Mana Ora: Students decarbonising schools

Evaluation report

Rachel Bolstad

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2024

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1. Summary

In 2023, Auckland Council's Sustainable Schools Team (SST) piloted a project called *Mana Ora: Students Decarbonising Schools*. The aim was that students, with guidance and support from teachers and SST, would plan and implement climate and sustainability action projects linked to decarbonisation within their schools.

Mana Ora supported the projects through a pool of funding, on-demand support from SST advisors, and cluster gatherings to bring schools and kura together at key points across the project. Students and teachers were encouraged to explore five theme areas to provide inspiration for their project ideas: transport, energy, waste, food, and grow.

Eighteen Mana Ora projects were implemented in early childhood, primary, and secondary schools, 13 in English-medium, and five in Māori-medium contexts. NZCER was engaged to evaluate the impact of Mana Ora in English-medium settings. Auckland Council established a separate Māori-led process to capture learning from Māori-medium Mana Ora projects.

In primary schools, projects were most often led by envirogroup students, supported by a teacher with an enviro/sustainability co-ordination role. In secondary schools, projects tended to be either led by senior students in sustainability leadership roles or were woven into subject-based classes. In two secondary schools, projects were described as more teacher led.

The evaluation explored the extent to which Mana Ora met its intended outcomes for students, teachers, schools, and SST advisors. It was beyond the scope of the evaluation to directly evaluate the emissions-reduction impacts of the projects, or the extent to which projects supported transfer of decarbonisation knowledge and practices into homes and the wider community. However, where possible, these outcomes were explored through interviews with students, teachers, and SST advisors.

The evaluation findings indicate that Mana Ora succeeded in achieving most of its intended outcomes for students, teachers, and SST advisors, with some variability across projects and contexts.

Outcomes for students

In terms of teaching and learning outcomes:

- Student leaders said Mana Ora gave them an authentic experience of planning and implementing a project. With support, students learnt through the processes of proposal writing, budgeting, soliciting feedback from others, and managing the changing realities and timelines of a project.
- Many students were able to explain new understandings they had developed about climate change and/or decarbonisation. Some students had a less strong grasp on the links to climate change and/or decarbonisation but could express how their projects were doing something good for the environment and for animals, and why this mattered to them.
- Direct teaching around carbon and climate change, and provision of time and support for students to do further research about this, had a positive impact on students' grasp on how their projects connected with climate change and/or decarbonisation. Students' age also had some effect on how easily they could explain these connections.

In terms of taking action for positive impact:
- Many students said it was "empowering" to see ways they could take action on climate change and sustainability issues through making a change in their own school. While they understood the scale of the challenge was large, and their project was small, students seemed positive about their contributions.
- Most students affirmed that their Mana Ora project had helped them to feel like they were part of a community taking positive action. Teachers and students talked about how the school and local community had "come in behind" students to support and celebrate the outcomes of their projects.

Outcomes for teachers
- Many lead teachers said Mana Ora had contributed to their confidence and knowledge to teach about and inspire climate action learning. Some teachers were already very experienced in leading sustainability action learning projects in their schools, while others were newer to these roles.
- Teachers who were able to attend Mana Ora cluster gatherings found it useful to make connections with other schools, and other people and organisations. However, several of the secondary and some primary schools were unable to attend some Mana Ora cluster meetings, for reasons including pressures from industrial action, COVID, flooding impacts, and exam timing in 2023.
- Teachers enjoyed seeing growth in their students and could see opportunities for their schools to build on their 2023 Mana Ora projects with next cohorts of students in 2024 and beyond.

Outcomes for Sustainable Schools advisors
- Advisors said that Mana Ora had helped build their own knowledge and confidence about how to "connect the dots" between school sustainability practices and decarbonisation.
- Advisors suggested there would be value in having more time "as a team" to continue to expand their own knowledge and understanding and to explore climate and decarbonisation resources they could recommend to schools.
- Advisors felt that connecting schools with "people resources" such as science and decarbonisation experts and other Council teams working on climate action was especially valuable.
- Advisors commented that Mana Ora has generated new resources, connections, and examples that they can use with new schools to inspire and support climate- and decarbonisation-focused learning and action.

The role of carbon footprinting and other data and measures

School carbon footprint calculation was not the main focus of Mana Ora, but a range of carbon footprint measurement tools and resources were available if schools wanted to use them, and a few schools had either already done a carbon footprint or did so during the year. Where available, these analyses gave students an indication of areas that could be targeted for emissions reduction; however, emissions from school travel were not always included in scope. Some teachers who had investigated available tools felt they were "time-consuming" and not "student-friendly".

There was interest in other options that could be used for more targeted data collection and analysis to provide a clear decarbonisation link to students' specific interventions; for example, being able to

monitor energy consumption in one school block, or emissions from school pick-up and drop-off over a specific period of time. Some options for doing this were explored during the year.

Other data and measures used by schools included waste audits, water-quality monitoring, plant growth, qualitative and quantitative indicators about the extent of community engagement and support, and indicators of increased wellbeing of people and the environment.

What worked well and what could be improved

Key aspects of Mana Ora that worked well included:
- the project launch and brainstorming workshop process
- the use of five focus themes to kickstart project idea development
- students and schools having the autonomy to shape projects that were meaningful and relevant to their contexts
- access to funding, support, connections, and motivation through being part of a wider project
- learning activities that consolidated students', teachers', and advisors' "carbon cycle" understandings and connection to their projects
- access to "student-friendly" and relevant data and measures
- the year-long time frame.

Important school-level contributors to success included backing from school leadership, provision of release time for lead teachers, and a school culture that is supportive of empowering students to lead projects.

Areas suggested for improvement included:
- timing and logistics of cluster gatherings
- curriculum-linked resources to seed "easy" whole-school engagement
- strengthening connections to te ao Māori and mātauranga Māori
- allowing for some "teacher-led" projects and/or for projects to run over more than one year where necessary
- getting "less enviro" schools involved, and engaging whole communities
- greater collaboration across Council teams and with other key stakeholders.

The findings of this evaluation align with other studies that demonstrate the benefits of learners having opportunities to engage in climate action projects, including decarbonisation projects, as a means to build climate knowledge and understanding as well as a sense of personal connection and power to make change. These studies further indicate that schools can benefit from tackling decarbonisation together, with time and space to share, compare, and learn from one another's successes and challenges. Further research and evaluation of Mana Ora or similar initiatives in 2024 and beyond could expand on what has been learnt in 2023, with a focus on investigating scaled and longer-term impacts.

2. Introduction

In 2023, Auckland Council's Sustainable Schools Team (SST) ran a programme called *Mana Ora: Students Decarbonising Schools* (hereafter, Mana Ora). The aim of Mana Ora was that students, with guidance and support from teachers and SST, would plan and implement climate and sustainability action projects linked to decarbonisation, during the 2023 school year.

The name of the programme is explained below[1]:

Mana Ora speaks to the mana (prestige/power) we have as ira tangata (people) to do right by our taiao/tūpuna (environment/ancestors) by enhancing the mauri (life force) and ora (health) of our taiao (environment).

Ka ora te taiao, ka ora te tangata
(a healthy land is a healthy people)

Mana Ora was led by Auckland Council's SST, and supported by Westpac NZ Government Innovation Fund and the Ministry for the Environment. A pool of funding for students' action projects was included in the programme.

The Mana Ora programme and evaluation build on what was learnt in Auckland Council's 2021 Schools' Carbon Footprint Pilot project.[2] The previous evaluation found that schools had some interest in using carbon footprinting to support student learning and action-taking, and school staff could see ways this type of investigation could potentially integrate with school-wide and student-led environmental and sustainability activities and/or classroom learning.[3] However, school staff and Sustainable Schools facilitators who participated in the pilot project identified various challenges, including:

- the time and other difficulties of gathering all the precise kinds of information required to calculate the carbon emissions from different sources (such as waste and transport)
- the need for expert guidance to build school users' knowledge and confidence with carbon calculator data entry and making sense of the outputs
- the potential "disconnect" between the technical processes of carbon calculation/carbon accounting, and the kinds of hands-on school-based environmental and sustainability practices that students, teachers, and facilitators were familiar with.

Building on what was learnt in the pilot, the Mana Ora project shifted focus slightly. The aim of supporting and empowering student-led action projects linked with decarbonisation continued. However, school carbon calculators were no longer the main focus. Instead, the aim was for students to come up with an environmental and sustainability project in their own school and community

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1 This explanation was shared at Mana Ora gatherings and was visible at the top of key documents, such as the funding application templates that student groups used to describe and seek funding for their projects.
2 The pilot involved 10 English-medium primary and secondary schools and was also evaluated by NZCER (Bolstad, 2021).
3 The pilot was also significantly impacted by several months of COVID lockdowns and, consequently, few students had the opportunity to be involved in the piloting process.

that could be linked with emissions reduction/decarbonisation goals.[4] Wrapping around the whole Mana Ora approach was a strong emphasis on supporting students' wellbeing through empowered, community-focused collaborative action and contribution—recognising that taking action can help to alleviate "climate anxiety".

Mana Ora also worked towards a more intentional te ao Māori framing than the previous pilot project, as indicated in the project's name and explanation. Auckland Council was able to offer kaupapa Māori facilitation approach to work with Māori-medium kura and kōhanga reo. Auckland Council established a separate Māori-led process to capture learning from Māori-medium Mana Ora projects, thus this evaluation report only covers the implementation of the programme in English-medium contexts.

School recruitment and project timeline

English-medium schools and early learning centres were recruited to Mana Ora through existing facilitation relationships with Auckland Council's SST.[5]

One of the ideas built into the Mana Ora project model was to bring different schools and kura together at key points across the project so that teachers and students could see that their own chosen project was part of a "bigger picture" of student-led decarbonisation and climate action across many Auckland schools. The hope was that bringing schools together would help to provide excitement/ignition to students and teachers, facilitate project brainstorming, and enable learners and teachers from different schools to learn from each other's project ideas, aspirations, and successes. Key dates are shown in Table 1.

TABLE 1 **Key dates for the project**

Key dates	Event
July 2022	Cluster meeting to discuss ideas with schools
November 2022	Mana Ora information workshop for teachers from interested schools
March 2023	Mana Ora Launch—Project Brainstorming Workshop
April–May 2023	Due date for schools' project funding applications
April–May 2023	Projects funded
May 2023	Planned Mana Ora cluster meeting (shifted to a 1-hour Zoom check-in)
September 2023	Mana Ora workshop at Auckland Climate Festival
November 2023	Mana Ora and Enviroschools celebration event

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4 School carbon calculators were amongst a range of resources and tools available to schools and their facilitators, if they needed or wanted to use them. See Appendix A.
5 All schools that took part in the 2021 pilot project were asked if they wanted to continue, and new schools were approached, working through Sustainable Schools facilitators who had experience and capacity to support school projects with a climate and decarbonisation dimension.

Launch and project ideation

In November 2022, an initial hui was convened with teachers from potentially interested schools. The purpose and timeline for Mana Ora were shared, including expectations of what this would mean for teachers and students for schools who decided to join the project. The Sustainable Schools team facilitated an active project brainstorming session, modelling to teachers how school-based project ideas could be generated around key themes such as transport, waste, kai, energy, and planting/growing, and how these ideas could be linked to decarbonisation.

Mana Ora was officially launched in March 2023. Schools and kura that had expressed interest were invited to each bring a lead teacher and two to three student leaders to the launch workshop day. A range of other supporters and key stakeholders also attended the event, including Auckland Councillors, guests from the Ministry for the Environment and Ministry of Education, Westpac NZ Government Innovation Fund, and other businesses and non-governmental organisations (NGOs) working in climate and sustainability. The morning began with a facilitated workshopping session to connect students with the intentions of Mana Ora, meet each other, and give them time to brainstorm what their school project could be. Five themes or impact areas were introduced as possible areas to focus on (Figure 1). These were put forward because they have been identified as areas with the most impactful emissions reduction potential in the Auckland context. The workshop included discussion about actions in each area and how these can have beneficial climate impacts.

FIGURE 1 **Five theme areas**

Grow	Food	Waste	Energy	Transport

To help guide their planning, student groups were invited to think about:
- which impact areas they found most interesting
- the strengths of their school community, and things their school has already done or that could be built on
- how to involve other students in planning and implementing a project
- whether whānau and community members could be engaged.

Each student group had a large whiteboard and time to discuss, draw, describe, and "pitch" their project idea to the assembled group, and get quick feedback.

At the end of the workshop, students and the other attendees were invited to hear from a small panel of inspiring young people (secondary aged to young adult) who were leaders of climate action projects and activities. The panellists explained how they had become involved and interested in climate and sustainability and what their current activities involved. The young leader panellists and other adult attendees spoke encouragingly to the student attendees, and passed on advice and suggestions they thought could help younger people seeking to lead change in their own schools and communities.

Funding and implementation

Following the event, a Mana Ora funding application process opened. It was required that students be involved in preparing the application, with support from teachers. Applications needed to describe how the proposed project would:

- align with Mana Ora
- relate to climate change and/or decarbonisation
- involve student learning and contribution
- identify meaningful outcomes
- engage with the wider community
- use data to measure change.

Applications also included a budget request and what the budget would be used for.[6] Applications were submitted in April–May, and funded projects got underway in most contexts during Terms 2 and 3.

Thirteen projects received funding for Mana Ora projects in English-medium contexts. This included 11 schools, one early learning centre, and one project led by secondary-aged students outside a school setting (project 13). An additional English-medium school did not put forward a funding application but remained affiliated with Mana Ora and progressed with a student-led decarbonisation project (project 14).

Mid-project cluster gatherings and final celebration event

The aim of bringing Mana Ora schools together during the year was only partially successful, because of scheduling challenges and school availability. A planned in-person cluster gathering in May 2023 was shifted to a Zoom Q&A check-in, following feedback from schools that it would be difficult to get to an in-person gathering. Only a few Mana Ora groups attended the Zoom. Another in-person Mana Ora workshop was planned to coincide with the Auckland Climate Festival in early September. Unfortunately, this timing was not good for the secondary schools, and only four schools (primary and early learning) were able to attend. In the morning, the school groups were intermingled with a wider group of people from organisations and groups taking community-based action on climate and heard from a range of speakers. In the afternoon, the Mana Ora groups split off into their own workshop, and the attending schools each provided a brief update on their projects. The Mana Ora leads also ran an interactive workshop session in which learners and facilitators worked together step by step to build a Lego-based model of the carbon cycle, overlaid on a large map of Tāmaki Makaurau (Figure 2).

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6   Projects were categorised as small (less than $500), medium ($500–$2,000), or large ($2,000–$3,500).

FIGURE 2 **Interactive carbon cycle activity**

The final Mana Ora event was a celebration day in November 2023, coinciding with the Auckland Enviroschools celebration event. All Mana Ora schools and projects were invited to bring the lead teacher and up to four students to the gathering. Participants from 11 of the English-medium projects were able to attend, mix and mingle, hear speeches, and showcase their project in a small walk-around exhibition area.

School characteristics

The English-medium schools included one private school, one state-integrated school, and nine state schools. All but one were co-educational. The sites (including the early learning centre) were situated across nine Auckland Council Local Board areas: Franklin (three sites), Howick (two sites), Puketāpapa (two sites), and one each in Upper Harbour, Ōrākei, Maungakiekie-Tāmaki, Hibiscus and Bays, Waitematā, and Māngere. The schools with the highest proportion of Māori students were one of the Years 9–13 secondary schools (32%), and one of the contributing primary schools (20%). Several schools had high proportions of Pacific students, including one secondary school (74%), and two primary schools (68% and 57%). Several schools and their communities had experienced direct impacts from the flooding and cyclones in early 2023, while others reported having been minimally impacted by these events.

Evaluation

NZCER was engaged to evaluate the impact of Mana Ora English-medium settings.[7] The evaluation looked at how Mana Ora was implemented. For example:

- What action projects were taken in each school and how were they chosen?
- How did Mana Ora support students' engagement with te ao Māori and mātauranga Māori and the intentions of Mana Ora?
- How did project partners and schools work together to support Mana Ora to achieve its intended outcomes?

The evaluation also investigated the extent to which Mana Ora achieved the following intended outcomes.

That students:

- experience authentic involvement in planning and framing their projects
- increase their understanding of climate change, know that there are ways to take action on climate change, and see that they can play a role in this action
- feel a sense of community and that they have participated in collective efforts towards a positive action
- can, in their own words, talk about their relationships and responsibilities in relation to the environment (aligned with the intentions of Mana Ora).

That teachers:

- feel confident, enabled, and empowered to teach about, and inspire, climate action learning
- feel that they are part of a collective of teachers in Auckland who are working on this together.

That SST advisors:

- feel confident to support schools in climate action learning
- are familiar with, and can recommend, a range of appropriate resources to support climate action-focused school projects.

Scope limitations

Several additional outcome areas were identified as important and likely to be of interest to a range of other stakeholders. These included:

- outcomes for schools' wider community. For example, to what extent are whānau and community engaged in student-led action projects? To what extent does this support transfer of decarbonisation knowledge and practices into homes and the community?
- the measurable emissions-reduction impacts of the projects.

While it was beyond the scope of the evaluation to gather direct data on these additional outcomes, where possible these areas were explored through interviews with students, teachers, and SST advisors. The final section of this report discusses the potential of projects like Mana Ora to contribute towards these outcomes.

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7   A separate kaupapa Māori workstream explored processes, impacts, and outcomes in Māori-medium settings.

Data collection methods

Data were collected through interviews with nine lead teachers, student groups in 12 schools, and eight Sustainable Schools advisors. Each project's funding application was also available to the evaluator, to provide context prior to the interviews. Participants were provided with an information letter explaining the purpose of the research and invited to participate on a voluntary basis. Most student interviews were conducted in-person at the students' schools in September (for secondary students) or November (for primary students).[8] Where in-person interviews were not possible, students were interviewed in small groups via Zoom. Most lead teacher interviews were carried out in person or via Zoom in November, although a few lead teachers were not able to be interviewed because of time and availability challenges. Sustainable Schools advisors were interviewed in small groups in early December. The evaluator also attended the in-person Mana Ora events in November 2022, September 2023, and November 2023. Interview transcripts were analysed and coded thematically using nVivo.

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8   Children from the early learning centre were not formally interviewed, but the evaluator visited the centre to be shown around by children and a teacher.

3. The Mana Ora projects

This section describes which students were involved in leading Mana Ora projects, the projects that were chosen within each context, and why these focuses were chosen. The nature of support from SST and other partners is also described.

Mana Ora really embeds me with power that I can make a change.
(Year 12 student)

Which students were involved, and why?

In primary schools, Mana Ora student leaders were typically selected from existing within-school envirogroups. The size and year-level composition of student envirogroups varied from school to school, but typically these were groups that students opted into, and were supported by an enviro or sustainability teacher. Because schools could only bring three students to the launch event and most other events, in some primary schools these opportunities were shared around a slightly larger group of students, so that different students would get the opportunity to attend at least one Mana Ora cluster event. In general, primary students who were involved in Mana Ora stayed with the project from beginning to end.

In secondary schools, the nature of student leadership varied. In two secondary schools, Mana Ora projects could be connected to qualifications the students were working towards. Project 1 (see below) counted as a Creativity, Activity, Service (CAS) project for a student who was working towards an International Baccalaureate (IB). Project 3 (see below) occurred in the context of a Year 13 Sustainability class, where students were working on action projects for a Level 3 achievement standard. In the other three secondary schools, the senior students' involvement was not explicitly linked to their subject classes. However, in only one of these schools did the senior students who initiated the project remain involved from beginning to end. In the other two schools, the projects were carried forward by teachers, with some involvement of students from subject classes they taught.

The projects

Table 2 provides a high-level description of all the projects. Key focal areas for projects included those that had been put forward at the launch as impactful areas to focus on for emissions reduction in Auckland: transport, energy, growing food, waste reduction, and various forms of community engagement. Many projects wove together multiple goals and themes, not all of which are captured in the table below.[9]

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9   For example, a health and wellbeing theme was evident across many of the projects.

TABLE 2 **Mana Ora projects in English-medium settings**

Project	School type	Focus	Description
1	Composite (Y1–13)	Transport	Student envirogroup leaders (Year 12) researched and investigated ways to encourage and promote more sustainable student transport to and from school.
2	Contributing primary (Y1–6)	Transport	Years 5–6 student envirogroup leaders and their teacher organised a 2-week themed campaign to encourage more families to use active transport (walking, biking, scootering) rather than car drop-offs.
3	Secondary (Y9–13)	Energy	Students in a Year 13 Sustainability class investigated options to retrofit the lighting fixtures in an older school block, to increase energy efficiency and create a more pleasant lighting environment for learners.
4	Full primary (Y1–8)	Energy, Outdoor classroom	Years 5–6 student envirogroup leaders worked with their teacher to design and plant up a calming "outdoor classroom" space adjacent to a new-build learning block.
5	Secondary (Y9–13)	Energy, Growing food	This project was to install solar panels to power a new indoor hydroponics growing room. The project had some student involvement but was mainly led by horticulture/primary industries teachers.
6	Secondary (Y7–13)	Growing food, waste reduction	Senior (Years 12–13) envirogroup students were initially involved in the proposal to establish planter boxes for food gardens around the school grounds. The project was continued and implemented by a food technology teacher and Year 9 students.
7	Early Learning Centre	Growing food, waste reduction	This project focused on producing healthy, low-cost, sustainable food for the community. Young children learnt to grow different vegetables and how to make vegetarian food with little or no waste. Children had hands-on learning about healthy soil, worm farming, and composting.
8	Secondary (Y7–13)	Waste reduction	Senior student envirogroup leaders researched and implemented a three-bin system to divert paper and plastics from landfill.
9	Contributing primary (Y1–6)	Waste reduction	Years 4, 5, and 6 student envirogroup leaders and their teacher audited waste around the school and proposed a new bins system to separate waste streams. An updated waste audit identified soft plastics as a continuing issue, leading to a new plan to implement soft plastics collection.
10	Full primary (Y1–8)	Waste reduction	Years 7–8 student envirogroup leaders audited school waste, realising that a large proportion could be diverted from landfill. A new system was implemented to divert food waste to new worm farms and a hot composting system in the school.
11	Contributing primary (Y1–6)	Communicating decarbonisation	Years 4, 5, and 6 student envirogroup leaders worked with teachers and other classes to design five thematic murals showing many different ways to reduce carbon emissions and look after the environment.
12	Contributing primary (Y1–6)	Communicating care for our awa	Years 5–6 student envirogroup leaders designed and installed mural panels in a public walkway near the school to convey messages to the community about caring for the nearby awa.
13	Intermediate (Y7–8)	School carbon calculator	Year 8 extension science students worked with an independent carbon accounting expert to calculate their school's carbon footprint and identify areas for potential emissions reduction.
14	Secondary student leaders' group	Growing/ planting, resources for learners	A group of five secondary student environmental leaders from multiple schools embarked on the design of a resource kit including a game and hands-on activities, aimed at supporting Years 5–8 students to learn about climate change and how to take action through growing and planting native trees.

How project focuses were chosen

Transport projects

For the two transport-focused projects, one secondary school (project 1) had already measured its school carbon footprint. Travel (including flights and school trips) had been identified as one of the biggest contributors. The school's sustainability council was reportedly working on the international travel aspect, so the students decided their focus would be on travel to and from school.

At a primary school (project 2), students learnt that transport (and "cow burps") were large sources of emissions, leading them to a creative campaign to encourage active modes of school travel (walking, biking, scootering) rather than using cars. In addition to the emissions-reduction benefits, safety issues had motivated students to take action:

> When I am on Road Patrol we see people trying to get into parks, and parking on yellow lines just to drop off their kid, and we wanted to decrease it … we had to put up signs. We had to get police to tell people off for parking along yellow lines. So, we also did this project for the road too, to keep it safe. (Year 6 student)

While these two projects were the only ones that explicitly targeted school transport, school transport and active travel came up in a number of other projects as an additional focus, or an area that lead teachers and students talked about as something for "next year" (see subsection below on "The role of data and measures").

Energy projects

A few projects focused on energy. One of these (project 3) involved Year 13 students in an education for sustainability NCEA Level 3 class, working on an achievement standard that requires taking an action towards sustainability. These students had not been able to attend the Mana Ora launch; however, they used the internet to research ways to decarbonise schools. Changing to LED lights came up in their searches, and students felt this change was "easier for us to achieve than other things we saw on the list". An older block of the school was targeted for the students' action project. In addition to being energy inefficient, these older blocks had harsh artificial lighting that learners found unpleasant, compared with other newer blocks in the school that utilised more natural light:

> It's like the lights are so *bright*. You just don't want to go in. In certain classes it's so bright for no reason. (Year 13 students)

In researching alternative options and seeking advice from lighting experts, students came to better understand the wellbeing impacts of different lighting, in addition to the energy consumption impacts. They were fascinated to learn that "there is a whole psychology behind" the effects of lighting on mood and motivation.

At a primary school (project 4), a new-build learning block had a small adjacent bit of underutilised land that the principal had offered to the sustainability lead teacher to do something with:

> I thought that would be an ideal opportunity if we can get some funding. To be able to plant up and have an outdoor learning space for students, a quiet space for them and for us as well. (Lead teacher)

This project had a nature/grow focus, and at the Mana Ora launch event this was presented as the notion of creating an "outdoor classroom" where learning could happen without needing to use power (lights, heating/cooling). The students leading the project sketched out plans for the garden, including elements such as a butterfly garden, lizard garden, Māori medicinal herb garden, and a sensory garden, incorporating things that junior classes and teachers had asked for when consulted:

> The reason why [we created it] is to try to lower the carbon emissions in our school—so we are trying to bring learning outside to use less carbon than in the classroom and we can use the plants in the garden like chamomile and stuff. (Years 5 and 6 students)

This project also had a strong wellbeing driver, especially for the lead teacher who commented that having an accessible, quiet, outdoor space was especially beneficial for neurodiverse students or any students experiencing anxiety who needed a place to "reset".

Food-growing projects

Several projects had a focus on growing food. One of these (project 5) was about both food production and energy. This secondary school, located in a more rural part of Auckland, already had a number of active food gardens, and several classes focused on learning about horticulture and primary industries. The specific project idea was to build an indoor hydroponics unit to grow food, with grow-lights powered by solar electricity.[10] In this school, the project was more teacher-led than student-led. The idea had begun to spark at a physics conference the teachers had attended where they made some useful connections with knowledgeable people:

> What we are trying to achieve is vertical hydroponics, something you could achieve in a house, and to get that solar powered. So, there's big ideas afoot, we are in contact with people who are way ahead of our thinking, that can help us with this, how to create an automated growing system that just runs itself—like [regulating] water temperature, telling when the lights need to come on or off. (Lead teacher)

The Mana Ora project came at the right time, providing an opportunity to access funding to turn the idea into a reality. While no students from this school were able to attend the Mana Ora launch, a few of the Year 13 Enviro prefects did contribute to the funding proposal. However, as the year progressed the students became too busy and dropped away, and the project was implemented by teachers with help from students in Year 11 horticulture and primary industries classes.

Project 6 was also in a secondary school and had a food-growing and food waste-reduction focus. In this case, the project was about creating outdoor garden planter boxes for growing fresh fruit and vegetables. As with project 5, the school could not attend the Mana Ora launch, but the project proposal had initial involvement from senior environmental students. The teacher supporting the project was a food technology teacher who immediately saw the potential of this idea:

> I don't know if [the students] thought too much about why they would want a vege garden. They just thought it would be a really cool idea. But as a food technology teacher I thought it was a great idea, because our students are quite disconnected from where food comes from. (Lead teacher)

Again, at this school the senior enviro students had dropped away through the year, but a number of people from within the school and wider community rallied together to build the planter boxes. The lead teacher and a Year 9 food technology class taught by this teacher became very active users of the planter boxes, learning to raise seedlings, plant, harvest, and use the fresh produce to learn to cook nutritious recipes and minimise food waste. Another teacher supported a different group of students to work on a mural to decorate the gardens.

Project 7, in an early learning centre, also had a food-growing focus, with associated waste minimisation. The lead teacher had initially found it challenging to think about how to connect very young children with ideas around the carbon cycle, and decarbonisation. The idea that developed was to set up raised garden beds, composting, and a worm farm so that children and their teachers

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10 The reason the hydroponics setup was solar powered, rather than using natural light, was partly due to the need to protect against theft (thus covering windows), as well as to be able to regulate lighting conditions.

could plant and grow vegetables on site, learn about worm farms and composting, explore different kinds of fruits and vegetables, and prepare the food they grew for eating. A strong goal was to "bring parents along" the whole journey so that the learning and practices could be implemented at home as well, supporting families with the high costs of buying food, amongst other positive environmental benefits. As well as learning about the growing process and different kinds of vegetables, children prepared meals using food they had grown, with the aim of developing a recipe book for families for healthy, low-cost, low-waste vegetable-based meals.

Waste and litter reduction projects

Projects 8, 9, and 10 all had a waste reduction focus. Project 8 was led by senior environmental leaders in a secondary school, where waste and litter had been a longstanding concern. The school was situated close to a harbour, and the impact of litter on marine life was one of the concerns students felt moved to address. In a previous year, students had learnt how to conduct waste audits through Sustainable Coastlines:

> We sort of decided to do a similar thing here this year, and we did a little [waste] audit here at school, so we could get a clearer picture of what we were dealing with and what we had to improve in our school environment. I think we wrote down that 35% of our landfill materials were paper or recyclables. (Year 13 students)

The solution proposed by the students was to implement a three-bin system, to divert paper and recyclables from landfill. Collecting organic waste for compost was considered, but structural barriers to this soon became evident:

> We kind of came to a barrier of, we didn't have the infrastructure to [process] a large amount of compost waste in our school, and we didn't have the organisation to be able to transport it out to someone else. (Year 13 students)

The bin system that was purchased was chosen because it provided the options to later "add on" additional streams for organic waste, and soft plastics. Student leaders hoped that these waste streams could be tackled in the future, once the initial three-bins system was established and working effectively.

Project 9, in a primary school, also stemmed from concerns about litter around the school, and the impact of litter on nearby waterways. In this case, it was an awa that passed nearby the school, which students had spent a lot of time cleaning and learning about through water-testing. A waste audit early in the year led to the identification of a separate bins system as a proposed solution. However, during the year the school changed its lunch system from an external provider that delivered cold packed lunches, to an on-site system of hot meals prepared by a staff member. Overnight, "the amount of waste vanished", as the food was more likely to be eaten by students, and the only waste was organic and could be composted. With help from a Sustainable Schools advisor, the lead teacher and students had to pivot to a different plan. This led to a second waste audit of litter around the playground which identified soft plastics from morning teas as an ongoing problem. The new plan was to provide clearly labelled collection boxes in classrooms and the staffroom for the collection of soft plastics, which would be taken to a local collection point periodically. By the end of the year, the focus in this school was beginning to pivot from waste towards decarbonisation through promoting active transport (discussed further in the next section).

Project 10, also in a primary school, chose waste as a focus. At the Mana Ora launch event, Years 7–8 students looked across the five theme areas (Figure 1) and felt that "we were doing quite good on the

other things but waste was the one we hadn't really done anything on". Students commented that a very high proportion of students already used active transport to get to their school (walking, biking, scootering):

> We have lots of bike racks. People use the fence for bikes as well. We have a track that does encourage a lot of the young kids to bring their bikes. It can have bikes, scooters, roller skates, skateboards … (Years 7–8 students)

After carrying out a waste audit, students identified that food waste could be diverted to compost and worm bins. Before beginning the project, the school only had one worm bin, but with Mana Ora funding, additional bins were purchased. The school had also recently invested in a hot composting system so large that they hoped to get community members to bring in their food scraps too. The school also had on-site vegetable gardens and chickens, and some students were also getting involved in Trees for Survival, raising native trees that could eventually be planted out.

Based on their audit, students established a bin collection system and a roster where students took responsibility for collecting and emptying the bins, with some food scraps going to the chickens, and the rest going to worm farms or the hot composting system.

A second waste audit carried out towards the end of the year showed improvement, with some areas still needing to be worked on. The second waste audit revealed that, while the classroom and staffroom waste systems had improved, an after-school programme had not been adequately provisioned with bin options, so this was addressed.

Projects to communicate to the community through murals

Projects 11 and 12 had many similarities with other projects described above, with a special emphasis on creating murals to convey environmental care and emissions-reduction messages to the wider school community. Primary students leading project 11 explained that, at the Mana Ora launch, they began to draw their brainstormed ideas around the five theme areas on the whiteboard:

> We had lots of drawings—stickmen, and a weird-looking bus. A lady came up to us and said 'That would look good on a mural!'. So we thought you know what, we are going to put that piece of art into something bigger, and we are going to make murals our project. (Years 4–6 students)

The project involved designing five murals, one for each theme, and engaging each year-group level in the design of imagery for each thematic mural:

> Years 0–1 did 'waste', Year 2 did 'planting', Years 3–4 did 'energy', and Years 5–6 did 'food'. And the Envirogroup and Mana Ora group did 'transport'. (Years 4–6 students)

Project 12 had a focus on care for a local awa (like project 9), in this case a section that ran through an area of new housing development. The awa, historically part of an important wetland, had recently been daylighted[11] and landscaped in ways that would decrease flooding risks and improve water quality. The surroundings of the awa were also landscaped with walking pathways and pedestrian bridges for safe pedestrian and bike movement around the area. As with project 9, students had engaged in various planting and water quality monitoring work, and with Mana Ora their project became a plan to design and install mural boards near this public walkway with messages to encourage the community to take responsibility for caring for the health of the awa.

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11 Stream daylighting refers to a process in which piped stormwater flows or buried streams are restored as above-ground stream environments.

Other focuses

Projects 13 and 14 sit slightly outside the main scope for the evaluation, as project 13 did not involve a Mana Ora funding application, and project 14 occurred outside a school context. Key focuses are indicated in Table 2.

Support from Sustainable Schools advisors and other partners

The role of Sustainable Schools advisors varied across different Mana Ora projects and was driven by the levels of support the schools needed and advisor availability. In preparation for Mana Ora, a variety of existing sustainability and climate education resources and carbon calculator tools had been compiled for the Sustainable Schools advisors to explore or recommend to schools if they felt these might be useful (Appendix A).

In some cases, the Sustainable Schools advisors had worked with lead teachers prior to and around the time of the project launch "to hone, sort of, the direction of their project, or their ideas when they were at the initial stages". Some advisors were working with lead teachers who were already quite experienced leading in-school sustainability action projects, and schools that had well-embedded school-wide support for this kind of work. In many cases, advisors' main role was to be a sounding board and support for lead teachers who mainly just wanted "clarification, and little check-ins to check that they were on the right track":

> They knew they were doing something meaningful, but it was just it's new territory for them. And there's a lot of learning for them [teachers] to do as well as students. (Advisor)

At times, advisors also helped lead teachers to make connections to other people or provided help transporting students to and from Mana Ora events.

In three of the secondary schools, Sustainable Schools advisors provided some direct support to students who were leading projects. As with lead teachers, this could take the form of being a sounding board, providing suggestions and advice on a particular problem the students were having, suggesting resources, or brokering a connection with someone else such as an expert or another team at Auckland Council that could help students with their next step.

Some schools accessed additional support from science organisations, people connected with universities, mana whenua groups, and other experts from within their school and local communities who came forward to help with their Mana Ora projects.

Project completion and succession planning

By late 2023, many projects were "complete" in that the sense that a specific tangible change students had been working towards had been implemented (e.g., mural panels completed and installed; new bins or worm bins purchased and in use; garden beds built and in use). A few projects had not quite reached the complete goal that students had been working towards, but there were plans to continue the project into the next year. New learning gained throughout the project had modified the direction of some projects and paved ideas for pursuing greater decarbonisation gains "next year"; for example, moving from actions focusing on waste, towards areas like active transport.

Mana Ora shares some similarities with a Western Australian 2-year Low Carbon Schools Pilot Program (LCSPP) project, where 13 Perth schools were supported to calculate their carbon footprint based on utility consumption (electricity, gas, and water), and were given ideas about zero, low, or high-

cost initiatives they could pursue across energy, waste, water, and transport (Odell et al., 2021).[12] Schools chose initiatives that were most relevant to their school and added to their action plans on an ongoing basis. Of the 636 actions identified across the 13 Perth schools, the most common areas targeted through action initiatives were energy (36%), waste (26%)—despite utility bills not providing measures of waste—water (19%), transport (7%), and "other" (12%) categories.

The LCSPP study also categorised the actions according to "type of action". Table 3 uses a slightly modified version of the LCSPP categorisations to summarise what the Mana Ora projects had achieved by late 2023.

TABLE 3 **Mana Ora projects categorised by action type, modified after Odell et al. (2021)**

Type	Description	Projects
Infrastructure	Implementing tangible infrastructure changes at the school	Projects 3, 4, 5, 6, 7, 8, 10
Investigate	Gathering more information, such as investigating resource consumption, conducting audits of appliances, gathering data about current behaviours and perceptions (e.g., travel surveys)	Projects 1, 9, 13
Behaviour change	Targeting specific behaviour changes to reduce emissions	Project 2
Educating others	Seeking to raise other people's knowledge, awareness, and understanding of ways they can take action	Projects 11, 12, 14

While the table above classifies each Mana Ora project into only one category for simplicity, it is important to note that these categories are not mutually exclusive. For example, most, if not all, projects in the "infrastructure", "behaviour change", and "educating others" categories also included aspects of "investigation". The nature of investigations across all projects is discussed further in the next section which reports on data and measures. Likewise, projects categorised as "investigate" in 2023 were largely a factor of time and will likely lead to next-step actions in other categories given more time. Indeed, by late 2023, students and teachers across many projects were talking about "next steps" that could be taken in 2024 to build on foundations that were established through their Mana Ora projects.

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12   Though students were involved in LCSPP, it is less clear that the project aimed to be as student-led as Mana Ora.

4. The role of data and measures

As part of the funding application process, groups were asked to identify the data they had already collected, or planned to collect during the project, to measure its impact. This section discusses the role of data and measurement in the projects, including which measures teachers and students tended to find easy or difficult to use, and their ideas about how to refine data and measurement for future school sustainability and decarbonisation projects.

Carbon footprinting measures

Carbon footprint measures were only used in a few schools. As in the previous pilot project, the evaluation of Mana Ora indicated challenges for schools around using carbon calculators to understand their emissions and/or to drive emissions-reducing changes within the school.

One challenge was a lack of access to time and technical expertise to produce a carbon footprint measurement for the school. One school (project 1) had previously worked with an external provider to measure the school's carbon footprint. Having this information already available had helped students to decide to focus their Mana Ora project on school travel. However, the students noted that their school was "privileged" and "had the ability to invest in sustainability activities":

> I have been talking to other secondary student leaders. I think like, other schools … wouldn't have enough funding to do stuff like we can do. (Secondary student)

Another school (project 13), a Year 8 extension science class, was working with the support of a carbon accounting expert to gather and input data across a range of areas to understand the school's carbon footprint. However, staff and student commuting were not included at this stage, described as "too big a task" and something that was "in development" for the future.

Several other projects signalled an intention or desire to measure the carbon emission impacts of their projects. However, teachers who had looked at suggested tools or searched for tools themselves commented that they weren't "student friendly":

> I looked at calculators and couldn't quite find something that was the right tool, it didn't quite make sense. I looked for ones that were student friendly—I'm still looking for a good one! (Primary teacher)

One primary school worked with a science research organisation that offered a different approach to measuring transport-related emissions. A sensor box was placed near the school gate to gather direct measures of atmospheric carbon dioxide and carbon monoxide in that area for a period of weeks. This approach was very attractive to the lead teacher because it was "only measuring one thing":

> And that the data was measured, analysed, and presented back to me by an outside agency that could support that. (Primary teacher)

The teacher contrasted this with a previous experience with the Schools' Carbon Footprint pilot project which had been "really time consuming" and "difficult to involve the students":

> I think I would be more open to taking [school carbon footprinting] on board if I was measuring one aspect at a time. (Primary teacher)

School travel data

Projects 1, 2, 13, and several other projects identified opportunities to gather other useful data about school travel. In project 2, Mana Ora students stood out at the school gate and interviewed people who already walked to school, and used an online survey to gather additional information from the wider school community about what influenced their travel decisions:

> [At the gate interviews we asked] 'Who do you walk to school with? Do you like walking to school? Do you feel safe walking to school?' That sort of thing. The [survey] we sent out was things like, 'How does your child get to school? How many km do you live within? Would you let you your child walk to school? Would you let them walk to school in the rain?' That sort of thing. (Years 5–6 students)

Students were interested to learn that reasons for walking included "for nature", "a kid who walked for all the dogs on the way", and "a kid who read while she walked". As part of measuring their impact, students carried out spot-counts of the number of scooters and bikes before and after their school-wide campaign to encourage active travel for the last 2 weeks of Term 3, which had been a huge success:

> Once [before the project] we counted there was 4 scooters on the senior side and 2 scooters on the junior side. After the project there was something like 191 scooters on the senior side. (Years 5–6 students)

Secondary student leaders of project 1 had also designed and carried out a survey of the school community, targeting "the people who are not currently on school buses", reasoning that buses were already providing a form of sustainable transport. The survey findings indicated that about 80% of those not using buses travel by car, with about half travelling about 15–20 minutes:

> The main reasons people said they are inclined not to [cycle] are 1) safety and 2) time efficiency. Around ¼ of people agreed that with better infrastructure and storage space their child would be inclined to go by bike or scooter. (Year 12 students)

Although it had taken them most of the year to develop, quality assure, and administer the survey to ensure the findings would be robust, the data had been useful in helping the students to target their project interventions. Next steps students were exploring included organising free bike training sessions through Auckland Transport and Travelwise, and installing infrastructure (bike racks, bike lanes) to address the other concerns and barriers:

> If bike infrastructure, especially bike lanes, are increased arounds schools it would be really beneficial. With bikes, we are aiming at the Years 5–6 and middle school. That is when students want to bike. Bike racks, bike systems, bike lanes—and with proper education the parents' attitude towards bikes and bike safety can really be enhanced. (Year 12 students)

At a more anecdotal level, students at the primary school that had designed five thematic murals, including one on transport, remarked that "we have noticed a lot we have seen less cars, more people walking and scootering to school" since the opening of the murals.

Another primary school that had focused on waste reduction in 2023 was beginning to discuss active transport as an opportunity to continue decarbonisation efforts at their school in 2024. The lead teacher had also discovered a whole box of pedometers in the school, leading to an idea that it could be made into a competition for next year:

> We have just got a new container for bikes. We want to paint a mural on the container with a clear carbon message for the students and community. Our aim is to get our students and whānau to understand the importance of doing as much as we can to reduce the carbon in the air, to help with climate change. Get out of the car and walk to school! (Years 5–6 students)

Energy monitoring

Several schools explored targeted strategies for measuring energy use or savings. For project 3, the students' project was to change the lighting in one school block. This was a manageable-sized project for the students' Mana Ora budget, and the block was selected because it was "older" and "was probably not likely to get renovated" in the near future. Students planned to gather power consumption data for that block before and after the project's implementation. However, at the time they were interviewed, students did not yet have access to school power bills, nor were they sure if the energy information was disaggregated to the level of just one school block.[13] Simpler measures to monitor energy-saving behavioural patterns were easier for students to carry out without assistance:

> We pretty much just spot check each classroom [to see if the lights are on] when they are being un-used. (Secondary students)

Envirogroup students at one primary school had done a "power challenge" with their teacher in the previous year. The teacher could not remember which tool they had used but had just searched the internet for "the most kid-friendly one I could find" to calculate power wattage, running costs, and carbon emissions produced for different appliances in the school such as heat pumps, TVs, devices using the internet, and CO_2 monitors:

> They could not believe how much power a heat pump uses ... 'Oh wow'. Calculating the lights, 'wow that's a lot'. Calculating the costs as well, for energy. A lot of them didn't know about carbon, or what a carbon footprint is. They had heard of it but didn't really understand what it was. (Primary teacher)

Developing this prior understanding had helped students recognise the decarbonising link to their outdoor classroom project and had also led to more power-saving behaviours in the classroom such as switching off appliances when not in use.

Waste audits and water testing

Structured waste audits and facilitated water quality testing were key data-gathering activities in several schools. Compared to energy auditing and carbon footprinting, methodologies for measuring water quality and auditing waste appeared to be much more readily accessible to schools, and more easily supported through existing resources and facilitation support. While these methodologies have a less direct connection to carbon emissions, feedback from students and teachers underscored that "data is motivating", and primary students in particular found it easy to explain these techniques and what they learnt from repeated measurements.

Students and teachers from one school discussed how they had been supported to use eDNA testing kits for their local awa. The discovery of cow DNA in the awa had intrigued students and provoked much discussion and theorising about what could explain this finding:

> They came up with their own theories about how an element of that specimen came into the awa. 'Miss, someone came along and threw their McDonalds into the awa.' (Primary teacher)

A lot of them didn't know about carbon, or what a carbon footprint is. They had heard of it but didn't really understand what it was.
(Primary teacher)

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13 This same challenge around disaggregation was discussed by a different secondary school in the previous Schools' Carbon Footprint pilot, which also had aspirations to support students to investigate energy consumption patterns "by block" and engage students in exploring ways to measure and monitor the impact of energy-saving interventions (see Bolstad, 2021).

This example (albeit not in the context of carbon emissions) had parallels to the experience of the school that had worked with the science research organisation to monitor school-gate emissions. Both highlighted the learning and engagement benefits of having access to conceptually advanced science testing, scaffolded by expert equipment and support that help students to explore the deeper interconnections between science and environmental/social issues.

Plant growth and number of plantings

For projects with a food-growing focus, the amount of food produced was a tangible measure of success. Similarly, for the outdoor classroom (project 4), a success measure was having procured and planted all the plants students had planned into their garden design. Where students had been involved in riparian or coastal planting (either as part of Mana Ora, or as part of other environmental and climate action activities), students showed some pride in stating the numbers of plants their groups had planted, as a measure of their impact.

Social and wellbeing indicators

Social and wellbeing measures and indicators of success were also discussed by teachers:

> It's the number of people engaged, the conversations that have been ongoing, the processes students have taken, students reviewing, and the processes they've taken, but also students talking to other students, and getting feedback. Our students in the school giving feedback to our leaders about the project. (Primary teacher)

> One staff member said that waiting at the gate was 'a joy'. Everyone was happy when they were participating. They were walking with parents, walking the dog. The sense of 'We're behind you, we want to do this.' (Primary teacher)

The teacher from the project that had created the outdoor classroom was already seeing benefits for students with anxiety or neurodiversity who often struggled in the classroom environment:

> When they start to escalate the behaviour and they can get quite angry or anxious, I can send them out with a task … [like] 'Can you go have a look to check if there are any lizards in the lizard garden?' (Lead teacher)

The teacher had noticed a reduction in behavioural issues through using the garden space in these ways. In addition to the calming and focusing effects, the garden provided a way to engage students with learning activities such as writing or reading, and the measurable progress specific students were making as a result:

> If we make it like 'Can you find out a little bit more about geckos that live in that area?' immediately [the student] will connect to that and will actually do it. (Lead teacher)

5. Outcomes for learners

This section looks at the extent to which Mana Ora supported the intended outcomes for learners who led the projects in their schools. Namely:
- whether they had an authentic experience of planning and framing a project
- how the project contributed to their understanding of climate change and decarbonisation
- whether it helped them see ways to take action
- the extent to which they felt part of a community that was taking positive action.

An authentic experience of planning and framing a project

Many student leaders said Mana Ora has "definitely" helped them to experience what it's like to plan a project and make it happen. Some students remarked "this was probably the biggest thing I have ever done" and "it was very challenging" but "very rewarding":

> I thought planning was easy, it's not really. (Years 5–6 students)

> It gives you a great opportunity to plan the whole thing. It asks you as a student to put your creativity into reality and see how things go. It also gives you an opportunity to see how planning changes—especially changes of timeline—we are changing ideas and changing steps [in the plan] all the time. (Year 12 students)

In the primary school contexts, lead teachers tended to support and guide student leaders, advising on their ideas and helping with the logistics of implementation:

> I've let them decide what the topic should be, what key areas to focus on, and that sort of stuff. So that was all student-led. I kinda did more of the admin side of it, to get them organised and moving them along. (Primary teacher)

In the early learning centre and some primary schools, the project was somewhat more teacher-led, but the timing and focus of learning activities was responsive to learners' interests and ideas and students were supported to lead where this was appropriate.

Students and teachers discussed what students had learnt from the processes of writing the funding application, working out a budget, seeking input and feedback from others, and negotiating amongst themselves as a team:

> I think the proposal of going through Mana Ora and having to prepare a budget, the research behind it was something I had not done before. And then, yeah, it felt quite impactful getting everyone's advice. (Years 12–13 students)

> Researching costs [for the planting budget]. I think they actually don't realise how much things cost—[because they are students], stuff just 'appears' so they don't [usually] know the costs of things. (Primary teacher)

Students and teachers talked about personal growth they observed in learners:

> I think for me the kids have grown in themselves to be advocates, to know what is next. They have developed a lot of life skills, processing skills, thinking and problem-solving. I think they have learned a

lot about themselves and their connection to the Mana Ora project, and what do we do for the future. (Primary teacher)

Several student groups said that having access to a budget to carry out their project had been essential to them being able to follow through on their aspirations. Secondary students in particular found the autonomy of having a budget was especially powerful:

> *To be honest, [the Mana Ora funding] enabled us to do this project. We had the idea but it's like having the backup and the funds to do it.*
>
> (Year 13 students)

> To be honest, [the Mana Ora funding] enabled us to do this project. We had the idea but it's like having the backup and the funds to do it. Our group wouldn't have been able to have done anything. We could have looked at the lights and analysed data but this is doing something bigger than just that. It's good they chose us [for funding] otherwise we wouldn't have been able to do this. (Year 13 students)

> The funding supplied by Mana Ora has helped so much, in like convincing the school to let us do it. It actually gave us a way to put [in place] what we want to do in like a physical way … we would not have been able to do that without the funding, there's no doubt about that because we've been trying [to do this] for years. (Years 12 and 13 students)

In two secondary schools, the original senior student leaders had not remained involved, and were not available to be interviewed. However, one secondary teacher who had continued the project with the help of junior students commented that:

> I think the [senior] students who initially helped with the project have been really amazed at the quality of the outcome even though they haven't been really involved in it. Because they are in the envirogroup it gives them a bit more confidence that they can start a project and that with the right people it can be implemented and carried out, so they can make a change. (Secondary teacher)

The younger secondary students who worked on the Mana Ora project implementation in these two schools were interviewed. From their perspectives, the projects had come from their teachers, and they were largely unaware of how they had got started, or the wider Mana Ora context. One teacher commented that, while these projects were more "teacher-led" in 2023, being involved in implementation gave the younger students an opportunity to "see how planning is done", even if it was their teachers actually progressing project plans and logistics.

Understanding climate change and decarbonisation

Many student interviewees were able to explain new understandings they had developed about climate change and/or decarbonisation:

> So all of the greenhouse gases are very bad for the earth, and make it, sort of like a blanket around the Earth I guess. (Years 4–6 students)

> The Mana Ora project, it gave me a better understanding of what carbon was and like how you can deal with it. And there was heaps of different types of carbon—there is carbon from cows, transport carbon, we had to choose which one we wanted to decrease. (Years 5–6 students)

> Yes definitely. The scale of everything. You know it's affecting, but I didn't realise how massive of a problem, and how everything contributes. (Year 8 students)

> Pretty much everything produces CO_2—definitely waste—and CO_2 warms the planet up. We need CO_2 to survive but we have too much in the atmosphere. It's all about moderation with the CO_2. (Years 7–8 students)

Climate is the weather, so climate change or global warming heats up the Earth. So the Earth is basically getting more hot overall, Antarctica gets more hot, and it makes ocean more acidic (Year 6 student)

When asked how they had developed this knowledge, some students and teachers described specific instances of teaching and learning that occurred at Mana Ora cluster events, or during their in-school research and project implementation:

The Mana Ora project, it gave me a better understanding of what carbon was and like how you can deal with it. And there was heaps of different types of carbon—there is carbon from cows, transport carbon, we had to choose which one we wanted to decrease.
(Years 5–6 students)

We learned about … how food travels from one place to another and how much gas is going into the air. And we learned about, like food miles—and that you can buy local instead of from far away. (Years 4–6 students)

Through the Young Leaders programme [students] were presented with information around where carbon emissions in Tāmaki [come from]. (Sustainable Schools advisor)

At the climate festival day—the facilitators [built the Lego] the carbon cycle with the kids—that was a really good activity. (Primary teacher)

At one primary school, the teacher explained that a scientist had come in and led Years 5–6 students through a learning activity to break down key concepts and vocabulary. At each stage of the scientist's presentation, students had to draw a picture of their understanding of what that component was:

So if it was carbon, they drew their picture of what it was in the environment. The key vocabulary was broken down and they had to put it in their own words and then draw a picture of what it might look like. I came out with a better picture of it myself too. (Primary teacher)

Several interviewees talked about the value of seeking to find the "decarbonisation" links to their chosen project focus, particularly where the link may have been less obvious:

I think one of the key [things they learnt] at the beginning, when we think of waste we often go to cleaning up litter. I think they realised 'Oh wait a minute it makes the school look nice but doesn't impact our carbon footprint.' They became more aware that in order to truly impact [emissions] there are certain changes that are significantly more important (e.g., composting impacted carbon footprint more than recycling). (Primary teacher)

We looked into where does New Zealand ship our rubbish? Obviously not all rubbish stays in New Zealand, our Government pays to ship it overseas, and so the impact of that in terms of it getting transported overseas, in terms of the carbon. Because we looked at the project decarbonisation goal like, how can we actually achieve that, like with rubbish, how does recycling achieve decarbonisation? (Years 12–13 students)

In one or two primary schools, students seemed to have a less strong grasp on the details of how their project was connected to climate change and/or decarbonisation. However, they were able to express why their projects were doing something that was good for the environment and for animals, and why this mattered to them.

Several factors seemed to impact learners' ability to explain their project's link to climate change and decarbonisation. These factors included: their ages; the extent to which those students had been present at Mana Ora cluster events or had additional inputs from climate- or carbon-knowledgeable

experts; and the amount of time and support they had to learn and research this in their schools. One primary teacher explained that, at their school, the Mana Ora project "hasn't been done in isolation"—for example, the school's production that year had had an environment and climate change theme:

> *It was good to be able to speak to the community and play a part. It made us feel a bit more powerful. Like we can make a change, that our voice will be heard.*
>
> (Years 5–6 students)

> We tie in our inquiries to literacy as well, the reading they were doing for literacy, reading and writing at that time was all environmental stuff. Global warming and carbon footprints … I think it's good that it all connects in—otherwise they can't connect to it and see the point in it. (Primary teacher)

Several schools (both primary and secondary) were involved with Trees for Survival, and students brought this up when asked about climate change:

> During this project there has been cyclones and stuff and we figured out our beach was eroding. We went down to the beach to plant grasses to prevent the dunes from eroding. (Years 5–6 students)

For the younger secondary students in the two schools with more "teacher-led" projects, there had been less direct discussion or teaching about climate change or decarbonisation:

> I guess with the whole climate side of things I have not explicitly taught that with my Year 9s. That's something we will put into our teaching moving forward. When we are working in the gardens like with the composting and things instead of putting scraps into rubbish if we put them into compost or reusing them those nutrients are going back into our bodies or into the soil—we talk about it in the gardens but not teaching formally. (Secondary teacher)

However, even without direct teaching, the student groups at both these secondary schools had some ideas about climate change and decarbonisation:

> I don't know if we have learned too much about climate change but by planting trees and stuff would help with that. I know the hydroponics, that's decarbonisation isn't it? I am pretty sure. We've been into a little bit of it but not too much. (Year 11 students)

> I think it just shows what you can do with the food, like stuff you aren't going to use. It just gives us more knowledge on how all this stuff works. That it could be more complicated than most people think. (Year 9 students)

Discussions suggested that students' ideas were often on the right track but that they would benefit from direct teaching around key concepts that could link their learning to climate change science:

> I think if they were to I guess go more in depth and talk about it more in class it would be quite good. The more we learn the more we can help out [with climate change issues] and enjoy it. (Year 11 students)

Seeing ways to take action on climate change

Most students felt that Mana Ora had helped them to see ways they could take action on climate change and other environmental and sustainability issues that mattered to them. Many said it was "empowering" to see that, as students, they could make a change in their own school:

> As students, we are really grateful for this experience and opportunities. Mana Ora really embeds me with power that I can make a change. It is very rare for students to feel they can make a huge change in their environment. For me personally, it is very powerful. (Year 12 students)

Yes, we feel more empowered. Before I felt it was kind of hard to put your voice out there and make a change. If it was just a group of kids, just us, it wouldn't change anything. We got help from the school, [a science research organisation], Mana Ora. It was good to be able to speak to the community and play a part. It made us feel a bit more powerful. Like we can make a change, that our voice will be heard. (Years 5–6 students)

Some students talked about specific changes they were making at home or at their school based on what they had learnt from their projects about climate change and carbon emissions:

I think doing this has impacted my lifestyle. I think a lot more about all my waste and stuff. I found it interesting how much little things can have an impact. It took me by surprise how much electricity and waste … [Like for example] at home usually in the morning I would reach for the heat pump remote—but now I put on a jumper. Turning off lights more, using them less. (Year 8 students)

If you can bike or walk to school, it's better than going in a car. It's better to pick up one piece of rubbish than none. It's better to do something than nothing. (Years 4–6 students)

One primary student involved with an active transport project had felt empowered to work with their own parents to find a solution to their concerns about letting the student walk or scooter:

We got this [smart] watch I can call her on and now she lets me walk to school. (Primary student)

While they understood the scale of the challenge was large, and their project was small, students seemed positive about their contributions:

It's just helped. More projects like this will slowly decrease the amount of CO_2 in the atmosphere. (Years 7–8 students)

It challenges you to see where the problem is and break it down, what is the biggest contributor, and the target what are the actions you can take to reducing it. (Year 12 students)

It shows us that smaller things can make a difference. For us it is a big project but on a wider scale it's quite small. (Year 13 students)

Feeling part of a community taking positive action

Most students affirmed that their Mana Ora project had helped them to feel like they were part of a community taking positive action. Teachers and students talked about how the school and local community had "come in behind" students to support and celebrate the outcomes of their projects:

[The student leaders] are really proud of what they have achieved here and want to show other classes, they have been guides to other classes. They made posters, took them around to other classes to show what they've done. They have talked at assembly several times, it's been on the school Facebook as well—what they have been doing and why. (Primary teacher)

We also got interviewed and got photos of the murals, and it was in the [local community] newsletter, people are like in the neighbourhood, adults come to the school and they are curious about it. Sometimes new students go up there and go 'Wow this is cool, how did this happen?' Then we get to tell. (Years 4–6 students)

The relationships that were developed as a result of Mana Ora also created additional opportunities to connect students to climate-relevant forums. For example, after getting to know Mana Ora students at a secondary school, their sustainable schools facilitator was able to arrange for two students to attend a community-based forum about local climate and flooding response:

The workshop [on local climate change and flooding response] really opened our eyes to other issues like not just [the decarbonisation project we were focusing on]. Like looking at the streams, from the perspective of indigenous people, how people perceived climate change, it really opened our eyes about how gardening impacts schools and communities. It gave us opportunities to learn more about climate change. (Year 13 students)

At the September Mana Ora event, students spent the morning in talks and workshops alongside a range of adults from different groups working on climate and sustainability actions all over Auckland. Some students said they really enjoyed getting to mix with a range of people:

I felt really connected when I met all of the other people, they were really kind. Both the adults and students. (Years 5–6 students)

One teacher reported that their students had also referred back to the panel of "inspiring young leaders" who spoke at the Mana Ora launch in March:

They really loved the young adults that spoke—they really connected with them. (Primary teacher)

Successfully making connections with students from other Mana Ora schools was more variable. Students who were able to attend the Mana Ora launch and other cluster events found it interesting and useful to meet other schools:

I'm excited to go [to the wrap-up event] on Thursday and see what schools have done, if they've made any changes [to their projects]. See if they've done any [projects] we were going to do. (Years 5–6 students)

Some secondary students were unable to attend all or most Mana Ora events (reasons for this are discussed in Section 8) but would have liked to if they could:

It would be cool to be honest, it would be beneficial. Especially [if another school had a] project that was similar to us. It would be cool to know what they found and how they did it. It would help us as well. (Year 13 students)

That could be quite [a] cool idea getting everyone involved, hearing what different schools are doing and how you know how they work on it. And you could see if with two schools, if it works in one school and not the other you can find out what went wrong with it. (Year 11 students)

A few secondary Mana Ora project leaders were also part of a wider Auckland network of youth sustainability leaders, and there had been some discussion about using this network to visit each other's schools:

We were initially thinking about a learning system like they would come to our school, we could go to their schools, like an exchange; sadly we didn't do it. I am thinking of it for next year! I think that would be very interesting. (Year 12 students)

A theme expressed by some students in the final year of their current school (e.g., Year 6, Year 8, or Year 13 students) was that they were "giving back" to their school, leaving a legacy and succession pathway for students who would come after them:

As Year 13s, since this is our last year, this is like us leaving our mark. Even if other students don't see [what we have done] we will know it's something we have done to help our school. (Year 13 students)

Some primary students expressed some sadness about leaving their current school and indicated an intention to join or find sustainability and climate learning opportunities in their next schools.

6. Outcomes for teachers

This section discusses the extent to which Mana Ora supported the intended outcomes for lead teachers. Namely, that they:

- feel confident, enabled, and empowered to teach about, and inspire, climate action learning
- feel part of a collective of teachers in Auckland who are working on this together.

Feeling confident and empowered to teach about and inspire climate action learning

Many lead teachers commented that Mana Ora had contributed to their confidence and knowledge to teach about and inspire climate action learning. Some teachers were already very experienced in leading sustainability action learning projects in their schools, while others were newer to these roles. Positive features of Mana Ora that were commented on included having the five suggested theme areas to work with, the opportunity to connect with other schools, and "having the autonomy" to shape a project that was relevant to their school context:
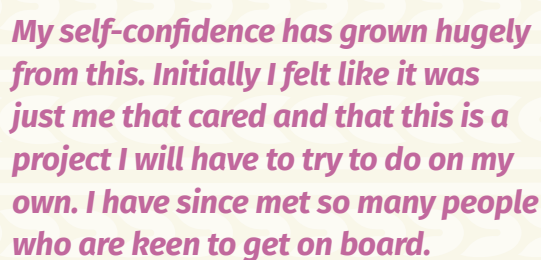
> For me I think the biggest thing about it is that it narrowed the scope a bit and gave you something to focus on. You know, if you think about it 'Oh, my gosh! I have to teach about climate change. It's like, what do you do? How do you start?' [Mana Ora] had the streams and we could choose a focus and really go for it— some parameters to stay within while improving the depth of knowledge. (Primary teacher)

My self-confidence has grown hugely from this. Initially I felt like it was just me that cared and that this is a project I will have to try to do on my own. I have since met so many people who are keen to get on board.
(Secondary teacher)

> The fact that [Mana Ora has] provided me with facilitators, experts, and opportunities to come up with goals, share goals, look at what other schools are doing. That's always crucial to the success of a project—otherwise I could end up doing the same things I do all the time, so new ideas are really empowering. (Primary teacher)

Several teachers made connections to expert people and organisations at Mana Ora events, or through connections brokered by the Sustainable Schools facilitators. The additional opportunities that opened up through these connections were highly valued and had been critical to the success of some projects:

> Knowing that if I'm stuck, I can call so many people, like [our sustainable schools advisor]—if I get stuck, or when I need someone to teach the carbon cycle … you can't underestimate that—as teachers we don't necessarily know who to contact. (Primary teacher)

> My self-confidence has grown hugely from this. Initially I felt like it was just me that cared and that this is a project I will have to try to do on my own. I have since met so many people who are keen to get on board. I have connected with lots of different organisations outside the school that have wanted to come in and help. (Secondary teacher)

Some secondary teachers said teaching climate action learning was not necessarily in the foreground of their teaching, but could see how it could be woven in:

> We are focused on getting standards—climate action is not a standard we teach, climate action is part of a conversation you have while teaching the standards. (Secondary teacher)

Feeling part of a community and collective of teachers

There was variation in the extent to which teachers felt part of a community of teachers across Auckland working on climate action learning. Several primary lead teachers talked about this in relation to the Mana Ora cluster events:

> Absolutely. There's no way I could have done this project by myself. I think the connection is a really strong one. (Primary teacher)

> I love looking at other schools' initiatives. Initiatives that we have are really related to our community needs. I suppose [looking at other ideas to see] what fits for us. (Primary teacher)

At least two primary school lead teachers were able to provide mutual support and connection when they crossed paths in other local meetings unrelated to Mana Ora.

Primary teachers also talked about the support they felt within their own school and community, including from other staff, parents, and people and organisations in the wider local community:

> It's given me opportunities, it's given me space to talk to staff with myself and [a senior leader], it's given me opportunities to talk to some of the BoT members informally on different occasions. (Primary teacher)

However, getting to Mana Ora cluster meetings proved to be difficult for most of the secondary schools, and some of the primary schools. Exacerbating factors that put additional pressure on some schools in 2023 included industrial action, COVID, flooding impacts, and exam timing. Some teachers were not able to be released or could not easily get students out of school for a day on those dates.

Many of the lead teachers had some release time as part of their school sustainability roles. However, this was not the case for all teachers, and some teachers said it was challenging not having sufficient release time to support students to the extent that they would have liked:

> I don't get any release time to do this. I would like just a little bit, just to meet with the kids so it's not in our break times. (Primary teacher)

> That's the wider issue of tackling climate change in schools. Like our waste audit or energy audit, where does that data go, who will lobby the caretaker, who needs to change policies with principal and BoT? Is it one person or a team? If it's teaching staff and they're not getting paid for this, how can we weave it into job expectations? (Secondary teacher)

> It's hard slog really. If there was somebody who had a full-time position that was focusing on this, everyone would be on board. Basically, that's the case everywhere. (Secondary teacher)

Some teachers wanted to stress that, even in cases where projects had been more "teacher-led", this was still worth doing, especially when it provided a way to establish something new in the school that could be sustained to benefit the next cohorts of students:

> The Mana Ora focus is about supporting and empowering learners, but the idea of a learner can be teachers too. We are also learners. If we get teachers on board, they can have a lot of impact as well. (Secondary teacher)

7. Outcomes for Sustainable Schools advisors

This section discusses the extent to which Mana Ora supported the intended outcomes for the Sustainable Schools team. Namely, that they are:

- confident to support schools in climate action learning
- familiar with, and can recommend, a range of appropriate resources to support climate action-focused school projects.

Confidence to support schools in climate action learning

Across the team, Sustainable Schools advisors came into the project with varying levels of knowledge about decarbonisation and how to link it with different aspects of school-wide sustainability practice. Some had expertise around transport and energy efficiency, while others held expertise in waste minimisation, composting, and restoration planting. As indicated in Section 3, some resources were compiled for the team with some sessions to continue to build their readiness to support climate and decarbonisation-focused learning. Several advisors commented that over the past few years it was becoming evident to them that "everything we do is climate-related", and "what we're doing [as sustainability advisors] is pivoting much more towards climate action". Advisors who had less background knowledge around the carbon cycle and carbon emissions said that Mana Ora had helped build their own knowledge and confidence about how to "connect the dots":

> *The realisation that everything we do is climate-related, and that's how we're framing [our work] as well.*
> (Advisor)

> It has increased my understanding of actions that schools can take that have the largest impact on carbon emissions. (Advisor)

> I definitely feel more confident. [Developing] that understanding of decarbonisation and this sort of breadth of kind of actions that can be taken that link [to decarbonisation]. (Advisor)

That said, several advisors commented that there were "still gaps" in their knowledge and there was "more they could learn". One advisor who felt confident in their knowledge said Mana Ora had "helped me to realise that we make a lot of assumptions about people's carbon literacy". Some advisors liked the idea of school carbon calculators, but (as with teachers) had not found them easy to use or to support others to use. Several facilitators said that they and the schools they worked with benefited from connections made with experts (e.g., scientists, carbon accounting specialists) who were willing and able to provide that expertise directly to teachers and students:

> I had a carbon expert who was able to answer those questions of those students and those teachers very fully … and he was able to help them to gather the data in a way that was really thorough and robust. (Advisor)

Able to recommend a range of appropriate resources

In late 2022, a variety of existing sustainability and climate education resources had been compiled for the Sustainable Schools advisors to explore or recommend to schools if they felt these might be useful. However, advisors' work programmes changed somewhat in 2023,[14] and advisors found they had little time to delve deeper into some of the resources that had been suggested. Some also had less engagement with their Mana Ora schools than they would have liked, though they were always available to provide support if this was needed. Some advisors suggested that having more time "as a team" set aside to explore resources and continue to expand their own knowledge and understanding of decarbonisation would be valuable:

> I know there's a lot more learning for me on that pathway, too. But I definitely feel like I am feeling much more confident than I would have this time last year. (Advisor)

In addition to existing resources, one advisor pointed out that Mana Ora has itself generated "many cool resources, PowerPoints, videos, and stories from this project which will now be useful for future schools". The tailored workshops at Mana Ora events were mentioned, including the activity to collaboratively build a Lego carbon cycle:

> It was role-modelling an activity that we could actually run [in a school]. And it's really, you know, bringing it right down [to an accessible level]. (Advisor)

Several advisors said that some of the most important resources were the people and organisations that they, and schools, met through Mana Ora cluster meetings and networking events:

> Personal connections with scientific experts … were extremely motivating. Feedback from those who attended our workshops was positive as they got to use, play with, and experience resources, which was more meaningful than just a list of recommendations for teachers. I feel access to expert scientists and artists was possibly more useful to schools than a plethora of online or paper resources. (Advisor)

One science research organisation that attended the Mana Ora launch event had subsequently been instrumental in supporting one school's Mana Ora project. This organisation was keen to continue to work with schools, and advisors felt that this had been a very good connection to have come about from Mana Ora. Similarly, a carbon accounting expert who had worked with a number of Auckland schools on school carbon footprinting was also open to supporting other Mana Ora schools with their next steps. These relationships and connections were made easier because of the Mana Ora gatherings and the networking conversations that could be had at those times.

By the end of the year, schools were also seeing how other schools in the project could be resources to them. For example, schools that were considering painting climate and decarbonisation murals as their next steps in 2024 talked about going to visit the schools that had done this in 2023. Schools that had focused on projects in similar theme areas (e.g., transport and carbon footprinting) expressed some interest in visiting each other to share ideas and next steps.

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14 This was an impact of Council restructuring.

8. What worked well and what could be improved?

This section discusses participants' views on what worked well and what could be improved about Mana Ora.

What worked well

Synthesising participant feedback, key aspects that worked well for most schools included:
- the project launch and brainstorming workshop
- the use of five focus themes to kickstart project idea development
- students and schools having the autonomy to shape projects that were meaningful and relevant to their context
- access to funding to implement projects
- access to support, connections, and motivation through being part of a wider project
- access to "student-friendly" and relevant data and measures
- learning activities that consolidated students', teachers', and advisors' "carbon cycle" understandings and connection to their projects.

The year-long time frame was appreciated by schools as this allowed for the "real" amount of time required to research and implement a project. However, some participants said they needed more than 1 year.

Many interviewees also felt it was helpful that many of the schools were well-established as Enviroschools, and key staff had prior experience in empowering student-led sustainability activities. Interviewees suggested that preconditions for Mana Ora to be successful within a school included:
- backing from school leadership
- lead teachers with release time
- a culture of openness to, and support for, empowering students to lead projects.

In schools where one or more of these conditions was less present, students and/or lead teachers encountered some barriers and challenges. Advisors had mixed views about whether Mana Ora could succeed in "any" Auckland school:

> I think, for people who are just dipping their toes into this kind of work, [Mana Ora] might be a step too far, but for people or teachers and schools that are already doing sustainability and want to go deeper or want to go broader, it's a bit of a natural next step. (Advisor)

> I think it could succeed in just about any school, but it would need someone who is keen and willing to drive. What you do have in lots of schools [are] stressed out teachers who cannot take on one more thing. That would be an absolute barrier if they had a mental thing that they just cannot take on one more thing. But if that wasn't there, then I think it could work and succeed in any school. (Advisor)

What could be improved

Timing and organisation of cluster gatherings

In 2023, the cluster gatherings worked for some schools but not for others. Secondary schools in particular faced challenges in getting students out of school for a full day. Some gatherings clashed with other key periods in the secondary school year, such as exam preparation:

> I found it pretty hard to convince the school to let us go even to the launch. (Secondary students)

Several teachers and students also regretted the limitation on the number of students per school who could attend cluster gatherings.[15] Although this was a good way to empower those students to become leaders and messengers for their fellow students back at school, some interviewees felt it was beneficial for many students to learn and be inspired "straight from the source":

> Mana Ora allows us to really establish a deep collaboration between students and Auckland Council and people at Auckland Transport. With student planning sometimes they can have only their thoughts [and these are] sometimes not realistic and need some improvements. The collaboration between Council to students directly can allow good education and communication of how things *actually* work. (Year 12 students)

Some participants also expressed disappointment that there hadn't been more connection between the Māori-medium and English-medium projects, with most Māori-medium project groups not attending the cluster meetings beyond the launch event:

> It would be great to see more collaboration where schools learn from each other to deepen their practice. (Advisor)

Various participants suggested alternative approaches including half-day "local" workshops for schools in nearby areas, rethinking the dates for cluster meetings, and more advanced planning so that schools have clarity about time frames and key dates when they opt in.

Resources to seed whole-school engagement

Some lead teachers said they would have loved to have access to curriculum-aligned resources that they could use not only with their students, but also to provide "easy" ways for other teachers and students to engage:

> If it had come with some lesson plans, literacy materials, and things relating to *The New Zealand Curriculum* it would have been amazing because you can tie into everything as well as feeding it out to the school as well, so the whole school connects. (Primary teacher)

One teacher provided an example with the recent Bird of the Year/Bird of the Century competition which all classes had engaged with through giving teachers easy ways to get their classes engaged:

> [At this school] you could hear children throughout the school imitating the bird calls. [It helps] giving teachers easy activities you can do, here are a range of activities you could do across all levels—it could be 5 minutes, it could be a 45-minute literacy lesson and here's what it could involve. (Primary teacher)

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15 This was necessary in order to be able to involve as many schools as possible within the limitations of facilities and funding for events.

Strengthening connections to te ao Māori and mātauranga Māori

Across the English-medium contexts, there was less evidence that Mana Ora deepened teachers' and students' ability to connect with te ao Māori and mātauranga Māori with sustainability and decarbonisation, compared to other outcomes. Many students said they "hadn't done very much" in their Mana Ora project in relation to te ao Māori:

> Respecting the land would be one, but we didn't learn anything with te ao Māori. It would have been a nice thing to do—we still could, we still have time. (Years 5–6 students)

Many teachers said that, in general, their school supported students to learn about Ranginui and Papatūānuku and other atua in relation to relationships to whenua and the environment, and developing an ethic of care for the environment, but several teachers commented that this was an area where more explicit guidance and access to relevant expertise and knowledge could be helpful:

> I talk to students about the word 'whenua' meaning land and placenta, the idea of land as something that nourishes us and that we need to look after it and it will look after us, the reciprocal relationships. Maybe next year we could look at Maōri calendar and plan some of our planting strategies round that. My knowledge in that area is zilch. (Secondary teacher)

Some teachers talked about the challenge of how to best use time "when I see them in short bursts"; for example, time spent supporting students to plan and carry out actions versus time to learn about and explore different worldviews and perspectives.

Some students and teachers talked about te ao Māori designs or whakataukī into murals or signage related to their projects, and who they had sought advice or knowledge from. In some schools, for the opening/blessing of new murals, students involved kaumātua and local mana whenua. Some secondary students talked about their own experiences as Māori, or peer-to-peer learning that happened between Māori and non-Māori students:

> I feel like as a Māori we are very self-conscious of the impacts we have on the environment. I feel that with that mindset and tikanga, as a project group we are doing that sort of thing in our school. Within the tikanga of passing things down, we are seeking to create a positive change in our community that we are doing to pass it down. (Year 13 students)

> In terms of like taking on other cultures and world views, I think that's kind of just really, that's just happened, like in discussion with our environment group and the different perspectives of people of their experiences. (Years 12–13 students)

Overall, the evaluation findings suggest that this aspect of Mana Ora could be further strengthened for English-medium settings. There would be value in exploring how decarbonisation knowledge and te ao Māori knowledges were woven together the Māori-medium Mana Ora contexts, what kinds of learning and actions this supported amongst ākonga, kaiako, and kaupapa Māori facilitators, and their views about what worked well and what could be improved about Mana Ora.

Better flow of information to students

Some secondary students said that information sent to schools about projects like Mana Ora often did not trickle down to students, particularly in large and busy schools:

> Making it more visible to students would be amazing. I know a lot of students from different schools that are really into the environment and climate change. It would be good for students in general— making it more accessible to them. (Year 13 students)

Some students suggested promoting Mana Ora to students through social media or "emailing it directly to students". Others suggested that students themselves could be proactive in engaging with students from other schools in their local area when they connected for other reasons (for example, sports tournaments):

> At the end of the year, we could get all the Year 6s environmental people [across schools] together for a breakfast and have a chat. Sidle up to them [and ask], 'So what have you been up to this year?' (Primary students)

Flexibility in some aspects of the model

In general, the Mana Ora project model worked very well for most of the primary schools and was slightly more challenging in most of the secondary schools. In addition to scheduling and timetabling challenges and assessment priorities, senior secondary students and the advisors who worked with them noted that, while senior students had the ability and motivation to be more autonomous in leading projects in their schools, they were also more likely to hit bottlenecks relating to school decision-making and consultation structures, staff time constraints, and the limited amount of time per day or week to work on their project. Based on what happened in 2023, options that might help Mana Ora work well for secondary school contexts include:
- allowing for more "teacher-led" projects where necessary
- allowing for projects to run over more than 1 year, including time to transition leadership to new students.

The adaptations discussed above may also be relevant if a cluster of schools at any level opted to work together on a larger or more ambitious project to impact carbon emissions or climate impacts in their communities (for example, changing modes of school transport to lower CO_2 emissions across a city or region). These sorts of initiatives may require time to build key relationships and fully investigate opportunities that could support long-term wider community change:

> Once we have it started [collaborating] it's much easier to keep it going. If it's not there it's hard to start but if we have a solid base and easy and established communication [it helps]. If we could create a collaboration network between schools that could be very beneficial. (Year 12 students)

Getting "less enviro" schools involved, and engaging whole communities

Several student groups reflected that their own schools were already "quite strong" on environmental and sustainability action, and to make a significant difference to emissions it was important to engage schools that were "less enviro":

> The people who don't do it much will always stay like that and so they will just have more carbon coming from their school. Maybe those [schools] that don't have Enviroschool bronze yet, help them get enviro-bronze so they can get started. (Primary students)

Some secondary students observed that some schools and communities were more advantaged than others, and that equity issues should be considered when thinking about which schools to support. Some students also suggested that Auckland Council could focus on engaging "whole communities" in order to have the biggest impact. While this does form part of Auckland Council's work programme, comments suggest that students and the public may not be aware of all the activities in this space:

> Schools and businesses are small groups of people but if you get whole communities in you will be able to get more people involved. Auckland Council should try more; I think they are doing lots of things but they are taking too long—I think they need to step it up more for the future generations. (Primary students)

These students also said they wanted to see Mana Ora reaching schools not just in Auckland but "in all the regions" to "have a bigger impact".

Greater collaboration across Council teams and with other key stakeholders

Advisors noted that through Mana Ora they had established better connections with Auckland Transport and other climate-related people and teams in Auckland Council, as well as other people and organisations that were ready, willing, and able to work with schools on climate and decarbonisation projects. With this knowledge, it was suggested that future initiatives could benefit from:

> … greater collaboration between teams to ensure streamlined work and to promote a greater understanding of the different mahi being done by each team. (Advisor)

Other suggestions

Other suggestions included ensuring that the speakers and sessions at cluster gatherings were pitched at the right level for children,[16] having some templates "which are more succinct for project planning and reporting", and simplifying the proposal application form to make it easier for students to understand and respond to.

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16 This was in reference to the September event which had a large proportion of adult attendees and speakers.

9. Discussion

Mana Ora in a wider context

Recent Ministry of Education work on reducing emissions in schools and kura suggests that:

> With the right support, the network of schools and kura can be leaders in Aotearoa's journey to a low-carbon future and empower the leaders of tomorrow to shape a low-emissions society.[17]

This final section considers the potential contribution of projects like Mana Ora towards these broader goals, situating the evaluation findings within the broader national and international context.

Potential to reduce school and kura emissions

At the end of the 2023 school year, the Ministry of Education released initial findings from the first carbon emissions inventory for the whole sector, produced as part of the Carbon Neutral Government Programme (CNGP). This requires public sector organisations, including state schools and kura, to:

- measure and report their emissions annually
- set emissions reduction targets in line with a 1.5-degree global warming pathway
- introduce emissions reduction plans
- offset any remaining Greenhouse Gas (GHG) emissions from 2025.

As this project and international studies have shown, the time, cost, capability, and administrative burden for schools to monitor and accurately report on their own emissions can be prohibitive (Albert-Seifried et al., 2022; Bolstad, 2021; Odell et al., 2021). Recognising this, the Ministry has undertaken this work on behalf of schools and kura, producing the first inventory based on centrally available data, aggregated and extrapolated to a national level to a total of over 1 million tonnes of carbon dioxide equivalent (tCO_2e) in the year ending June 2023. The Ministry's inventory identifies that the highest-emitting activities for the sector on an annual basis are purchased goods and services, transport, and construction.[18] Other emissions sources include fuel use for heating, electricity, water, and waste.

The inventory is useful to consider in view of the types of projects selected by Mana Ora project teams. The Ministry's analysis of potential emissions-reducing actions identifies school transport as one of the areas that could have an impact,[19] suggesting that national reductions of 77,620 tCO_2e could be achieved if half the ākonga living in urban centres got to school via active transport, and reductions of 53,121 tCO_2e could be made by building fewer carparks for new teaching spaces. Given this potential for impact, it is significant that several Mana Ora schools chose school transport as a project focus or were thinking about it as a next step for 2024.

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17 See https://www.education.govt.nz/our-work/changes-in-education/carbon-neutral-government-programme-in-new-zealand-schools/ Accessed 11 January 2024.

18 See https://assets.education.govt.nz/public/Documents/Ministry/Initiatives/Carbon-Footprint-Schools-Kura-audited-1.pdf

19 At the time of writing, no further details were available about the criteria and assumptions used to determine these areas.

Active and low-carbon school travel has been the focus for numerous local governments, including Auckland Transport's Travelwise programme,[20] Greater Wellington's Active Travel Action,[21] Christchurch City Council's School Travel,[22] and Dunedin City Council's Move It programme.[23] Resources, data, and case studies[24] generated from these programmes provide strong parallels with the experiences of Mana Ora teachers and students, showing that student-led approaches can be effective in empowering and informing students, and garnering support from the wider community.

Other action areas relevant to Mana Ora projects such as composting, LED lighting, and changes to school lunch provision are also visible in the Ministry's analysis of potential tCO_2e reductions. It interesting to note the more modest potential tCO_2e reduction if these actions were scaled across the school network (around 2–13 thousand tCO_2e), compared to transport interventions. However, in estimating the benefits of student-led environmental action, it is important to avoid "carbon tunnel vision" (Konietzko, cited in Achakulwisut et al., 2022; see also Bargh, 2023, p. 5), narrowing the field of view to the exclusion of other social, health, environmental, and equity complexities bound together in the production or reduction of carbon emissions. The world faces numerous environmental challenges, including biodiversity loss and pollution, and these issues, alongside climate change, have social and cultural justice dimensions that are worthy of examination and action. Climate change also has the potential to amplify existing social and ecological issues and inequities. Actions such as care and conservation of fresh water—of interest to many schools—may have a modest impact on reducing emissions but will be of critical importance in supporting community and ecological resilience in increasingly climate-changed futures.

This evaluation suggests that projects like Mana Ora project can indeed support decarbonisation actions in schools, though further work could be done to provide "student-friendly" tools and support for gathering data to inform and track the impacts of student action, including but not limited to the impacts on reducing emissions. As with the previous pilot (Bolstad, 2021), Mana Ora suggested a need to find the right balance between the need for accuracy in measurement and tracking of carbon emissions, and the need to excite and empower students and schools to be actively involved in making changes that are, by definition, more sustainable and climate friendly. The broad range of other measures and indicators referred to by Mana Ora teachers and students underscores importance of keeping broader ecological and social impact benefits in view alongside decarbonisation benefits, particularly when thinking about what sorts of measures and indicators feel meaningful and motivating for non-experts in carbon accounting.

Potential to help shape a low-emissions society

Education's potential to contribute to whole-of-society transitions towards a safe climate future is increasingly recognised at the global level. The first international environment and education ministers' summit was convened at COP26 in 2021, and in December 2023, at COP28, over 40 countries endorsed a climate and education declaration[25] committing to actions to adapt, mitigate, and invest in tackling climate change through education (Department for Education, 2023a). The UK is one of the first jurisdictions to have developed a sustainability and climate change strategy for education

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20 https://at.govt.nz/cycling-walking/travelwise-school-programme
21 https://schooltravel.gw.govt.nz/resources-and-activities/classroom-ideas/active-travel-action/
22 https://ccc.govt.nz/transport/getting-around/schooltravel/
23 https://www.dunedin.govt.nz/services/roads-and-footpaths/getting-around-dunedin/getting-to-school/move-it-schools-programme
24 For example, students from Paremata School.
25 See https://www.unesco.org/sites/default/files/medias/fichiers/2023/12/Declaration-on-education-and-climate-change-en.pdf

(Department for Education, 2023b). Their vision is to be "the world-leading education sector" in sustainability and climate change in 2030, with a focus on nature connections, biodiversity, climate resilience, net zero buildings, and green/sustainability careers.

Scholars identify climate change education (CCE) as one of six potential "social tipping interventions" to achieve worldwide transformation and the shift toward carbon-neutral societies by 2050 (Otto et al., 2020). Leal Filho et al. (2021) discuss education's role in both reducing "carbon footprint" through adopting low-carbon operational practices and expanding the societal "carbon brainprint" through "developing curricula and pedagogical approaches to educate students (and by extension society) about the imperatives of carbon neutrality and climate change mitigation and adaptation".

The CCE literature is clear that education for climate action requires more than just providing people with information about the causes and impacts of climate change, and what kinds of activities and human behaviours produce high levels of emissions (Watabe & Yamabe-Ledoux, 2023). The climate challenge must be recognised as a complex systems problem, where "both natural and social systems are characterised by a high level of complexity" and "established social systems [...] while they may partly be open to change, tend also to possess self-stabilising mechanisms that oppose change" (Otto et al., 2020). In addition to economic drivers of behaviour, social and moral norms can impact behaviour on a large scale. While transformative change in these norms is possible, it can take considerable time to achieve.

Research by Watabe and Yamabe-Ledoux (2023) builds a case for creative approaches to the use of carbon footprinting as a lever for inspiring change. In addition to highlighting the decarbonising changes that individuals and groups can make in their homes, schools, or workplaces, their research demonstrates the importance of engaging citizens in interrogating and reshaping the "systems of provisions" that enable or constrain decarbonised ways of living at the scale of a whole community or city. This "both/and" approach recognises that individuals can act in ways that reduce their personal or household emissions if they have the will to do so, but only to the extent that physical and social systems surrounding them make alternative choices viable. Infrastructure for safe cycling and affordable and well-provisioned public transport are salient examples.

It has been argued that learners—and people of all ages—need exposure to activities that "enlarge the imagination" about what kinds of futures are possible and help them to see what actions they can take to help build more positive futures (Levrini et al., 2020). This kind of work takes time and needs sustained systems of support for citizen participation and engagement with agencies (including local and central government) that can enact changes to benefit communities and the climate.

Like Mana Ora, other studies demonstrate the short-term impacts of learners having opportunities to engage in climate action projects, including decarbonisation projects, as a means to build climate knowledge and understanding as well as a sense of personal connection and power to make change (Albert-Seifried et al., 2022 Cordero et al., 2020). These studies further demonstrate that schools can benefit from tackling decarbonisation together, with time and space to share, compare, and learn from one another's successes and challenges. While some studies are beginning to examine the longitudinal impact of education for climate action (Cordero et al., 2020), more research is needed to track the wider-scale impacts of climate change education at the individual, community, and national level, including its significant potential to act as a catalyst for community engagement (Eichinger et al., 2022; Odell et al., 2021).

Kwauk and Winthrop (2021) argue that the community connection potential of schools makes them the perfect network of institutions to effectively scale learning for community-driven climate action, ensuring learning and action is "locally-relevant and tied to local environmental justice issues [and] to local community challenges with climate change". Emerging research further suggests a "sweet spot" for implementation of specific climate actions is at the scale of 10,000–1,000,000 people (Bhowmik et al., 2020). The combined communities associated with a Mana Ora-sized cluster of schools and kura could easily reach the lower end of this range, and a city- or region-wide approach would begin to reach into the upper levels of the range.

Further research and evaluation of Mana Ora or similar initiatives in 2024 and beyond could expand on what has been learning in 2023, with a focus on investigating scaled impacts. For example:
- What does it take to create widespread and sustained decarbonisation action across a school or community, and what other co-benefits are achieved?
- How can schools and other groups best support young people's involvement in the design or redesign of local "systems of provision" to achieve sustained decarbonisation shifts in their schools, communities, and cities?
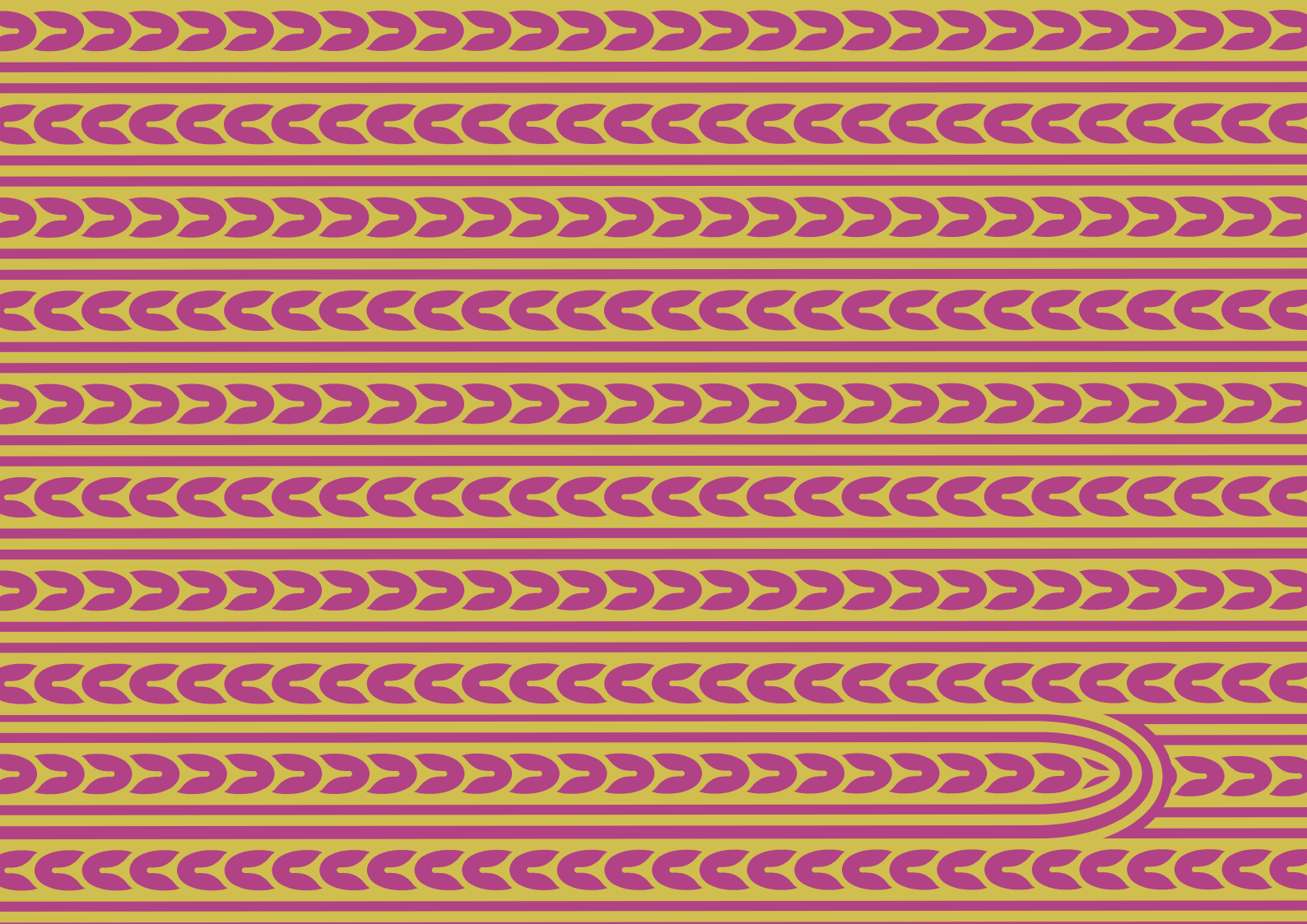
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APPENDIX A
Tools and resources compiled for Sustainable Schools Advisors

Type	Format	Name	Creator
Online carbon emissions calculator	Website https://www.zerocarbon.online/	ZeroCarbon.online: School or Business Carbon Calculator	Auckland Council/Adrian Feasey
Carbon emissions calculator and reduction guide	Unpublished PDF and excel sheet	Carbon Neutral Schools: A Guide for New Zealand Schools to Reduce Carbon Emissions	Victoria University/Eloise Blewden
Climate Change learning programme	PDF series available on website https://www.nzaee.org.nz/resources/climate-change-learning-programme	Huringa Āhuarangi: Whakareri mai kia haumaru āpōpō Climate Change: Prepare today, live well tomorrow	Future Curious/ Sian Carvell
Curriculum development resource	Workshop series detailed on website https://www.knzb.org.nz/programmes/education/climate-ready-classrooms/	Climate Ready Classrooms Curriculum Guide	Keep NZ Beautiful
Curriculum development resource	Website and toolkit https://putatara.education.govt.nz/#/home	Pūtātara: A Call to Action	Ministry of Education
Science education resources	Website https://www.sciencelearn.org.nz/	Science Learning Hub Pokapū Akoranga Pūtaiao	Curious Minds
Whole-school sustainability development resources	Various printed resources	Enviroschools Toolkit	Enviroschools
Grow resources	PDF available on website https://waip2k.org.nz/native-plants/	He Kakano: How to set up a native plant nursery	Mountains to Sea Conservation Trust and Toimata Foundation

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