to these other stressors.

> They are struggling. You go stand in the middle of Kaitaia talking about this and you almost get laughed at. They are not growing their own food anymore. It's complex. (Community educator)

Many interviewees also identified intersectional issues around sustainability and privilege, noting that people's ability to make different choices was often constrained by time and income.

> Just having that ability to just pick-up and shift and move or that ability to make choices that may be a greater personal or financial cost isn't available to everybody. (Primary educator)

Hauora, health, and wellbeing

Interviewees noted that some people were already experiencing mental, physical, cultural, and spiritual health and wellbeing impacts linked with climate change and environmental degradation.

> A few years ago we had to close the school because of flooding and send everyone home, and kids were in tears and terrified because there's a big rain and they think they're going to have to move house again because it's going to flood and it's going to cost money and their parents are going to start arguing. (Primary teacher)

> We're seeing signs of climate anxiety and depression and that's only going to increase. People who have survived climate events, we're going to see PTSD coming through from them. For future generations, they're going to have a drastically different way of living—there are going to be more diseases because of increased heat. (Secondary student)

Some interviewees, particularly Pacific people and Māori, identified deeper root causes for the current struggles and impacts for health and wellbeing, linked to colonisation, and disconnection of people from their environments.

> A lot of people are unwell and disconnected [from the environment]. (Māori sustinability educator)

The potential for healing both people and the world through reconnection to both Māori and Pacific indigenous frameworks was discussed.

> When we look at the environment as our elders and as the source of where we are from, we have a deeper relationship to it. And so, when we have that relationship with our environment, we become part of the environment in a spiritual sense, which is a really important way to heal. (Māori sustainability educator)

New Zealand less affected than other parts of the world

Many interviewees noted that other parts of the world will experience more severe and rapid climate-linked impacts than New Zealand.

> I think the hard thing for New Zealanders, the majority of our population in the medium-term years to come won't experience massive adverse impacts of climate change on their lives. Our middle-class live in a way that we can be quite resilient or even isolated from a lot of those changes because of where and how we live. (Tertiary educator)

Summary

Most interviewees' expectations about climate change matched recent published scientific, economic, and policy analyses. They anticipated a web of interconnected impacts, including physical/environmental impacts such as sea level rise, flooding, drought, and other extreme weather events. They expected climate change to have impacts on non-human species, as well as social, cultural, economic, and health impacts for people, some of which are already being experienced in some communities. All interviewees also talked about climate change having unequal impacts for different people and groups, and about the interaction between climate change and social and economic inequalities. Māori interviewees discussed specific impacts for Māori, including on mahinga kai. Specific impacts for Pacific New Zealanders were also discussed, including how their lives are affected by climate change impacts in Pacific nations as well as within Aotearoa.

4. How is education currently responding?

> **Can we act fast? Time is ticking on. We should have been having this conversation 20 years ago. When the changes come, they are going to be big and fast, and I don't know that educators are ready for that.**
>
> (Secondary educator)

We asked interviewees how they thought education in Aotearoa New Zealand was responding to climate change as a whole system, and within the schools, tertiary institutions, and other organisations they were personally connected with. Most interviewees suggested that sustainability was generally more visible than climate change. They also thought the degree of visibility and focus on climate change varied within, and between, different educational settings. Our survey data also support these views (see Bolstad, 2020a, forthcoming).

Some interviewees thought events such as the school climate strikes and greater media attention to climate issues were having an impact in educational settings. Others said the impacts had been marginal, and they weren't seeing much change to "business as usual". Most interviewees felt that the education system could be doing much more, and made a number of specific recommendations about what was needed. This chapter describes interviewees' perspectives on current educational responses, and the next chapter outlines the opportunities that interviewees could see for education to "do better".

Visibility of climate change within schools

Most interviewees observed that attention to climate change was variable across different schools, and different regions.

> I think it depends on the region and the whole attitude of that region towards climate change. (Secondary student, climate leader)

> There are teachers who are really grappling with climate change, and how to teach it and work with young people.

> And, you know, teachers reflect the communities we live in, so there are other teachers who are not entirely convinced that this is an issue we need to worry about. (Education for sustainability facilitator)

A few teacher and student interviewees said climate change was quite visible in their schools. This was often attributed to it being a focus or value for that school's community, staff, or students.

> Things have changed in the last couple of years. At the moment climate change is a pretty visible topic at my high school and I think some of that is from some of the work other students and myself have been doing around that. In my other schools, primary and intermediate, there wasn't that discussion, and it wasn't very visible. (Secondary student, climate leader)

> I think overall with the schools and kura I have engaged with it doesn't feel like it's necessarily an overarching or foundational topic. It fundamentally comes down a lot to the confidence of the teachers and their own personal—or the kura's collective—understanding of the concepts of climate change and what it might look like and how to then discuss it. (Māori sustainability educator)

Several interviewees were frustrated and distressed by the minimal focus on climate change in their own, or their children's, schooling.

> [My son] he said the only time he's ever done it in school was in debate—debating whether it's real or not. But it depends on whether you have one teacher who cares about it. (Community educator)

> It wasn't there when I was at school, and I don't think it's there at the moment. (Tongan New Zealander, researcher)

> When I got to high school I was excited to be finally old enough to make a difference. I was sure my peers would be interested in doing exciting things. Turns out no one was interested in climate change, we had three climate change classes in science, and one of my friends left saying that she didn't believe in it. It was quite distressing. (Youth leader and educator, university graduate)

A secondary student commented that educators who don't believe in climate change, or diminish its significance, were one factor that could hinder young people's climate engagement. He also felt that humans, generally speaking, needed to evolve and be more open to adopting new ideas and ways of understanding how to live in a climate-altered future.

> I think that we need to let go of our pride, and our unwillingness to be wrong, our stubbornness. I think that's a lot of what holds us back. We believe too harshly in the first thing that we say and oftentimes we refuse to allow any other ideas in. I believe that taking away that pride and stubbornness that we have will greatly improve the prevention and mitigation of climate change. (Māori secondary student)

Several interviewees again talked about intersectionality between socioeconomic privilege and culture, noting that, in some communities, other social issues tended to be more dominant, even though these communities were also likely to be more adversely impacted by the impacts of climate change.

> There'd be a whole heap of them [in this decile 1B secondary school] who might not even know what you're talking about. Not a lot of those kids go on climate strike marches, because they don't know what it is. Because they're dealing with so much other stuff all the time. (Secondary teacher)

Visibility of climate change within tertiary institutions

Several tertiary educators identified high-level strategic commitments their institutions have made around climate change. Some institutions were seeking to reduce their carbon footprints through operations and infrastructure, some were divesting from fossil fuels, and some had established sustainability or climate groups.

> A lot of the climate action plan that they're focused around is transport. Solar panels, gas boilers, electric pumps, that kind of stuff, LED lighting, composting, all that physical stuff. (Tertiary educator)

However, the visibility of climate change in curriculum design and teaching across different disciplines seemed to vary. Most interviewees only knew what was (or was not) happening in the parts of the institution they worked in.

> I think within certain disciplines the teaching of the science of [climate change] is very good, at least in the sciences. What I don't know is, is it being taught across the university? Are law students, commerce students, engineers, and art students getting it? (Māori tertiary educator, scientist)

Tertiary sector interviewees from health, education, and social work disciplines said the visibility of climate change tended to happen because particular staff or students chose to make this a focus of their own research.

> It's one of these things that particular academics either have a strong opinion about or are completely uninterested in. (Samoan New Zealander, researcher/tertiary educator)

> I will be honest, it's not visible. It only becomes visible if it is part of an assignment or paper that a student takes, then it becomes a topic of conversation. In the field that I am in, the visibility of climate change is close to zero. (Tongan New Zealander, researcher)

An interviewee who worked in teacher education said their institution's approach to teacher professional learning was focused on "business-as-usual" priorities, and was not sufficiently oriented towards a climate-impacted future.

> We're actually not couching [teacher professional learning] within a clear understanding of what the future looks like for education, and more broadly for our communities. (Tertiary educator, teacher education)

Visibility across the education system

Interviewees saw climate change as having low visibility across the education system. They felt there was a lack of clear directive "from the top" that climate change response is a priority.

> If there is [a directive] it's not verbalised down the chain. There's not even an 'All schools will be zero carbon by … and this is how we're going to help schools reach that', which we know financially would be a really good place to be. (Secondary educator)

They also thought that support and investment was needed to ensure that it wasn't left up to schools to try to figure everything out for themselves.

> [The system needs] to be more direct in terms of what our expectations and urgent needs are, in terms of schools' roles in addressing climate change. (Tertiary educator, teacher education)

> We tend to do a really good job in education of saying, 'We want to do this', and then it is just left to people to get there on their own. Not all schools are created equal. And in this instance, that's not going to be acceptable. (Secondary educator)

At the time of the interviews, several major aspects of the schooling system were in various stages of review and redesign, including Tomorrow's Schools and NCEA. With so many other moving parts, some interviewees were worried about whether climate change was being factored into the big thinking that will shape the next decades of education.

> There is a whole heap of shifting and changing going on—is it co-ordinated? Is climate change a priority? For most people, I would say no, to be honest. (Primary educator)

Interviewees suggested a more coherent systemic response to climate change would require strong alignment and prioritisation both within education, and with other sectors outside education. Their views and recommendations are discussed further in the next chapter.

Summary

Most interviewees thought that climate change is not currently a clear or visible priority for the education system in New Zealand, although there are pockets of interest and innovation across the system. Within schools and institutions, a focus on climate change and sustainability was often linked with individuals (including teachers or students) choosing to make this a priority in their setting. Interviewees identified the need for clearer signals "from the top down" that education can and should engage with climate change.

5. The big opportunities for education

> **It's not just, 'Oh well, it's all wrecked.' We need to have the ability for people to have hope, and to see that they have agency. I think that's a critical part of what the education system could provide.**
> (Māori tertiary educator, scientist)

The international literature makes several key recommendations about what a systemic educational response to climate change and wider global sustainability issues should comprise. These include policy-level changes, rethinking the infrastructure and operation of learning environments, adopting whole-school approaches, building the capacities of educators, engaging with communities, and empowering and mobilising young people as leaders, innovators, and beneficiaries of positive sustainability action (UNESCO, 2014, 2015). However, most analyses indicate that these recommendations have not been taken up consistently in most education systems (Bieler et al., 2017; UNESCO, 2019).

Interviewees could see many opportunities for education in Aotearoa New Zealand that they felt were yet to be fully realised across the system. Many of their recommendations align with the international literature.

Nurturing the potential of diverse young people

Most interviewees became positive and animated when talking about the potential of young people. Seeing the involvement of many young New Zealanders in the recent[9] School Strike for Climate marches had given them cause for optimism.

> We have amazing young leaders, who have this incredible knowledge of climate change, and the leadership ability to take it other places. (Youth leader and educator, university graduate)

> I see students as this massive resource to reform schools from the inside. To make their schools sustainable, and their communities. I think we have this labour of love to be tapped. (Secondary educator with systems-level role)

Student interviewees stressed the importance of young people being involved in the decisions that will shape their futures.

> What's at the top of my mind is ensuring [national and international decision makers] understand youth perspective and take our opinions into account. I do believe that youth are one of the most important voices, considering we will be taking up the important roles in international and national affairs in the coming years. (Māori secondary student)

Interviewees identified many ways in which education could be doing more to nurture and support young people's motivation, agency, creativity, and connectedness in working towards a sustainable climate future. They stressed the importance of shaping learning opportunities that are relevant and connected to the lives, cultures, interests, and concerns of diverse young people.

Intersectional issues

Criticisms were noted of climate and sustainability movements predominantly involving people from white and/or middle-class backgrounds.[10]

> I asked my daughter [at a climate strike march], 'Who do you see in this crowd? Who are these young people?' And she said, 'They're all from school.' And I agreed, but asked, 'What do they look like? Where do you think they come from?' And my daughter said, 'It looks like they come from the same kind of schools and communities that we come from.' (Pākehā tertiary educator)

Indigenous people and people of colour have often been at the forefront of environmental movements, yet their contributions and leadership have often been overlooked or marginalised. Within Aotearoa New Zealand, groups such as Pacific Climate Warriors[11] and Te Ara Whatu[12] have been prominent in national and international climate activism that centres indigenous people and indigenous youth. Yet it is also the case that some rangatahi and Pacific youth may be disengaged from climate and sustainability issues. Interviewees spoke about what schools and kura can do to support Māori rangatahi, and Pacific young people to connect, engage, and lead.

> I became aware as a high school teacher [at a low-decile, multi-ethnic school] just how little connection and motivation learners and families in that community had, to do with climate change [and] social justice-oriented issues to do with climate change. It just wasn't on their radar. So as a teacher I made quite a concerted effort to not just raise awareness about climate change,

9 At the time of the interviews.
10 It was acknowledged during interviews that this demographic also describes many of the key informant interviewees, and the lead researcher of this project.
11 https://350pacific.org/pacific-climate-warriors/
12 https://tearawhatu.org/

> but actually look at—particularly for young Pāsifika and Māori learners—how do we support them to develop the agency, thinking skills, and organisational skills to lead action at a community level? (Pākehā tertiary educator)

Several interviewees pointed out that colonial education systems have long underserved the needs of indigenous young people and communities. Many interviewees spoke about the need for profound shifts in "mainstream" educational thinking and practice, not just because of climate change, but because schools are still experienced as "white spaces" by many young Māori and Pacific youth and their families (Milne, 2013).

> I think the mainstream education system is not built for the growth of every individual person. It might work for some but it's not built for the success of Māori. That's been proven for decades. We have had nearly 200 years of a schooling system that hasn't been the best for everyone. (Māori sustainability educator)

A Māori interviewee talked about the importance of holding fast to a long-term vision for redesigning education, even if it takes several generations to realise the vision. Te Aho Matua, the founding document for kura kaupapa Māori, was discussed.

> Te Aho Matua is an amazing thing. It was founded for the revival of tikanga Māori, reo Māori, and holistic Māori living. I really back that system. It's an amazing kaupapa. Holistic and spiritual, it's really beautiful. (Māori sustainability educator)

The establishment of kura kaupapa Māori was discussed as a model for long-term change that is possible when there is a strong vision, and a commitment to see it come to fruition.

> If you're really thinking about te āpōpō … the important thing is the tūmanako, so we know that they will eventually come to fruition … If you considered investing just 20 years to change to new systems, to recreate a better system that is better for all. It is not that long when you think that for the next 200 years it could all be beautiful development and growth. (Māori sustainability educator)

Interviewees from Pacific backgrounds also described the need to reconceptualise climate and sustainability education for Pacific youth in ways that centre cultural values, indigenous knowledge and practices, and what matters to communities.

> To be honest, the discussion about the Pacific and climate change needs to go back to the Pacific and talk to people there. Climate change already is a scientific term that means nothing to a lot of Pacific people. If we can have communities self-define their own understanding of what climate change is, then see where the commonalities are at, this will help communities, and young people also, to create communities, work together, and collaborate to reduce this global issue. (Tongan New Zealander, researcher)

Optimistic, practical, solution-focused learning and action

Interviewees stressed the importance of practical, positive, solution-focused learning and action. Just learning "about" the causes and impacts of climate change and other unsustainable practices wasn't enough, and could add to feelings of hopelessness or "eco-anxiety". Interviewees felt it was important for learners to have meaningful engagement in solution-focused learning and action.

> We know that the biggest way to solve climate change-related mental health issues is to support people to take action. (Youth educator)

> You don't let people leave [the room] until the solutions have been talked about. (Tertiary educator, social work)

Student interviewees saw a need for "a lot more practical learning" and direct participation in solution approaches.

> Because it affects people a lot more if they are making and seeing changes, rather than talking about other people making changes while sitting in a classroom. (Secondary student, climate leader)

In terms of what those solutions might involve, several interviewees suggested that young people's creativity and idealism, coupled with access to science-based knowledge, could be a generative source for solutions that adults either wouldn't have considered, or wouldn't have thought possible.

> I really strongly feel that to get out of it, as a humanity if we could get out of this hole, kids are the answer. We need their creative thinking, we need to not stifle what they have to say with our didactic creations of learning and teaching. (Tertiary educator, social work)

One interviewee said that everyone—including learners, organisations, and government agencies—should begin by investigating their carbon footprint.

> Do you know why? Because the second you look at it, you are learning. (Sustainability educator)

The interviewee referred to Project Drawdown, an international non-profit organisation that analyses research to identify solutions to support "Drawdown"—a future point in time when levels of greenhouse gases (GHG) in the atmosphere stop climbing and start to steadily decline, due to engineered and naturally-driven processes that reduce atmospheric GHGs. Publications associated with the project seek to identify and quantify the potential impacts of specific actions that can be taken across different sectors (including energy, agriculture and land-use, buildings and industry, health, and education) to reduce net GHG emissions to zero, uplift nature's capacity to absorb carbon (carbon sinks), and foster equity in society (Hawken, 2017).

Support students to lead, while also building their knowledge

Many interviewees talked about the importance of supporting students to feel ownership over the focus and direction of their learning around climate and sustainability. They advocated for pedagogies involving student-led inquiry, and co-construction of learning opportunities with students.

> Working closely with young people about what they want to be taught and how. That kind of consultation happens very rarely, from my perspective, and based on what I've seen in classrooms. (Youth climate educator)

Interviewees talked about supporting young people to develop their ideas and visions for a sustainable future, and to identify actions they can take towards realising that future. At the same time, interviewees identified the need to scaffold learners to ensure that they were building their knowledge in key areas.

> [We] want them to be curious and creative, but at the same time kids don't know what they don't know. They're only young, they need guidance. (Secondary educator with a systems role)

> What I noticed speaking to the young people after the [climate] march, they have a lot of passion and drive and they care about the environment, but what is missing are just educational facts and information. (Māori sustainability educator)

Interviewees with backgrounds in science and/or sustainability education talked about the need to build young people's knowledge in these areas.

> We take the approach that knowledge is power and so we're trying to teach the children about what climate change is, why it is happening, where it's come from, but also do that while empowering them with action. (Primary teacher)

> I think there needs to be a very good and clear teaching of what natural climate change is, and what we're going through right now [anthropogenic climate change], so that everyone who's within that education system can make their own mind up, rather than having to rely on others or experts to tell us this is what's going on. (Māori tertiary educator, scientist)

Interviewees discussed additional kinds of knowledge and capabilities they thought young people needed to develop to support effective climate and sustainability action, including things that haven't necessarily been centred in "status quo" school education. This included:

- greater focus on indigenous knowledges, practices, and relationships to the environment, and stronger connections to local and place-based knowledge
- understanding the histories and relationships between colonisation, capitalism, economics, politics, and the environment
- development of ethical thinking and systems thinking
- developing capabilities to critically analyse dominant systems, structures, norms, and practices and see their relationship to climate and sustainability issues
- civics and citizenship knowledge, including how to organise and plan for change.

Interviewees talked about what this could look like for students at different ages, and in different kinds of communities. Many interviewees talked about the need to deeply consider the big-picture purposes of education in a complex, changing world.

> Having an education that's meaningful in terms of humanity. (Secondary teacher with a system-level role)

They saw education as having a key role in supporting learners to question and challenge established norms and systems that may work against the goals of sustainability and a safe climate future.

> The place of education is to bring to light the political, economic agendas that have shaped where we are now as humanity in general. (Samoan New Zealander, tertiary educator)

Integration across disciplines

Interviewees suggested the interdisciplinary and cross-cutting nature of sustainability and climate change lent itself to approaches that integrated across school subjects and disciplines.

> I feel like climate change is such a great opportunity to experiment more with this cross-curricular learning that we're moving towards, because it's such a cross-curricular issue. (Youth leader and educator)

However, challenges were noted for integrated and cross-disciplinary teaching and learning when subject separation is more common (see also McDowall & Hipkins, 2019). One secondary school teacher explained that, at their school,

> [Years 9 and 10 students] do a unit of climate change in science, then a year later maybe a unit in social studies, they might look at an article in English … rather than doing that, it might make more sense for students to have a unit of climate change, that brings in all the perspectives. (Secondary teacher, sustainability)

Another secondary educator described a professional learning workshop they had facilitated for other senior secondary disciplinary specialists. The teachers were invited to pair up with a different discipline (e.g., mathematics and music) and develop a concept for what an integrated sustainability unit might look like, drawing on standards from each discipline. While some innovative concepts were developed,

> I felt there were quite a few people who really couldn't see how sustainability could be in their subjects and that was disappointing. I didn't really find out what the barrier was. I think they were wondering why I was doing it. Saying 'Well you can't tell teachers what to do, you can't say sustainability is compulsory.' (Secondary educator with a systems role)

Place-based, community-based learning and action

Many interviewees discussed the value of students' involvement in collective, place-based approaches, and community-wide responses to climate change.

> Going out in the community into their own people and neighbourhoods, collaborating with organisations to co-construct a strategy, designing projects within their own school—I think in general we want to be doing more of that. (Secondary teacher, sustainability)

> What actions can we take as individuals, as families, as schools, as communities working together that can make a difference? And how can we create a positive future? (Secondary student)

Some interviewees suggested that community-led and grassroots organisations were often ahead of governments and large institutions in terms of localised, systemic, sustainability and climate solutions.

> Grassroot movement says you don't look to governments, change is from the bottom, so what are the answers from that field? So it's about the institutions looking to the community. The answers are there, it just means listening to the right people. (Community educator)

The frustration was that community and grassroots organisations that were doing good things—such as establishing effective zero-waste systems, or local food production—were also often lacking in resources and funding, while government agencies and large corporate organisations had plenty of resourcing but were perceived as delivering few effective solutions.

Māori sustainability educators talked about the kaupapa of their organisation, which supported marae and kura to implement sustainability-focused initiatives, without prescribing what those initiatives should be.

> We are an encouraging and supportive roopu. We are not only here to come and show and educate, we are here to support. The cool thing is they [marae and kura] come up with their own initiatives, sometimes they just need someone to support them with their strategies and resources. (Māori sustainability educator)

New pathways prioritised

Some interviewees talked about the importance of focusing on new kinds of career opportunities and pathways associated with a transitional economy, and the shift to a low-carbon future. They argued that schools should be helping to make clear what learning and qualification pathways students can take to move into these areas.

> New occupations identified, and 'greening' of old occupations … in NZ we are in a situation we could be upskilling and giving opportunities to be training students into these green jobs. Our secondary NCEA needs to be positioned so students have an idea of what these skills are, and that our vocational education is offering skills for green jobs. (Secondary school educator with systems-level role)

Some argued that this was essential for getting young people engaged and excited, rather than disengaged and depressed or feeling like they have no future.

> A lot of people see climate change and they worry about can I make a career out of it, get money out of it, or make it into a job. There are possibilities out there that we can weave in at a secondary level. How do we pathway that into university and into the workforce? I think that will create some excitement for young people. (Tongan New Zealander, researcher)
>
> How do we create young entrepreneurs, innovators, and business leaders who want to work in big business, but are doing so with really creative and sophisticated ways of also protecting the climate and minimising their impact on the earth? (Tertiary educator)

The need for alignments across systems

Interviewees suggested a more coherent systemic response to climate change would require strong alignment and prioritisation, both within education and with other sectors outside education.

Within-education alignment

Interviewees identified the need to strengthen and prioritise climate change education responses through curriculum, assessment, and teacher education.

> As with education for sustainability (EfS), it's meant to be throughout the curriculum, and some teachers and some schools can do it well, and others really struggle with it. I think climate change is sitting in the same space. (Sustainability educator)

Several said they were concerned that teachers are not getting enough opportunity to develop their understanding and capabilities to address climate change into their classroom programmes.

> If they aren't being exposed to climate change and how to deal with that, then it comes down to personal interest, and if they are not well equipped with resources and skills around how to teach that and integrate climate change into the curriculum [it won't happen]. (Sustainability educator)

Some saw opportunities for strengthening sustainability and mātauranga Māori within the current NCEA review, and were hopeful that this would support more contextualised learning opportunities around climate and sustainability.

Most interviewees were in favour of a more system-wide emphasis that could support all schools to engage with climate change, while also supporting and enabling localised curriculum design.

> You know Enviroschools, environmental educators that go into schools, that's what you need for climate change. (Community educator)

Cross-sector alignment

Interviewees identified the need for educational responses to weave into a co-ordinated national response to climate change. One university-based interviewee highlighted the potential of academic institutions to "creat[e] spaces where we can have these rigorous informed debates that inform the upper echelons of our national governance and policies", including more effective integration of indigenous knowledge, research, and policy.

> I still feel that it's quite disparate at the moment. We have a pocket of researchers doing one thing, and indigenous activists, and policy makers—and we're still not getting enough traction between all of them to really be able to put in place something that is unique to Aotearoa, and our position in the Pacific, but that also has longevity. (Samoan New Zealander, researcher/tertiary educator)

Other interviewees talked about the need for better urban planning and design, considering school location and transport systems in a co-ordinated way, to reduce carbon emissions and adapt to a warming climate.

> It would be fantastic if every high school in Auckland had a light rail station within 500 metres, do you know what I mean? I think councils are starting to think more about walking and cycling routes to school. I wonder if it needs to be more co-ordinated than just depending on what each local council wants to do, and maybe it needs to be across the country, maybe there needs to be certain standards or expectations, so regardless of where you are [in New Zealand], you know you have a safe well marked route to school by bike or walking. (Secondary educator)

Summary

Interviewees could see many opportunities for education in Aotearoa New Zealand that they felt were yet to be fully realised across the system. Foremost for many interviewees was the important role education can plan in nurturing the potential of diverse young people to engage in positive, solutions-focused climate learning and action. They said young people should be supported to develop their ideas and visions for a sustainable future, and to identify actions they can take towards realising that future. At the same time, interviewees identified the need to scaffold learners to ensure that they were building knowledge in key areas.

Interviewees also talked about the importance of focusing on new kinds of career opportunities and pathways associated with a transitional economy, and the shift to a low-carbon future. Finally, interviewees suggested a more coherent systemic response to climate change would require strong alignment and prioritisation, both within education and between education and other sectors.

6. Practice examples

This chapter provides five practice stories, shared by interviewees, that illustrate many of the themes discussed in the previous chapters. The first two stories involve secondary-aged students giving input into how their cities and districts can support community wellbeing, resilience, and adaptation. The third story describes an empowering kaupapa for supporting kura and marae to identify and implement their own sustainability solutions. The fourth story describes a primary school engaging with the implications of climate change for their place and community, and the final story describes an innovative approach to creating a zero-waste food system in a secondary school and community.

EXAMPLE 1: Planning for community resilience and adaptation

A story shared by a secondary teacher

A teacher from a large urban secondary school teaches a senior (Years 12 and 13) sustainability class, in which students carry out an action project for one of their assessments.

> They identify something they want to do about either in the school or the local community. I give them freedom to select what they want and that is important to them, waste is often quite high on their agenda, and climate change comes up quite frequently as well.

In a recent year, students had had the opportunity to work with the city council while they were developing a city-wide Climate Action Plan.

> Students selected a community as they wanted to define it. It could be students, family, their extended neighbourhood, and they collected 'voice'. On how their community might adapt, the focus was community resilience. They came up with recommendations which they put forward to council about improving community resilience in regard to climate change.

Some students explored needs around infrastructure, and others looked at social structures and networks that could support resilience.

> One student saw the big challenge … if there's going to be more serious weather events perhaps, storms and where we lose power and things, it's important for the community to be well connected. His strategy was looking at having neighbourhood groups in the community. He explained it in terms of being for wellbeing, and also to get people together so they could be proactive about doing things in their neighbourhood.

Other students looked at school resilience, and what students would need in a changing climate

> Some of my students picked up the idea if it's generally going to be getting hotter and people are going to be walking to school, there needs to be more provision for shade. I think that needs to be [a] priority coming from the Ministry, that there needs to be money for hundreds of trees to be planted in each school. That has a double benefit, providing shade from a warmer climate and it helps to mitigate carbon emissions.

Thinking about schooling in a climate-changed future

Students also considered that shade trees were needed, not just at school, but on people's walks to and from school.

> That is another thing that works in conjunction with the council. Street trees probably need to be priorities. Access to drinking water as well. More public water stations, like if a child is walking home from school and it takes them 20–30 minutes at 33 degrees, they are going to need shade and at least one water station along the way.

The teacher speculated that other aspects of school location and logistics might need to change for a climate-changed/low-carbon future. As the population increased, he suggested that schools might develop "satellite campuses" within walking distance of their homes.

> Perhaps students might come to the main campus for a couple of days a week and for the [other] three days the students go to a satellite campus.

He could also see potential for greater use of blended learning (online and face-to-face). Fundamentally, he saw the need for more integrated urban planning and design, including transport planning that considered what was best for learners' and communities' wellbeing in a climate-changed future.

EXAMPLE 2: Youth councillors supporting district council principles for climate adaptation

A story shared by a secondary student

A Māori secondary student was the vice chair of the Youth Council in his coastal district. Climate change was a key focus for the Youth Council.

> One of the main things we have been focusing on is, we have seven climate change principles, that we and others in the community have gotten council to adopt. And basically, it's putting everything council does into a climate change lens.

Youth were involved in taking the draft principles out widely into schools and communities and seeking people's feedback in a range of ways, including meetings and surveys.

> We brought that back and made a case for things such as looking after our people and place, ensuring that the people who are most vulnerable are protected—those were the youths' ideals that they wanted, and which were actually added, which I think is incredible. It shows how powerful youth can be.

The student explained the seven principles as follows:

1. **We will act now.** That's making sure that we put climate change as a top priority above all. Because ultimately if climate change continues down the path it's going, it will destroy the community and world and country that we all live in.
2. **We will look after our people and place.** That is basically ensuring that each person and each community within our district (and hopefully further) are protected and are safe. In order to survive we do need to slow the effects and also adapt to the effects that are coming our way.
3. **We will acknowledge those most affected.** Council wanted to especially acknowledge that climate change affects the more vulnerable people within our community. That can range from things like natural hazards that climate change has [exacerbated], things like deforestation that affect climate change, and stuff affecting the areas around where that stuff has occurred.
4. **We will think and act long term.** Basically, ensuring that further into the future our actions don't have consequences that might negatively affect us long term.
5. **We will learn.** Ensuring that we learn from the mistakes we have already made and the mistakes we may make in the future.
6. **We will be part of the solution.** Council want to ensure they are assisting in climate change, and be a part of the helping process, rather than a barrier in our way.
7. **We will build capacity to recover from difficulties.** So, I think that's specifically talking about mitigation, trying to find ways to bounce back from the difficulties, barriers, and consequences of climate change, and ensuring that we are resilient in every facet of life.

Overall, the student felt optimistic that young people were going to be bringers of positive change as they moved into positions of power, leadership, and decision making.

> I think we're responding much better than any other generation. In terms of when we as youth start to get into positions of power, I think we have now learned a lot of what we need to know on climate change, and with that will bring a lot of positive outcomes. I think we will be able to slow down, and adapt our way of living, in order to continue as a species.

Ensuring the wellbeing of Māori, and overcoming current inequities and disadvantage, were a key priority for any roles that he had or may have in the future.

> I think that if put into a position of power, that is one of the main things I would strive to ensure—the safety of our people.

EXAMPLE 3: A supportive kaupapa to empower marae and kura

A story shared by Māori sustainability educators

Two Māori sustainability educators, working in two different regions, had roles working with marae, kura, kōhanga reo, and not-for-profit organisations. Their kaupapa is grounded within a Māori framework that supports groups to identify and implement their own waste minimisation and sustainability solutions. This example weaves together kōrero shared by both educators.

> [Our goal is to support] a holistic Māori view of environment, going back to our ancient belief system and atua, how everything is connected. And products, how everything that we use throughout the world comes from the natural world, and for us that comes from our atua. It's a way of helping people become more mindful and caring, and understanding why it's really important to do all you can to give back.

Part of this approach was to help people understand their connections to the resources they used, and how use of resources and production of waste were linked to environmental impacts and climate change.

> Like this reusable [plastic] ipu, it's actually made from oil, and oil is te hinu o Papatūānuku, it's from mother earth, and for kids' education all you need to do is to tell them and they become informed, on something they didn't know before, and it becomes a part of their life and way of thinking.

The emphasis on a holistic connection between people and Te Ao also supported an emphasis on social connection and collective responsibilities to care for the earth.

> If we acknowledge that kaupapa Māori frameworks can inform us with our identity, then we have a stronger sense of understanding who we are, where we need to go, and how to look after each other, [to] understand that we're a part of this network, we are all products of the environment.

Both described their kaupapa as supportive, not directive. The process begins with an initial visit and sharing of information.

> That first presentation is usually a really good gauge. You can get a good sense at that point of where on the spectrum of understanding is this whānau with waste minimisations? And are there people in here who have broader understandings of other, much wider, bigger contexts [including climate change]?

Follow-up visits are about supporting what the marae or kura want to do—or learn more about—next. As one facilitator explained, they could dip into their "kete of knowledge" to keep feeding the interest or needs that arose, as well as reaching into the kete to "leave some new things on the table" for people to explore and think about for the next time.

One facilitator talked about the impact that making changes in a marae setting can have for "generational change", as tamariki and whānau learn from what is valued and practised on the marae and carry these kaupapa into their own homes.

> For us as Māori, marae are our home bases. They are the places we come together for happy and sad occasions. They are the places you create memories that will last forever. The more you go to marae and the more involved you are, the more engrained those values and memories become in how you are, who you are. The idea, the kids go to the marae and come home and say 'they don't do that at the marae'.

The solutions that they helped marae, whānau, and kura with included establishing māra kai and worm farms, reducing or eliminating the use of plastics, and any other ideas that emerged from their supportive and encouraging relationships. Both facilitators emphasised the importance of caring for your own places through direct connection and action, grounded in cultural values.

> That is definitely an important solution and strategy in itself. You look after your own places so you can know what's going on. You can look after the mahinga kai in your awa, your native species, you replenish them, you know the native birds and calls, you have specific karakia for your region and your tūpuna. These are our cultural values, these are the things that matter to us.

They felt all people could access these kinds of small connections and solutions towards a more sustainable, healthy, connected, and conscious way of living on the earth.

> People can do this in their own homes too. That's your place, your stories are there too, whether you are Māori or not. You can always grow something in a pottle. On a small scale, in your own house you can focus on your own food waste, how much water you use, fundamental concepts like that can support and help slow the process of climate change.

EXAMPLE 4: A primary school engages with the implications of climate change for their place and community

A story shared by a primary teacher

One teacher taught at a primary school in a location that was already affected by changing climate, specifically rising sea levels and flood risks. Over several years, the school had begun to proactively engage with what climate change will mean for them and their communities. The first year, the school asked to be the hosts for a travelling exhibition about climate change, that had been curated by a local museum.

> Each class went through the exhibition, and the idea behind it was that there were hands-on interactives that explained the science behind climate change, as interactives that looked at melting ice caps and over time what the predictions for their area [were].

This meant students could see that their area may not continue to be habitable in the future, which teachers knew might be stressful or upsetting for the children.

> So we have to had to work around 'well what do we do with this information' and having those conversations with kids, basically saying, where you live now may not be liveable when you're an adult. So what can we do knowing that information, and dealing with it, but also working out ways to live better in the situation that we're in right now.

Having the exhibition in the school also made it more accessible to the community, which continued to initiate these sorts of conversations. The focus on "what we can do" included looking at within-school practices such as waste and transport, but also "re-vision[ing] the whole school, with these new thoughts in mind". This process involved every class.

> I had the Year 5 kids for an hour a week and set them up as leaders. Each week we would play different games, and have different topics and they'd go off and teach that to the other classes. That was a peer-to-peer, tuakana/teina thing and gathering ideas from the kids and bringing that back into their vision.

The second year, the school focused on several within-school environmental projects, and Citizen Science projects including the Marine Metre Squared coastal survey. The coastal focus also included turned to noticing the impacts of climate change, and what was being done about it.

> The first few years we were going to the beach and doing the classic beach safety stuff but then the third year we went to the beach but we started looking much more at erosion. We got someone from the regional council to show us where the coast had eroded away and the different impacts of sand sausages and sea walls and things like that, so they were seeing the real physical issues that need to be dealt with and how the council has to make decisions around those.

Teachers and school leaders also worked through a planning process to bring a science education lens to the question, for the senior students, "What important things do they need to know to be able to be effective citizens in the future?" They boiled their focus down to four key things:

1. the carbon cycle
2. classification of living things, and how humans relate to living things
3. material world, because "You can't have a conversation with children about the carbon cycle unless they understand the world is made of smaller parts that we combine in different ways to make different materials"
4. food.

The material world focus included students exploring different substances, and help from a university to make and compare biodegradable plastics and petroleum-based plastics.

> Kids got deeply into looking at how everything around us is made into smaller parts and they got really quite excited. Then we linked that in with learning about the carbon cycle, so they could see that when we're talking about climate change—they can now actually understand what CO_2 is and understand what methane is … they know these things combine in different ways and they can be good and bad in different quantities.

The food focus included recognition that some students and families had insecure food supplies in the home.

> We have vege gardens at school but we're trying to use them more wisely but it's also part of a cultural community garden, so it tends to be the adults that are there … they come together to learn English and dig in the garden … But we're not really using that food as wisely as we could, so we're looking at food history—looking at different ways of preserving food and adding or removing things to the food, so removing water and drying it, adding salt and preserving it.

The school also asked the senior students to brainstorm what they felt were the biggest environmental issues in their lives; things they cared about personally. Four themes came up: land, water, alternatives to plastics, and natural products. Then working in groups of four students, student teams came up with a project.

> So there were 30 different projects that all went on throughout the school. It was all student-led for the second half of the year. It was a really different way of working for the teachers and we called in a lot of help from our communities—not just our parent community but the wider community, like the university and various skills that were available.

It was described as a "new way of working", and though the teachers felt some improvements could be made, it was worth sustaining and doing again "because it really gave the kids so much in terms of key competencies". The teacher summarised the school's thinking and goals around climate change education as "giving students the skills to make clear decisions in moving forward in what is quite a chaotic and unpredictable world".

> We are trying to look at climate change not as a topic, but as a window into the future of what the world is going to look like for them. We're sitting here 40-, 50-, 60-year-old teachers and we can see back in time and see how things have already changed, but for kids this is just the way the world is. I think it's an adult view to constantly retrospectively look back and want to change things to the way things were but the kids are not wanting to change it to the way it was, they're looking ahead all the time and wanting to move forward.

EXAMPLE 5: Creating zero-waste food systems through STEM problem solving

A story shared by a secondary teacher

One teacher had worked in a large urban low decile school where over 70% of students were Māori, developing a programme for Years 11–13 STEM students using a "project-based problem-solving" approach, grounded in sustainability thinking. The teacher sought to uphold principles such as "mana whenua, of actually being connected to the land", bringing mātauranga Māori into the

problem-solving process, and connecting and networking with local people, places, and resources to investigate and implement possible solutions.

The teacher encouraged students to look for solutions that created "zero-waste" systems. At one point, students inquired into the question of how biochar[13] could increase the yield of tomato plants in hydroponics.

> We have a company up the road who grow tomatoes in hydroponics. We were taking their waste, drying it, turning it into biochar and then using that as the substrate in hydroponics rather than using the standard substrates that they usually use. So [requiring] less chemicals, less fertilisers, because they were growing from the actual biochar.

The tomatoes could then be provided to hospitality students, and the STEM students used hospitality students' food waste to create worm farms.

> Then feeding the worms specific things so we could test the kind of worm teas they made through chromatography, to then look at whether that had a different effect on the kind of biochar we made. It started off like that, and what happened was students then come up with their own questions based on that, and that's how their projects worked, and then I would pull out the NCEA credits based on what they did, rather than just teaching them something. Which they really enjoyed.

The teacher stressed the importance of knowledge building in project-based learning.

> One of the things I think teachers often think is that if you do project-based learning you don't have to do any teaching. That's wrong; you still have to do a lot of teaching.

She described an approach that involved "backfilling", rather than frontloading knowledge.

> What I wanted to do was to try and find engagement. We worked on problems where they had something that created a passion for them in the first place. Then from that, from empathising and having their solutions, part of the programme was to work out the knowledge they needed to be able to make or do or solve that, or what kind of knowledge they needed to do their inquiry, to come up with a solution.

The programme was special in that students worked with the teacher for the whole day, in a "workshop" setup. This also created strong relationships which enabled the teacher to work effectively with students even when they were having challenging times. She described the workshop as a safe environment where students could feel relaxed, and therefore better manage and regulate their own stress levels.

> I became much more a facilitator, and picked up on their cues really quickly. I used to know as soon as they walked in the room if something was wrong. Therefore I'd have the relationship to say, 'I know you need to do this today, so you sit there and get a start on that and I'll come and see you in a minute, because I get a feeling that you need five minutes to get yourself in your right headspace … and is everything alright? What's going on?'

The students were described as being those who, under other circumstances, might be at high risk of not achieving NCEA credits. While this programme enabled them to gain credits, students expressed satisfaction with other benefits they had gained from the process.

13 Charcoal produced from plant matter and stored in the soil as a means of removing carbon dioxide from the atmosphere.

> What was really interesting was at the start they would say the most important thing for them was credits. By the end of it, credits was one of the least important things for them. The things that were important for them was 'I learned how to grow food, which I've taken home, and now I grow food at home.'

The students' work to optimise their hydroponic system and biochar production included skyping to share their data with university-based science researchers who were experts in the field. The teacher and students had begun to work on a bigger plan, and write grant applications, to scale up the zero-waste sustainable food production system involving biochar, hydroponics, aquaponics, growing food, and having biodigestors to cook the food. The idea was to look at how systems like these could be scaled up across the community. Students would learn about all aspects of the process, learning how to grow food, build zero-waste systems, as well as developing the skills to manage projects. A further angle to the idea was that school projects like these could be recognised as innovative localised systems for carbon offsetting, also generating a sustainable revenue stream to reinvest into the sustainable food production system.

> So for people who were offsetting carbon, they could pay to offset carbon based on paying the school to grow some food, which then got turned into biochar. That's what the kids wanted to do. We had a group of students that everybody else thought were going to fail, who couldn't read and write properly, and they came up with this plan.

The teacher felt that innovation was essential for New Zealand's future, and that the students were very motivated to be innovators, once they could see how each success step led to a new opportunity or idea to develop. Unfortunately, the teacher subsequently left the school, and said that the programmes and processes weren't sustained in the way they had run while she was there. She noted the challenges of sustaining innovation in secondary schools, and suggested that primary schools were better at "embedding" sustainability; for example, through Enviroschools' whole-school approach.

7. Next steps

Climate change impacts everything, including land and water, food systems, economies, health, migration, jobs, access to resources, and much more. The best science knowledge available provides a clear signal about the urgency of action required (IPCC, 2019). Surveys show that a majority of New Zealanders are concerned about climate change (Leining & White, 2015) and think more action is needed (IAG, 2020). Yet the all-encompassing nature of climate change poses an unprecedented challenge to political leaders, policymakers, and leaders within every sector, requiring us to address traditionally separate issues in an interconnected manner (UNESCO, 2015).

Globally, education is seen as playing a central role in responding to climate change and "enabling society to be a part of the solution".[14] However, while international and national *climate action* policies may be calling for education to contribute substantially to addressing climate change, international analyses suggest that *education* policies are often not aligned to this call (Bieler et al., 2017; UNESCO, 2019), and "the education sector remains underexploited as a strategic resource to mitigate and adapt to climate change" (UNESCO, 2015, p. 66).

The perspectives shared in this report suggest there is scope for growth and development in the way that schools and wider education systems in Aotearoa New Zealand engage with, and respond to, climate change. The stories shared by key informants suggest that localised innovation and change is possible, particularly when young people are mobilised, engaged, and informed about the causes and consequences of climate change, and what they can do to make a difference. However, wider system structures, norms, and mindsets play a role in enabling or limiting the extent to which young people and communities are able to engage effectively with climate change.

The next stage of our research project will report findings from a 2020 survey of teachers and school leaders in English-medium secondary and composite schools. The survey data provide additional information about the extent to which climate and sustainability are visible and prioritised across different school settings, and the nature of teaching and learning practices where climate change is an explicit focus in the classroom. In future phases of this project we will continue to explore directions for further systemic educational policy and practice responses to climate change in Aotearoa New Zealand and seek to identify and share examples of effective on-the-ground practices across a range of contexts.

14 See https://unfccc.int/topics/education-and-outreach/workstreams/education-and-training

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Appendix 1: Methodology

How interviewees were selected

The five priority perspectives identified for this component of the research (see Chapter 1) guided the selection of interviewees. Potential interviewees were identified in a range of ways. We contacted people and organisations that were known to be engaged with climate change activities involving education and young people. We also used our networks to seek suggestions and recommendations for potential interviewees. Some interviewees contacted us after learning about the research project, and met the criteria we were looking for. All invited participants were provided with an information letter about the research so they could decide whether they wanted to contribute to the project. Interviewees were in several regions including Auckland, Wellington, Christchurch, and the Bay of Plenty. Although we aimed to have at least four people who identified with each priority perspective, we were less successful in recruiting interviewees from some of our target groups, including young people, and rangatahi Māori and Pacific youth in particular. Several approaches were made to networks and groups fitting this description, that either declined to participate, or were unable to due to timing and other commitments. In future phases of the research we will explore alternative approaches, including going into schools and community settings to meet with young people.[15]

The interview process

Each interview took between 60–90 minutes. Interviews were transcribed and coded using NVivo. Most interviews were carried out via Zoom, rather than researchers or interviewees travelling to conduct face-to-face interviews. At the beginning of each interview, we explained that interviewees should feel comfortable to express themselves freely. We acknowledged that climate change was a complex topic that can bring up a variety of emotional and psychological responses. Each interview began by asking the interviewee what was on the top of their minds with respect to climate change.

Interview questions

Questions varied slightly depending on roles and perspectives of key informant(s).

Your perspectives and involvement in climate change response

1. What's top of the mind for you at the moment, with regards to climate change?
2. How are you/your organisation involved responding to climate change? (Could you give me some background?) OR How is climate change visible in your work/the work of your organisation?

15 Methodologies for gathering any further qualitative data for this research will also need to be developed within recommended protocols associated with COVID-19 national alert levels that came into place in New Zealand from March 2020.

Impacts of climate change for Aotearoa and the Pacific

3. How do you think climate change will affect people in Aotearoa New Zealand in the years to come? (within your lifetime, and for future generations?) [Māori—ask how it affects/will affect Māori, whānau, iwi, hapū.] [Pacific peoples—ask how it affects/will affect people in Pacific nations, and Pacific people living in Aotearoa.]
4. As a [Māori/Pacific/young person/educator/person with an education system perspective], how do [Māori/Pacific/young person/educators/people with education system perspective] think about climate change [and what it means for whānau, iwi, hapū]?

Education and climate change

5. In your view, how is education in Aotearoa New Zealand responding to climate change at the moment? (at the level of your school/kura, or at a regional level, or at a national/systemic level?)
6. What do you think about the student school climate strikes, and other youth-led climate action?
7. How *could or should* education in Aotearoa New Zealand respond to climate change? (For example, what do you think we might need more of, less of, or "different" from current practices and norms?)
8. How could Aotearoa benefit from mātauranga Māori/Māori ways of thinking about climate, environment, sustainability? How can Aotearoa benefit Pacific knowledges?
9. Have you seen, or do you know about, any particularly good examples or models of education for a changing climate (e.g., examples you think should be shared/scaled/adapted/used more widely)? [These could include examples or models from outside Aotearoa, as well as within Aotearoa.]
10. In your view, what are the most important things to focus on in shaping education in Aotearoa for a changing climate?
11. If education was redesigned in response to climate change, what might the education system (or a school, kura) look like [10 years?] from now?
12. Is there anything else you would like to say?
13. Do you have any questions for us?

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