

90814R



Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 2 Education for Sustainability 2025

90814 Demonstrate understanding of aspects of sustainability in different contexts

Credits: Four

RESOURCE BOOKLET

Refer to this booklet to answer the questions for Education for Sustainability 90814.

Check that this booklet has pages 2–10 in the correct order and that none of these pages is blank.

YOU MAY KEEP THIS BOOKLET AT THE END OF THE EXAMINATION.

CONTEXT A: Waste-to-energy plants

Economic growth, urbanisation, and a growing population are causing a global waste problem. Landfills are filling up and releasing methane, a greenhouse gas.

One alternative to landfills is burning waste to create energy at waste-to-energy (WtE) plants. Non-recyclable waste is burned at high temperatures. This process produces steam, which can power turbines to generate electricity. The heat generated can be harnessed for local industrial use or for residential heating. According to *ACCIONA*, a renewable energy company, WtE plants have two key benefits: they reduce waste that would otherwise go to landfill and conserve energy resources.



Figure 1: The waste-to-energy process

Waste-to-energy plants in Italy

WtE plants help tackle the growing waste problem, while providing clean, reliable power. Globally, 35 countries, from large nations like China to smaller ones like Bermuda, have adopted this technology. A notable example is a modern, high-tech facility in Brescia, Italy.

The Brescia WtE plant processes approximately 720,000 tonnes of non-recyclable waste each year to produce electrical and thermal energy. This prevents waste from being disposed of in landfills, and reduces the need for fossil fuels by generating over 70% of the heat and electricity required in the local areas.

By saving around 160,000 tonnes of oil annually, the plant prevents the release of 830,000 tonnes of CO₂ into the atmosphere. This reduction in emissions can be compared to the carbon absorption capacity of more than five million trees, demonstrating the potential of WtE plants in contributing to environmental sustainability.



Figure 2: Brescia waste-to-energy plant in Lombardy, Italy

Although burning waste releases about 1.2 tonnes of CO₂ for every tonne of waste processed, landfills can emit more than double that amount. This reduced carbon footprint is a key environmental benefit. After the burning process the remaining materials, such as metals and bottom ash, can be recycled or repurposed, contributing to a more circular economy.

Waste-to-energy in New Zealand: Opportunities and challenges

In New Zealand, there has been hesitation about supporting WtE projects as the benefits are perceived to be less evident than in other countries. With a smaller population, New Zealand may not generate enough waste to justify large-scale WtE plants. Transporting waste from all over the country is also challenging, due to the diverse landscape of hills, rivers, and coastlines. Importing waste from overseas would be costly and difficult, due to New Zealand's geographic isolation. The country already generates 86% of its energy from renewable sources, raising questions about the need for energy alternatives.

Opponents argue that the potential negative impacts on local communities and the environment must be evaluated before proceeding with any plant. A zero-to-waste advocate highlighted one major concern, stating, "There are a lot of chemical compounds being produced by the incineration process, including dioxins." Many new forms of WtE technology do not effectively remove these from wastewater, meaning they could affect the land, and therefore food production. Additionally, managing air emissions from WtE plants, including carbon released from burning plastics, remains a big challenge. These emissions could increase New Zealand's carbon footprint, and the ash produced, which may contain heavy metals, could exceed acceptable levels.

Advocates of WtE dispute the negative environmental impacts of WtE plants as new technology has evolved over the last 30 years. This means that earlier worries about dangerous contaminants may no longer be a concern.

Figures show New Zealand is the third most wasteful country in the OECD, an organisation of 37 developed countries. We produce five times the global daily average of waste per person, and education campaigns about the damage that household waste causes to the environment have not helped to sufficiently reduce this. WtE plants have been proposed for Kaipara and Waimate,

but have so far not been given the go-ahead. The proposed WtE plant in Waimate, South Canterbury, could burn about 20% of all rubbish produced in the South Island, generating enough electricity per year to power tens of thousands of homes.

Local opposition and concerns

The Waimate project attracted significant opposition, not just from local residents but also from Māori and environmental groups. The community group “Why Waste Waimate” led the charge against the proposal, alongside the Māori-focused zero-waste group “Para Kore”. Their concerns are rooted in tikanga Māori (Māori principles), which stresses the sacred connection between the people and the land.

“The Earth is our mother and the sky is our father. We are related to mountains, to rocks, to insects, to birds, to the rivers and bush, to all parts of the natural world. They are our ancestors, our relations. We are the teina, the youngest sibling, and part of the family of nature. We identify with the landforms and the place.”

Critics argue that WtE does not address the root cause of New Zealand’s waste problem – waste reduction. By focusing on burning waste, they believe the issues of reducing consumption and improving recycling practices are overlooked.

In an ideal world, there would be minimal carbon dioxide released into the atmosphere, no dioxins from plastics entering the air, and no materials dumped in landfills. Instead, there would be a global strategy that promotes a reduction in waste. Achieving zero waste could not only benefit the environment, but also create jobs and foster more equitable societies.

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CONTEXT B: To mow or not to mow?

Lawns are a fairly modern invention. They became popular in 17th century England and France, and were originally a sign of wealth – having a lawn was a sign that you had enough money to own nonproductive land. Aristocrats had their lawns trimmed by hand, using scissors or scythes. It wasn't until the 1830s that the lawnmower was invented.

Fast forward to today and lawns are everywhere. In New Zealand, lawns cover 15–20% of urban areas. In Auckland alone, that's up to 200 square kilometres of grass. A survey of 1,000 Auckland households found that residents spend \$131 million on lawn upkeep each year, while councils across the country spend millions more on maintaining public parks, berms, and walkways. Maintaining these lawns comes at a cost – not just in terms of time and money, but also for the environment.

The rise of the low mow movement

The good news is an alternative to mowing is gaining attention: “low mow.” This approach, which reduces the frequency of mowing, first gained popularity in the United Kingdom when the charity Plantlife launched “No Mow May.” It has since spread worldwide, encouraging homeowners, councils, and institutions to reconsider how often they mow.



Figure 3: No Mow May promotion from the UK

In New Zealand, interest in the low mow movement is growing, with various trials underway. The Auckland Botanic Gardens launched the Sustainable Meadows Trial to explore how reducing mowing could create visually appealing yet functional spaces. The project aimed to develop meadows that people find attractive while providing additional environmental benefits.

The results showed that unmown areas:

- supported more plants, birds, and insects
- soaked up rainwater better, reducing stormwater runoff and keeping plants alive longer
- created more engaging, natural spaces for people to enjoy.

One key lesson from the trial was that presentation matters. As one expert put it, “Make your meadow look intentional, not neglected. Mow the edges of your meadow and a winding path through it. Use a piece of garden art.” This approach helps shift public perception, making naturalistic meadows seem designed rather than overgrown.



Figure 4: A no mow wild flower meadow at Auckland Botanic Gardens

Environmental and biodiversity benefits

Beyond looking good, reducing lawn mowing has important environmental benefits. If we allow our lawns to bloom, even for just a month, we unleash the power of wildflowers, which actively support our local bees. This also contributes to the broader biodiversity structures that play a critical role in maintaining balance. Using less herbicide helps to stop the decline of insect populations, which are vital to the complex soil ecosystem of fungi, worms, and microbes.

New Zealand researchers are studying these benefits. An Otago University study found of the 98 plant species on their campus, 94 were found in unmown areas, but in mown areas, only 22 species were found.

Mowing less also cuts emissions, particularly from two-stroke mowers. An Australian study found that weekend lawn mowing contributed 5% of carbon dioxide emissions in summer. Mowing less frequently is a simple way to shrink a household's carbon footprint.

In Wisconsin, USA, research found that the gardens of homes in one trial had more diverse and abundant flora, three times more types of bees, and five times more bees than mowed lawns.

Research and trials have also taken place in New Zealand. Hamilton City Council has allowed the grass to grow in parts of 13 parks in the city, covering about 1% of the green space. They found benefits to biodiversity, a reduction in greenhouse gas emissions from mowing and saving of time and money. An unexpected benefit was that locals enjoyed new play opportunities in these areas.



Figure 5: Sign in Hamilton explaining no mow initiatives

Social and cultural barriers

There is opposition to these low mow trials. Residents of Hamilton were concerned that the long grass would attract litter. Experiments need to be timed according to the seasons as fields of grass can dry out at the end of a hot summer. In Canterbury this is especially a cause for concern, as long, dry grass can be a major fire hazard.

Cultural perceptions of beauty also play a role in resistance to low mow initiatives, for example, traditional Western landscaping favours manicured lawns. The Sustainable Meadows Trial in Auckland faced objections from the public where there can be social pressure to maintain closely clipped lawns. Their survey found that 80% of Auckland households noticed when their neighbours had not mowed. More than half said that mowing was important for aesthetic reasons, and 12% said they mowed their lawns due to peer pressure.

Other opponents feel that “restoring biodiversity requires more than doing less”. While low mow lawns increase overall plant diversity, the Otago University study found that in urban areas, most of the new plant species that emerged were exotic rather than native.

A shift in perspective

You may think that your garden is too small an area to have an impact globally, but in the USA for example, two-thirds of their 40 million acres of grassland is in home lawns and in the UK, there are 20 million gardens.

The low mow approach offers a simple, cost-effective way to support biodiversity and reduce environmental impact. If it became more socially accepted, it could be a powerful example of “doing more by doing less”.

For those who prefer the look of a traditional lawn but want to lessen their impact, small changes, such as mowing less frequently, avoiding herbicides, or planting pollinator-friendly patches, can make a difference. Choosing mat-forming native species reduces the need for mowing and adds texture, colour, and food sources for wildlife through berries and seed heads.

The Auckland Botanic Gardens Sustainable Meadows Trial demonstrates how we can transition to more natural landscapes without sacrificing beauty. By embracing biodiversity, urban spaces can reflect both ecological and cultural values, helping to shift attitudes towards sustainable landscaping. This approach supports ecosystem restoration, honours te ao Māori (Māori worldview), and reduces environmental impact.

With growing awareness of sustainability, perhaps it's time for New Zealanders to rethink their relationship with the lawnmower.

Acknowledgements

Material from the following sources has been adapted for use in this booklet:

Context 1

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Images:

Figure 1: https://www.researchgate.net/figure/Scheme-of-a-MSW-incineration-plant-for-power-generation-SEVEDE-2007_fig4_338124321

Figure 2: <https://wastemanagementreview.com.au/waste-the-power-behind-our-future-cities/>

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Images:

Figure 3: <https://roundandabout.co.uk/no-mow-may-to-help-wildlife/>

Figure 4: <https://www.aucklandbotanicgardens.co.nz/whats-on/news/no-mow-low-mow-and-meadows/>

Figure 5: <https://www.rnz.co.nz/news/national/511868/data-shows-how-no-mow-trial-in-hamilton-parks-helped-biodiversity>