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YOUR SEAT OF POWER

SMART WORM BENCH PROJECT

MICHAEL MOBBS

2025

FINAL, DECEMBER 2025

*Kalgoorlie coolseats installed in September 2025 beside the Yarra River in Melbourne, Victoria.

COOL SEATS MR FOX IN A BOX™ WICKING AUSTRALIA coolseats coolseats1

Language in this report

This report is intended to make sense for citizens and technically-focused readers. It uses plain English and some technical words either explained in the text or supplemented with some technical and research data in Appendices, fact sheets and links. The report is funded by public monies and is to be read by both the public and private sectors.

Example of plain English = "climate pollution". The report uses "climate pollution" throughout. This isn't a unit of measurement and doesn't suit an evidence-based impact report. It is used or explained in links, appendices (eg Appendix H, p46) and, where appropriate, replaced or supplemented with recognised scientific language such as "greenhouse gas emissions (CO_2e)" / "emissions avoided (CO_2e)", and with clearly stated conversion factor/sources. Throughout this report we use a conversion factor of 0.65 kg CO2 avoided for each kg of food waste composted. A wide range of research to support recommendations is provided in Appendices D and F.

A useful Glossary of different words for "climate pollution" and "CO2" is here - https://bluemangrove.fund/wp content/uploads/2021/03/Glossary-on-different-CO2-terms.pdf

Where you see those words, "climate pollution" they refer to greenhouse emissions (CO2E" unless otherwise stated.

There is detailed scientific language and sources throughout, for example, in the QR code at the bottom of the comparison between business as usual and the circulate economy / net zero option on p15.

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1. Summary

To govern or administer in Australia is to act on behalf of citizens, and on behalf of the resources giving life to we humans and all else here. A powerful action when governing or administering is to say to citizens, let's learn and trial a new idea and be clear whether or not it works?

This December 2025 report is about a trial of two of a total of three trial installations, called 'smart worm benches', to compost food waste in the public and private domains at Fishermans Bend in the City of Melbourne, Victoria. Incorporating feedback from the community and Council, this final report is submitted in December.

Zoe Wang, my fellow prize-winner, created her own separate design, the third trial installation for which she will provide a report.

This trial offers valuable potential to learn, to change, to strengthen ways the community of Fishermans Bend and of the whole area of Melbourne City Council may reduce food waste, to learn how to compost and garden, how to improve gardening policies and, for Council, how to conduct future trials of new ideas.

This report is written in December, the 11th month in an 11 month project. There's presently only three months of quality and quantity data about the compost in two of a total of three bench installations, one at Yarra Edge, the other at St Ali coffee roastery.

Greater confidence about the success or failure of the trial may be gained after a total of six to seven months of data and community feedback, by April or May 2026.

The council initiative of inviting Michael Mobbs and Zoe Wang to provide continuing maintenance and advice to the community and businesses until the project concludes in May 2026 is a proactive way of maintaining the good will and engagement of all project participants as vital data and confidence in the installations is more likely to be obtained.

Like all data this project data has some limitations and they are described in this report and on the project website: https://participate.melbourne.vic.gov.au/emerging-tech-testbed/worms-at-work-pilot

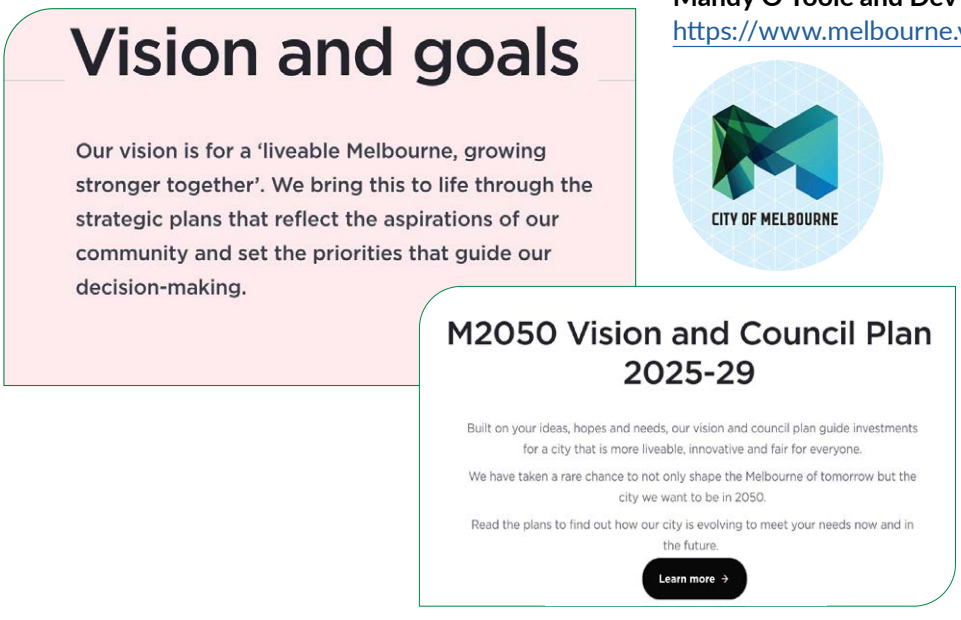
Quantifying community involvement, support or opposition by feedback and surveys is elusive because personal values are involved. Perhaps the most reliable community feedback is what the community does and asks for. The October request by the Yarra Edge Compost Champions to City Councillors for more benches like those they use at Yarra Edge and St Ali is encouraging; See **Appendix A** (p32-33).

For the four participants in this (and any) trial - the Council project team, the two creators of the composting options, and the residential and business 'hosts' of the installations – full transparency may be uncomfortable. But the alternative – choosing comfortable certainty through command and control policies, fearing failure and plodding on with business as usual – these less courageous approaches put off learning how to improve.

A powerful action when governing or administering is to say to citizens, let's learn and trial a new idea and be clear whether or not it works?

Melbourne City Council

In its 2023/4 Annual Report, Melbourne City Council makes clear it has chosen to learn:



Yes, this report does not have the full data to be obtained next year, but there are early lessons and data to assist hosts, report readers and the public to choose whether, how and why to compost. It provides data and analysis of two of the three composting options. It considers lessons from a collaboration between the trial participants: Council administrators, one of the two prize winners Michael Mobbs, a fabricator and fellow designer Ciro Guiliani and his fabrication business, Mrfoxinabox, and the community hosts.

Thank you all for your time, design, collaboration, advice and patience.

Go the worms and nature's little creatures who make soil from food waste and have helped us have fun and avoid climate pollution during the project – we humans get by only because of you, and this trial could not have occurred without your silent support.

Thanks – **Angela Forgan, America Suarez, Carol Berg, Carolen Fisher, Heather Richards. Krystle Mitchell, Lucy Ward, St Ali, Sarah Taylor, Tracy Cameron, Sustainable House Intern, Emilio Hugler, 18 Pence Lane Cafe, Andrew Ligdopoulos, Mrfoxinabox, Ciro Giuliani, Ian Collins, WaterUps, Dave Goodman, Kensington Compost and for perspectives, generosity (including to "Glowup") – Professor Dimity Reed and the project team: Nicky Stecca, Mandy O'Toole and Dev Patel.**

https://www.melbourne.vic.gov.au/council-plan-vision

2. Findings and recommendations

1 Installations

Four benches were built and installed in two locations by one of the two Fishermans Bend Digital Innovation Challenge prize winners, Michael Mobbs, within the project budget and timeline (see the project budget, **Appendix I** (p47).
Two pre-assembled benches were installed on the public concourse at Yarra Edge for use and maintenance by local residents. As it was a trial the Council required no formal approval for the installation but did agree to some minor design changes to the prototype proposed by Mrfoxinabox.
The other location involved simultaneous assembly on site of two benches by the business tenant, St Ali, and Michael Mobbs and Mrfoxinabox; this location is private land outside the St Ali coffee factory in Hall Street where the business uses and maintains the bench. As that's private land no Council approval for the bench or the design was required.

2 Long term acceptance of worm benches:

After more than three months of trialling and maintaining them both host managers of the two benches have accepted the benches are useful to their community and business. Both have informed Michael Mobbs they wish to keep the benches beyond the trial that ends in December 2025 and to continue using them for future years.

3 Report relevant to several Council departments:

This trial project has strategic implications for the operation, planning and budgets of different departments of Council including those responsible for: roads, footpaths, waste, sustainability, and other departments. It is recommended the report be provided to several Council departments and they be invited to consider options for including benches throughout city streets, parks, schools, education via public libraries and institutions with which the Council collaborates. It is recommended the 2026 budgets allow for $nil financial costs for local assembly and maintenance by the community and businesses which may host, assemble, install, and use the benches. The bench design, and flat packed delivery option, avoids significant capital and operating costs for Council.

4 Assembly Guide:

When the report is referred to other department(s) any such referral may usefully invite other departments to review the Assembly Guide which is **Appendix B** (p34-35). That Guide specifies the materials, dimensions, and installation process for the benches.
The Guide shows:

- Structural, safety, and long term weather-proof utility are achieved;
- Any unskilled person may assemble, install and use a bench;
- Asset costs and maintenance are reduced or avoided for Council;
- Adjustable legs or wheels enable a bench to be leveled on site, or placed on castors so the bench may be located on grass or soil without damaging soil structure including plant roots.

5 Public domain planning to respond to *Australia's National Climate Risk Assessment* published in September 2025

Emerging climate-risk projections highlight the increasing importance of local cooling and soil resilience across Melbourne's neighbourhoods. While current Council strategies emphasise climate adaptation and greening, they do not yet include specific mechanisms that empower residents and businesses to improve soil health or support local cooling through community-generated compost. The Worms at Work pilot demonstrates a practical, low-cost model that could help address this gap. Future policy development may benefit from exploring how community-led composting and micro-greening initiatives can complement Council's broader climate resilience and public-realm objectives, particularly in areas such as Fishermans Bend.

6 To grow community, cut capital and operating costs for street furniture and waste - amend policies:

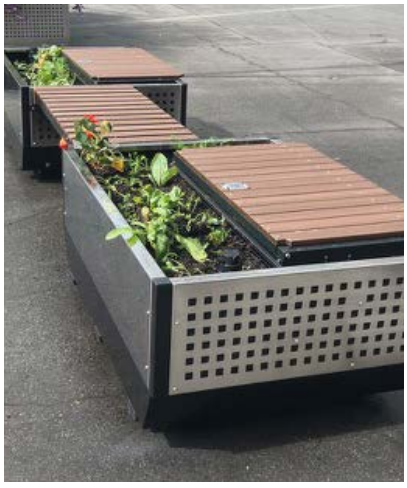
It is recommended that in 2026 Council implement the statutory principles in the **Local Government Act** (see the principles below, **3. What would success look like? p8)** to simplify its public domain and gardening approval policies to increase the number and rate of take up of local composting options. Amendments will enable citizens and businesses to compost and garden in footpaths and verges

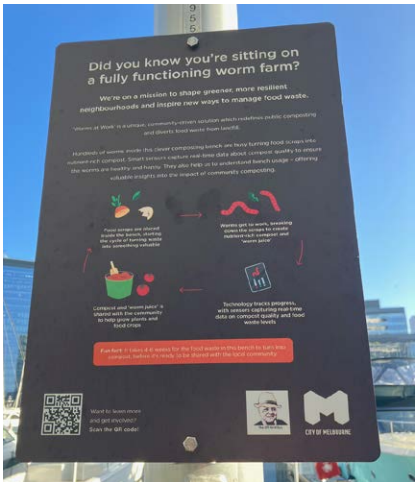
without Council approval. When implemented the amended policy may match the Sydney City Council Footpath Gardening Policy which, since it was made in 2013, has for 13 years, in one page, permitted gardening and composting in the city's footpaths without Council approval; (**Appendix C, D, E p36-39).** The policy has created an extraordinary growth in: community and biodiversity, cooler streets (data here: https://www.streetcoolers.com.au/), storm water retained to grow canopy; and consequential reduction in air conditioning costs, and reduced Council administration and asset maintenance costs.

7 Include new street furniture and related data collection options in the 2026/2027 Council budget

To embed public and private composting in the Council's next budget the costs and savings of increased food waste composting in public street furniture should be quantified in Council's 2026/2027 budget. Budget options should be informed by a survey of financial incentives for reducing all forms of waste. If less waste is produced then waste fees should be lower; the scope for such incentives and examples of such incentives overseas, particularly in the United States, should be evaluated.

Data would usefully include unique social benefits from local composting which are unavailable from typical waste collection systems, including FOGO type systems. There is plentiful research on those benefits and they include:





Two benches at Yarra Edge, Fishermans Bend, November 2025

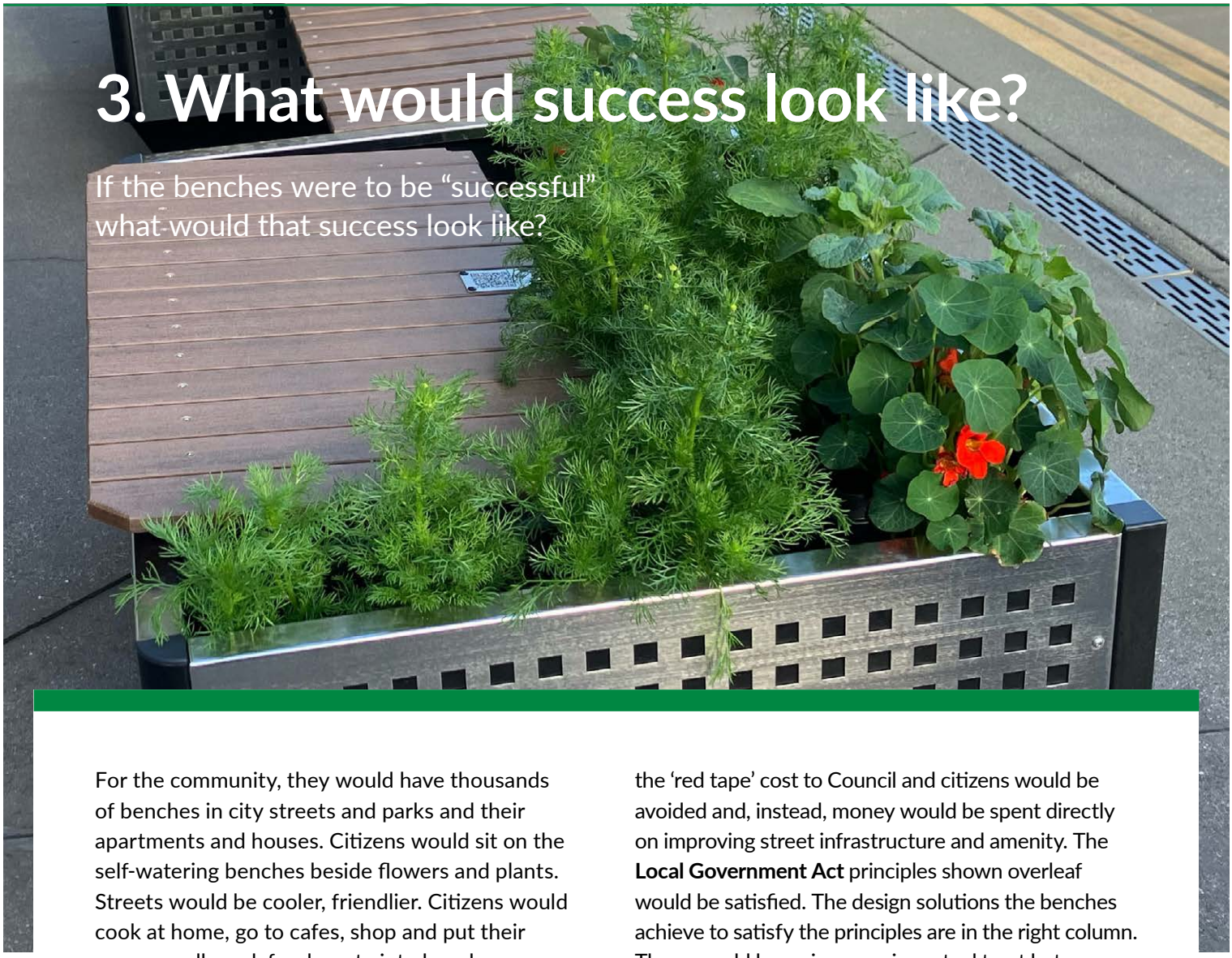
- Connections with those in difficulty meeting basic costs of living including obtaining buying food; conversations can reveal when a neighbour needs some food donated which they otherwise can't afford;
- News that someone is ill or otherwise needs support;
- Support for someone struggling with mental health issues;
- Prompting a person to walk or wheelchair in the street to garden, or to compost, or simply to walk or wheelchair the streets with a newfound sense of social connection or confidence.

For research see **Appendix F** p40-44.

8 Collaborate with other Councils to expand composting options in street furniture state-wide:

There is obvious potential for future and broader collaboration and expansion of public composting in street furniture with other councils, state agencies, local composters, apartment and housing sectors and in parks, gardens across Victoria.

It is recommended the final report be provided to other Victorian councils for their information and with a request for their feedback so it may be included in the final report by Council's project team expected in May 2026.



3. What would success look like?

If the benches were to be "successful" what would that success look like?

For the community, they would have thousands of benches in city streets and parks and their apartments and houses. Citizens would sit on the self-watering benches beside flowers and plants. Streets would be cooler, friendlier. Citizens would cook at home, go to cafes, shop and put their paper, cardboard, food waste into benches near or where they live, relax, dine out, have coffee. Cafes, businesses and rate payers would save their food waste costs and win lower rate rises by composting and by reducing or ending their food waste.

Communities would grow conversations, nurtured by the new dynamic of unexpected conversations with friends and strangers in the street, park, at or outside cafes.

Biodiversity would increase, nourished by healthier soils, more prevalent flowers, vegetables. For Council, its administration costs and maintenance time would be reduced for new street and park furniture, its capacity to reduce waste increased, and it would reduce climate pollution, and provide safer streets. By no longer requiring permit applications and approvals the 'red tape' cost to Council and citizens would be avoided and, instead, money would be spent directly on improving street infrastructure and amenity. The **Local Government Act** principles shown overleaf would be satisfied. The design solutions the benches achieve to satisfy the principles are in the right column. There would be an increase in mutual trust between the Council and the community.

By choosing to grow community by enabling public domain composting the Council would acquit statutory duties it must meet under its enabling legislation. For example Council would discharge this duty:

"(d) participants in community engagement are entitled to reasonable support to enable meaningful and informed engagement;"

LOCAL GOVERNMENT ACT 2020 – SECT 56
The community engagement principles

And, of course, statutory governance and supporting principles for all Victorian Councils applying to the project would be implemented. In particular, statutory subclauses (b) through to (g) in the **Local Government Act** shown in the left column below would be satisfied. The design solutions the benches achieve to satisfy the principles are in the right column.

Subclauses	Design solutions
"(b) priority is to be given to achieving the best outcomes for the municipal community, including future generations;	Long lasting, recycled materials, 90% Australian made materials.
(c) the economic, social and environmental sustainability of the municipal district, including mitigation and planning for climate change risks, is to be promoted;	Efficient, robust, stainless steel, rat proof materials and design functions to achieve easy installation and use by citizens Free soil-making and fertiliser production for local use No embodied energy for installation or maintenance and almost none for watering The bench (the slatted seat and garden) harvests and stores rain; the .85m2 surface area harvests ~ 650 litres per annum in a 900 mm annual rainfall zone Annually 1,000 benches would: • harvest 650,000 litres of rain; • produce 520,000 kg of compost • avoid 2,080,000 kg of food waste • avoid 1,352,000 kg of carbon emissions. (CO_2e emissions or Greenhouse gas emissions (CO_2e))
(d) the municipal community is to be engaged in strategic planning and strategic decision making;	Feedback is permanent through the metal QR code on the benches and nearby Council signs. Community members can help identify installation sites and shape street scape integration, giving them a direct role in early planning. With transparent access to bench and sensor data, they can also engage in ongoing decisions by understanding impacts, setting priorities, and advocating for future climate-resilience measures.
(e) innovation and continuous improvement is to be pursued;	QR code made with Linktree on metal plate enables feedback and information to be edited without changing the QR code Simpler, less time-consuming and costly (to Council and applicants) policies will replace the two existing policies. Combining street furniture with smart sensors provides real-time insights into usage, performance, and environmental conditions. These datasets support Council's strategic decisions, improve community service delivery, and guide future public-realm and climate-resilience initiatives.
(f) collaboration with other Councils and Governments and statutory bodies is to be sought;	Able to be used and affordable by both city and country Councils advancing collective goals among Victorian councils around waste reduction and climate resilience through effective collaboration.
(g) the ongoing financial viability of the Council is to be ensured;"	Almost $nil installation and operating cost when citizens install, assemble, maintain.
LOCAL GOVERNMENT ACT 2020 – SECT 9 Overarching governance principles and supporting principles	

Success would also look like the Council was in fact implementing one of its key "Strategic priorities' promised in its ***Financial Plan 2025 – 35 p 22.***

That priority is shown in the Plan as **"Living Sustainably".** Implementation of the priority is anticipated to be achieved by "Ensuring local access to high-quality parks and open space, supporting community resilience and transition to zero emissions and a circular economy, taking Country-first approaches to restoration of the environment"

Living sustainably	Ensuring local access to high-quality parks and open space, supporting community resilience and transition to zero emissions and a circular economy, taking Country-first approaches to restoration of the environment.

Source: Financial Plan 2025-35, p 22

3.2 Strategic priorities

Following a series of community engagement activities, Council has identified the following strategic priorities to support the aspirations of the Council Plan. The strategic priorities are included in the 10-year Financial Plan and, where appropriate, referenced in the commentary throughout the plan.

In response to the Community Vision, Council has developed the strategic priorities for the Council Plan 2025–29. Our vision for Melbourne anchors and connects these objectives to deliver real outcomes for the community.

Strategic priorities	Overview
Governing for the future	Sustainably managing finances, leading and advocating on issues, furthering partnerships and self-determination with First Nations peoples, empowering communities to participate.
Healthy, safe, clean and connected communities	Enabling physical and mental wellbeing, supporting in times of need, contributing to a safe and clean city, supporting people to experience a sense of connection and belonging.
Living sustainably	Ensuring local access to high-quality parks and open space, supporting community resilience and transition to zero emissions and a circular economy, taking Country-first approaches to restoration of the environment.
Vibrant and creative Melbourne	Retaining Melbourne's position as a world-class creative capital, nurturing local creative talent, ensuring uniquely Melbourne experiences are accessible to all.
Leveraging our economic strengths	Driving innovation, education and investment, supporting an inclusive economy with shared prosperity, backing adaptive re-use of underutilised space, supporting robust visitor economy.
Building a city for people	Contributing to a well-designed transport network, delivering welcoming and accessible streets and public places, supporting housing affordability and choice through growth, ensuring high-quality design outcomes.

Alongside each strategic priority, there are a set of outcomes that will be appropriately measured. In developing the Financial Plan, we have ensured that appropriate resources are allocated and that the capital works program aligns to deliver these priorities.

22 Financial Plan 2025–35

My Smart Garden program

These expectations of the potential of the project are reinforced in a program evaluation report of a comparable trial involving gardening and carried out by eight (8) Melbourne Councils, **My Smart Garden.** Key findings include:

"My Smart Garden program is a holistic initiative that is leading to significant positive change for individuals, communities and the environment. My Smart Garden provides free and engaging workshops for enhancing gardening practices, but also works to build connections and encourage community participation."

Participants have experienced numerous health and wellbeing outcomes, as well as improving their gardening practices to produce more fresh produce, save water, reduce waste and enhance biodiversity. Ultimately, My Smart Garden is more than the sum of its parts – it is a way for councils to support community members in becoming healthier and more resilient, while leveraging that action to contribute to the environmental priorities of participating councils.
The impact of, and interest in My Smart Garden continues to increase." P 8

https://mysmartgarden.org.au

4. Background

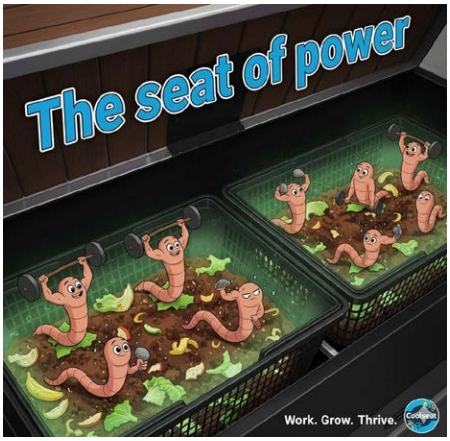
In late 2024 Zoe Wang asked me, Michael Mobbs, to collaborate with her on a pitch for a prize offered by Melbourne City Council to the general public for an innovation project; this was the 2024 Fishermans Bend Digital Innovation Challenge. We had first met that year when some people across Australia gathered to discuss setting up a national group for local composting; LOccal. The group is incorporated and I join monthly committee meetings — www.loccal.org

From early 2024 my existing composting options called coolseats had been fabricated in Melbourne with an existing garden furniture fabricating business, Mrfoxinabox.

Ms Wang's idea had been chosen as one of three innovation ideas shortlisted by Melbourne City Council for a competitive public pitch event. It was to design a below ground compost solution. Ms Wang had not composted and had no direct composting experience. There was no design for the idea. I offered to collaborate if the idea was changed to an above ground option similar to one I had been developing for some 8 years but, of course, to be varied should our pitch win.

After we agreed to refine and adapt my design we rehearsed the pitch and I traveled several times from my home in Sydney to Melbourne for our rehearsals.

After Zoe Wang and I agreed to collaborate on a pitch I began to inspect the area of Fishermans Bend for prospective installation sites should we win the pitch. To prepare for the possibility of winning, to demonstrate an existing viable example, and to inform myself of local composting sentiments, I arranged with Andrew Ligdopoulos, the owner of



a local café, 18 Pence Lane Café, to install an existing coolseat option there and which I donated. With the assistance of Mrfoxinabox, who built the coolseat, I installed one there so I might gauge the level of community and business interest in composting and gauge its effectiveness through the eyes of the café owner and the café patrons whilst preparing the pitch.

Ms Wang and I our pitched our proposal together. Our presentation included several images of the existing café compost installation; we won.

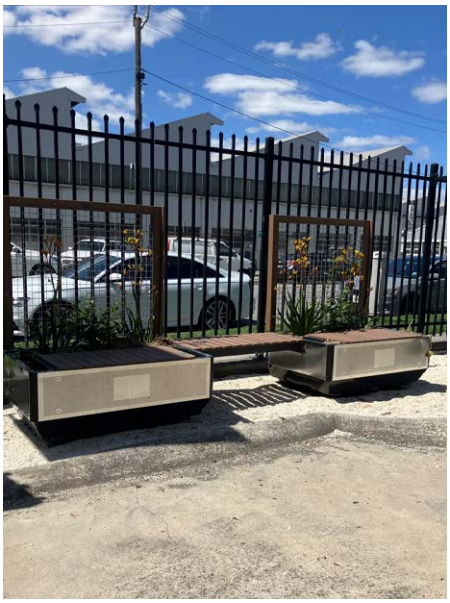
Then, over two months, a collaboration contract was negotiated and was signed on the 7th of February 2025 when work began on the project leaving 11 months to complete it.

The prize and project background is described on the Council's website.

During the project the silent, invisible daily pollution collapsing Melbourne's and Earth's climate continued, including from food waste in Fishermans Bend.

For the first time, in October 2025, the federal government published detailed descriptions of the local impacts across Australia caused by the collapse; ***Australia's National Climate Risk Assessment.*** For Melbourne it identifies these risks:

(Climate Risk on next page)



St Ali benches

Climate Risk Assessment

Major urban centres and cities across coastal areas emerge as primary hotspots for risks from sea level rise.

“

At +3.0°C of global warming, heat related mortality is projected to increase by 444% in Sydney, 259% in Melbourne, 335% in Townsville, 312% in Perth, 146% in Launceston . . .”

— p105

For the first time, in October 2025, the federal government published a description of the local impacts across Australia caused by the collapse; ***Australia’s National Climate Risk Assessment.*** For Melbourne it identifies these risks:

“Urban communities

Major urban centres and cities across coastal areas emerge as primary hotspots for risks from sea level rise. Exposure is increased in coastal areas that have high population density, residential buildings in close proximity to soft shorelines, and erosion due to higher sea levels and shoreline characteristics. The relatively high values of assets at risk increase the impacts if risks are realised (high confidence).

- *Urban areas with increasing exposure to sea level rise include Darlinghurst, Haymarket, Millers Point, Kogarah, Double Bay and Darling Point in Sydney;*

  South Melbourne; and in the east, west and north of Melbourne’s central business district. Expanding coastal urban suburbs and waterfront developments will increase future impacts from sea level rise, storm surges and extreme weather events. Evidence: Communities Technical Report”
  P61

Exposures vulnerabilities, impacts and risks

This Section provides a summary of impact associated with the health and social support system (Table 11).

These have been identified by understanding the change in climate hazards, as well as exposures and vulnerabilities that drive them.

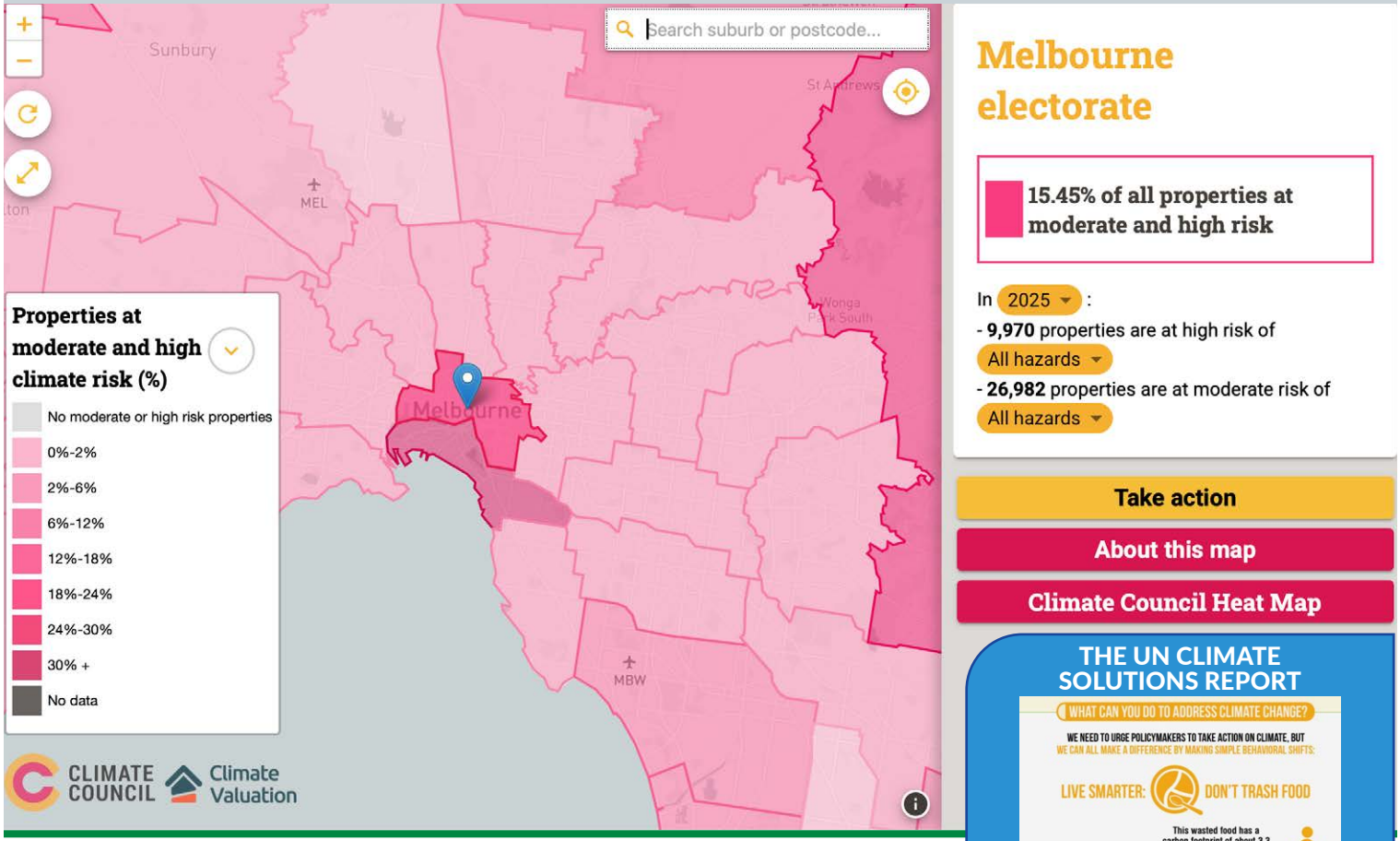
Climate impact	Current	Future			Current climate adaptation examples
	GWL +1.2°C	GWL +1.5°C	GWL +2.0°C	GWL +3.0°C	
Heat-related health impacts	Heatwaves are the deadliest natural hazard in Australia, and increased temperatures have significant adverse health outcomes.	Heat-related mortality rises relative to current – for example: 103% in Sydney, 60% in Melbourne, 94% in Townsville, 68% in Perth, 52% in Launceston and 112% in Darwin.	Heat-related mortality rises relative to current – for example: 190% in Sydney, 126% in Melbourne, 159% in Townsville, 139% in Perth, 88% in Launceston and 199% in Darwin.	Heat-related mortality rises relative to current – for example: 444% in Sydney, 259% in Melbourne, 335% in Townsville, 312% in Perth, 146% in Launceston and 423% in Darwin.	Cooling centres in cities and rural areas. Resilience education for vulnerable groups. Increased capacity for emergency and health services during peak heat seasons. Green infrastructure and effective insulation.

Table 11: Summary of impacts to the health and social support, system, and adaptation, examples, derived from analysis for the national assessment. Further details, including information sources, can be found throughout the chapter. p132

"• The footprint and intensity of heatwaves is changing, with significant spatial and social variation in their impacts. **During extreme heatwaves across southeast Australia in January 2009, 5 million people in Adelaide and Melbourne were exposed. In Victoria, this resulted in 374 excess deaths** (State Government of Victoria, 2009). Looking ahead, the Australian Climate Service modeling demonstrates that some extreme heatwaves could become larger spatially, and more intense, resulting in a significant increase in deaths (Figure 51).

Evidence: Australia's Future Climate and Hazards Report" P134

Climate risks are now quantified by postcode and federal electorate and the risks - 10.47% of all properties at moderate to high risk for Melbourne City – are below:

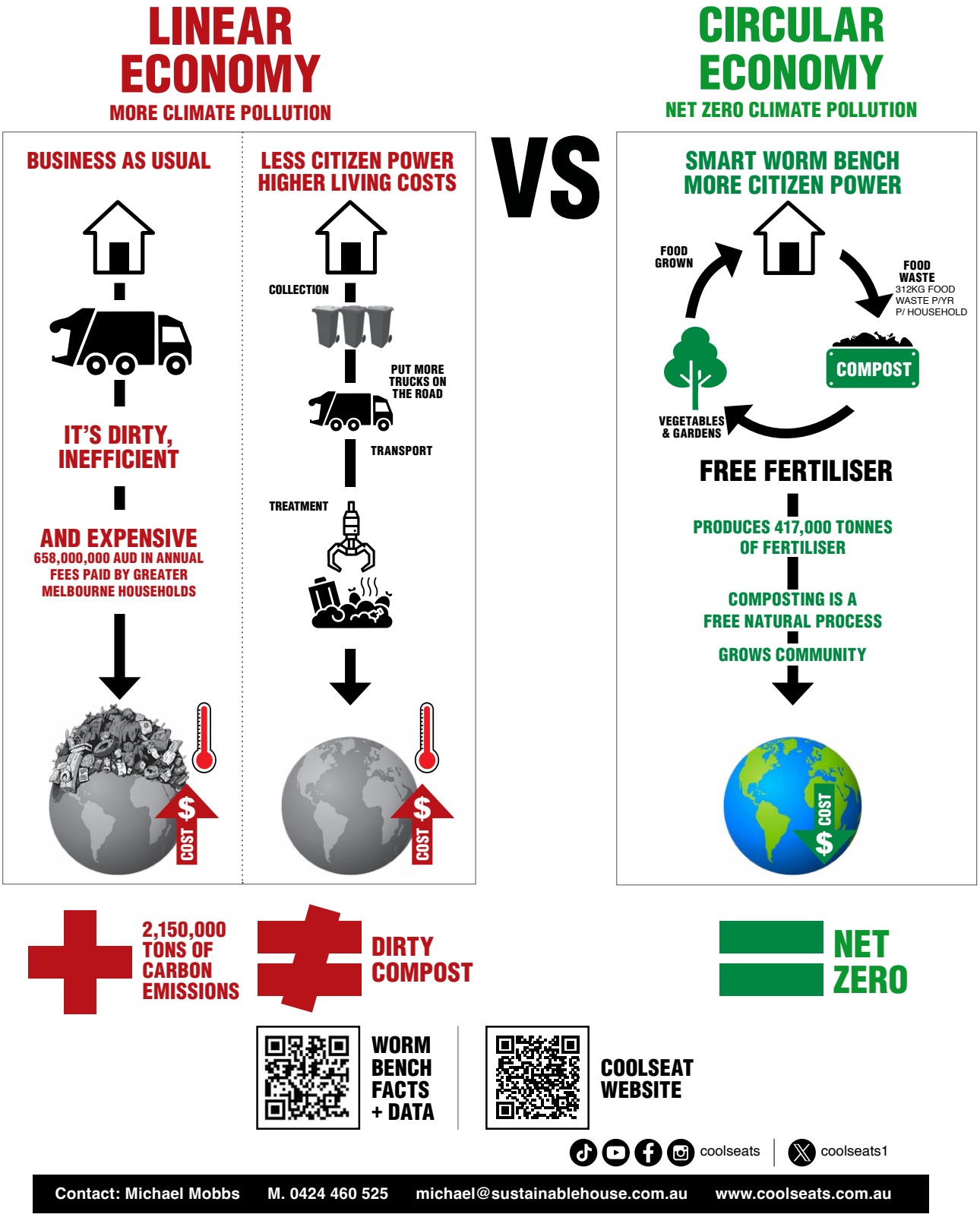


https://www.climatecouncil.org.au/resources/climate-risk-map/

The benches offer a significant new low cost solution to the third most climate polluting source, food waste.

EXPECTED INCREASE OF HEAT RELATED MORTALITY:

444%	259%	312%
SYDNEY	MELBOURNE	PERTH



Key points:

- Current policies for gardening approvals and permits in the public domain were published some years ago. **Appendix E p39**
- The policies do not address or offer solutions to the risks identified in the federal government's 15 September 2025 report, ***Australia's National Climate Risk Assessment.***

5. Design, fabrication and use

Key points: The benches are unique: a seat, a garden bed, a compost, self-watering, water storage, rain harvesting, self insulating, grow free food, soil and fertiliser.
Public street and park composting grows community.

5.1 Goals

The benches implement the legislated statutory governance and supporting principles for all Victorian Councils and the social values the legislation expects Victorian councils to apply as they administer the legislation. They also implement and respond to the community workshop held at 18 Pence Lane Café at the beginning of the project where the community questions (eg about smell) and suggestions were fully documented.

An efficient compost is fully ventilated and insulated by soil and air on all sides of the compost pile, has opportunities for worms and microbes to freely navigate in and out of and away from the food waste, is not too wet or too dry and is moist to support the diverse life in it which digests the food waste. That compost environment is provided in garden bed furniture which is stylish and visually attracts any passer-by to linger, to sit, to reflect. Whilst being both attractive to the eye and without odour, the bench:

- Is unique as it does not appear to be a compost, simply a garden bed with a seat;
- Has four functions: garden bed, seat, compost, water storage;
- Is prefabricated in Melbourne from Australian recycled materials;
- Uses the same materials already being used by the garden furniture business, Mrfoxinabox, so as to cut fabrication costs;
- Parts can be flat packed and freighted and delivered anywhere in Melbourne and Australia;
- Able to be assembled by unskilled citizens;
- Stylish, attractive to the eye of pedestrians and others in both the public and private domains;
- Invite the viewer to sit on it, and to garden with it;
- Complement existing Council street furniture in look and with steel materials;
- Harvest rain water in garden beds and through seat;
- Low or nil installation and maintenance costs to Council;
- Safe for children – the gas struts prevent the seat slamming shut;
- Physically accessible for most users;
- Rat proof;
- Odour free and quick to compost because full air and ventilation happens on all sides of the composting food waste – top, sides, base.

Waterups cells store water near plant roots, reduce water use, watering time, by over 90%. Details in Appendix B (P34-35), images, 10, 16, 17.

5.2 Bench facts

Design and usage facts for one bench:

Costs savings:
Four products in one:
seat + garden bed + compost + fertilizer + water storage

90% Australian made

Flat packed self assembly Save time Save costs

Light enough for two people to carry and transport

Water saved 1,000 L p/year -/100 L p/month typical beds

Watering time saved: no watering time

2080kg
Food waste avoided per year

W: 900 mm **H:** 450 mm **L: 1650** mm

1,352kg
Carbon emissions avoided per year**

Figures below assume medium use of one bench. Greater amounts of food waste are composted with twice weekly aerator turning of food waste in both baskets and when baskets are kept full and compost is transferred weekly to garden beds.

- **Waste avoided: 2080 kg food waste a year***
- **Free soil: 208 kg free soil a year**
- **Storm water runoff avoided, harvested – With 900mm rainfall a year a coolseat harvests ~ 650 litres a year and prevents that amount of storm water runoff; therefore the four benches prevent around 2400 litres of storm water runoff a year polluting the Yarra River and Port Melbourne**
- **Carbon emissions avoided: 1,352 kg a year ****
- **More fun and relaxation in public and private locations, less stress, better physical health**
- **Grow community and conversations**

UNIQUE FEATURES TO SMART WORM BENCH

(ALSO KNOWN AS THE KALGOORLIE COOLSEAT)

Sources:

** Quantities based on observations of similar bench (coolseats) designs*

*** 1 kg food waste causes (and composting avoids) 0.65 kg climate pollution – calculator*

Wicking cells reduce irrigation by > 80% - research

5.3 Installation, use and approval for public land installations

• *L: Worms at Work benches – Kalgoorlie Coolseats* • *R: Council's nearby existing garden beds not shown*

Trialling commenced in the Melbourne factory in September 2025. A prototype bench garden bed was designed and built by Ciro Guiliani at his factory. Michael designed and collaborated with Ciro the composting components to be integrated within the garden bed. Council was invited to inspect it where Ciro listed forthcoming design changes to the prototype garden bed. The agreed design changes were made and Council approved the bench for use on public land it administers but no formal approval was issued as the bench is a trial design.

Two benches were installed at each of the two installations. Data sensors were installed in only one bench on the left hand side as one looks at the front of the two benches. An additional sensor to measure seat use was installed under the seat connecting the two benches. The data from the two sensors measuring seat use is aggregated and presented as one total use on the website dashboard but the individual totals of each sensor is accessible privately by the Council.

The first installation was on Friday 29 August at St Ali Coffee factory in Hall Street, Port Melbourne. Two benches were installed at this installation within the project budget. No council approval was needed for this installation as it was private land.

This first installation was planned to test whether the bench can be assembled on site by those unfamiliar with the design and who were unskilled.

The second installation at Yarra Edge was planned to demonstrate that, when assembled in the factory, two people may carry a bench by hand to install it, no heavy lifting equipment is required for installation, and installation is a low risk activity. Two benches were installed at this installation within the project budget.

For the first installation Michael and the St Ali factory manager, Lucy, arranged the run-sheet, site preparation and installation in advance. At the first installation, to test whether the design could be assembled by others who were unskilled, parts to make two benches were laid out on two blankets. The factory manager,

Lucy Ward, and another factory worker assembled one bench while Michael and Ciro assembled the other bench beside them.

Both benches were completely assembled at about the same time and the two assemblies took less than one hour. All materials, and the benches when fully assembled, were carried by hand by two people. No heavy lifting equipment or vehicles were required other than the van in which the parts for the two benches were transported from the factory. The bench may be flat-packed and freighted anywhere in Australia.

Dave Goodman from Kensington Compost had been booked by Michael to bring worms, compost, and a compost auger to put in the two benches to commission them. Michael paid Dave for the service and materials in cash on the day and did not seek reimbursement from the project budget.

Lucy brought about six small buckets of food waste from another St Ali café located elsewhere. A barista from the café at the coffee factory carried the waste coffee ground container to add coffee grounds to the food waste.

Some Yarra Edge Compost Champions (Heather and Carolen) closely watched and questioned and discussed the bench assembly and design. Some factory staff and Zoe Wang and those collaborating with her on the design of her bench also watched the detailed assembly process. This installation was useful for Zoe and her fabricators as her design was incomplete at that time.

Michael explained the design and use to about 20 of those observing the assembly. Ciro Guiliani explained his fabrication business. Melbourne City Council commissioned a videographer to film the assembly and that video is on the project website.

After the installation Michael explained to Lucy and a fellow factory worker how to use and maintain the benches, including how to harvest compost juice from them. Lucy agreed to buy and disperse stones around the two benches and to arrange for regular food waste contributions.

The Smart Worm Benches at St Ali and Yarra Edge include a compost design that is fully aerated in all coolseat options and which are kept at stable temperatures, protected from hot and cold weather by stored water and surrounding soil as shown in the Coolseat option at a school at Beechworth, Victoria.

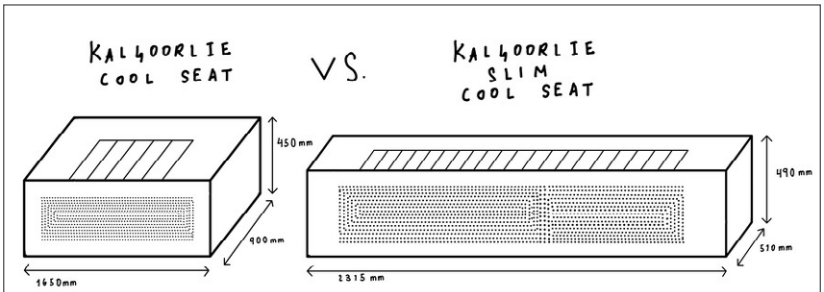
Design Details

The design goals have been achieved by a collaboration between Michael Mobbs and Ciro Guiliani whose Melbourne business, Mrfoxinabox, has designed and fabricated the bench structure and integrated in it the compost design by Michael Mobbs.

Mrfoxinabox designs and fabricates a wide range of garden furniture.

COOL SEATS MR FOX IN A BOX™

Those skills and experience were combined with my composting experience to create the bench design. The design has an Australian registration by Mrfoxinabox – called, Kalgoorlie Coolseat. A slimline version is available, the Kalgoorlie Slimline Coolseat. It's ideal for laneways, narrow footpaths and small spaces.



When adding adjustable feet (40mm) and the seat (20mm) the overall hight increases to 510mm.

Composting capacity and climate pollution reduction

The following estimates are made based on experience and observations which I anticipate will be refined with data being obtained from Council sensors and first hand observations of users of the two installations. Assumptions below apply to one bench with two baskets. Each of the two installations has two benches:

42 Litres Compost basket storage capacity in one basket

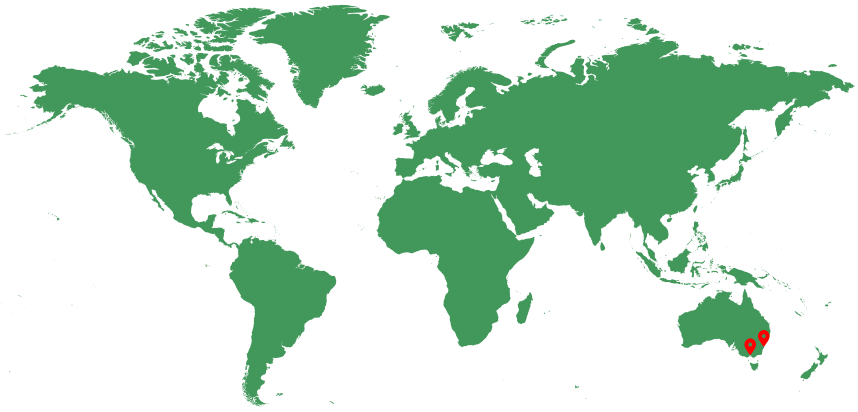
40 Litres Food waste storage capacity in litres assuming 5% less volume

80 Litres Total food waste storage in two baskets

80 Litres Amount of food waste composted in four weeks

1 litre of food waste = 1 kg therefore 80 litres = 80 kg of food waste

Amount of carbon emissions avoided from composted food waste = 0.65 kg carbon emissions per 1 kg of food waste; therefore; 0.65 x 80 kg food waste = 52 kg of carbon emissions avoided every 4 to 6 weeks per bench.



There is potential for the two installations, each of two benches, **to prevent 208 kg of carbon emissions every four to six weeks.**

In a year the two installations **may prevent around 2,496 kg of carbon emissions**, or some two and a half tonnes.

Each bench in the area **may harvest approximately 650 litres of rain each year** to store in the wicking cells and prevent storm water pollution of the Yarra river and Port Melbourne.

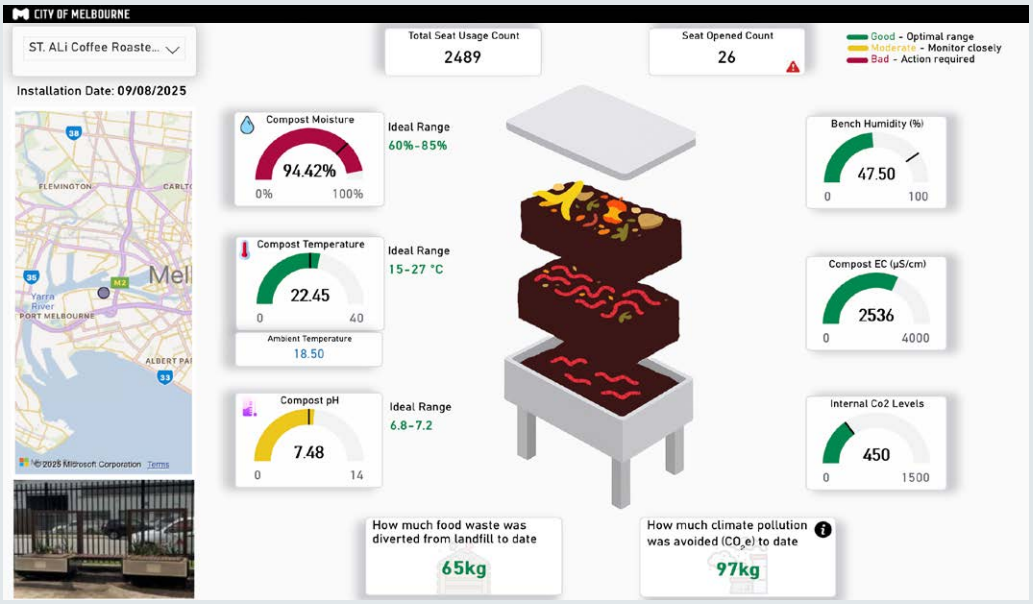
5.4 Maintenance

In October the Yarra Edge Compost Champions wrote to Councillor Rowse, who had launched the project for council, proposing five locations for more benches like those at Yarra Edge or similar designs but costing less, and the letter is **Appendix A** (p32-33).

Bringing bee and insect attracting plants and edible plants for the Yarra Edge installation.

6. Data

The Worms at Work dashboard provides a real-time snapshot of compost health and community use. It shows key indicators such as compost moisture, temperature, and pH, alongside metrics like seat usage and the amount of food waste diverted from landfi The dashboard is updated automatically every three hours and can be viewed by anyone interested in following the progress of the pilot.



https://participate.melbourne.vic.gov.au/emerging-tech-testbed/worms-at-work-pilot/sensors-and-data

At Yarra Edge one seat usage sensor was placed on the left seat and one on the bridge or connector seat between the two benches. To calculate the number of people who sat on the left hand seat and the connector seat we need to half the total usage count and add to the total to calculate usage for the right seat i.e. 3221/2 + 3221 = 4831 people used those two seats. All up there are three seats. There is no sensor on the right hand seat (as one looks towards the river) so the usage of it is a topic of speculation.

For Yarra Edge we - the project team and I - chose not to add the additional step of weighing and reporting food waste before depositing it in the bench as is being done by St Ali. This decision was made to avoid deterring community members from using the bench, and because there was no centralised location with weighing scales available to carry out this step.

6.1 Limitations on data for two bench installations

Data is being obtained from 5 sensors placed in one of the two benches in each of the two locations. The data is refreshed In real time, with updates sent from the sensors every three hours. Data is then fed into a data dashboard available on a dedicated public page available to anyone who wants to find out more.

https://participate.melbourne.vic.gov.au/emerging-tech-testbed/worms-at-work-pilot/sensors-and-data

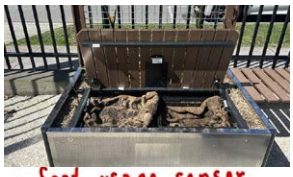
Like most data any sensor or other data limitations or qualifications to clarify results need to be stated with the data to retain credibility and inform responses to the data.

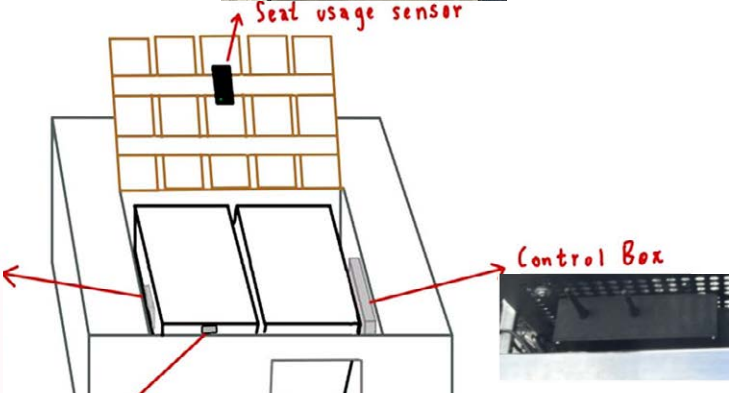
For example, pH in compost (and soil) will vary over time as the compost matures. The food waste, too, when put into the compost container will vary from acidic to a neutral level. Over time, however, as the compost matures and the levels of acidity vary the pH data will have more value because those trends will show the variations.

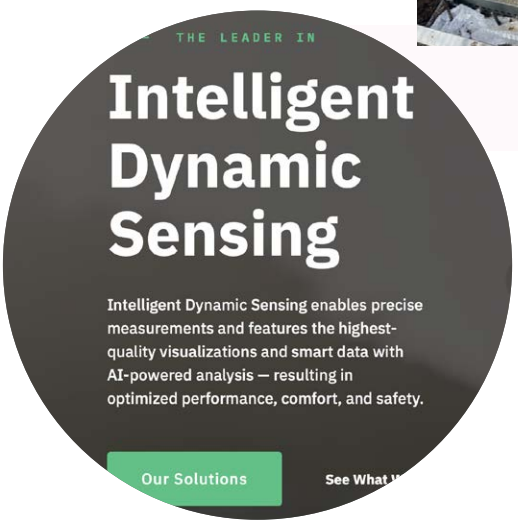
In addition, the three installations are in different locations which vary; one has exposure to full sun and wind, another is protected from full sun and wind. So the readings will be influenced by the surrounding temperatures in each location and by the way the compost is maintained and what is put into the different compost options.

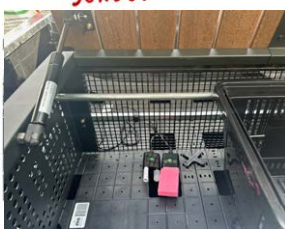
Another limitation is that the compost moisture data is not measured by a sensor in the compost. Because the compost may be turned or removed with hand spades or other gardening tools the probes cannot be located within the compost itself.

The moisture probes are below the compost contained in the basket above, and the probes rest on top of the cells containing water that are below the baskets of compost.









6.2 Data analysis

Preliminary observations in this report are limited because they rely on three months data for two of the three installations.

Around April 2026, when over 6 months data will be available for two of the three installations, the Council project team will use data to that time to provide a more informed analysis in its project report to be published by June 2026. That analysis will also include comparisons between the three installations and offer observations on the impacts on the data of the three different physical site aspects which are: Yarra Edge: fully exposed to wind and solar exposure on the north, south, east and west; St Ali: partially exposed to wind and solar on north, south, east and west; Susuro: limited exposure to wind and solar on north, east and west no exposure from the south.

The data summary below is for the three months period to mid-December, 2025, and limitations and assumptions are stated.

Note: Each of the two installations has two benches with a connecting seat. Sensors are placed in one bench only of each installation.

St Ali installation

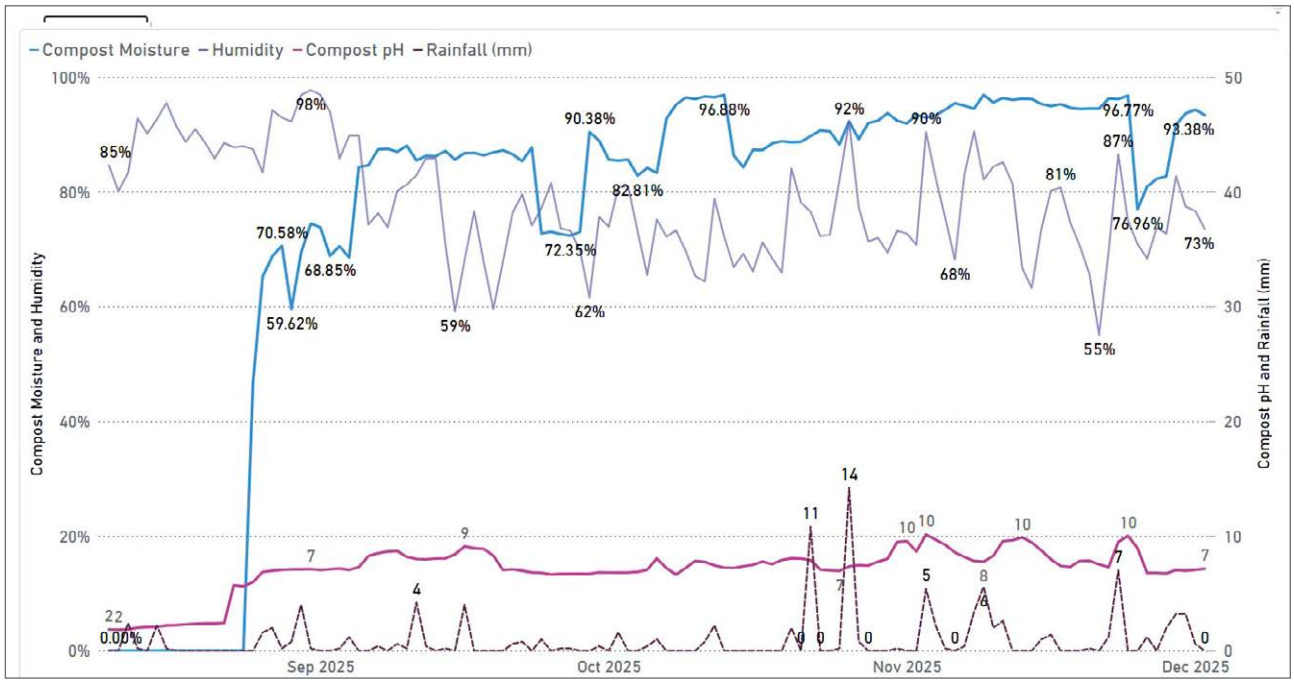
Climate pollution avoided: 42kg
(equivalent to 564km of driving in a petrol car).

Assumptions: aerated food waste compost

See Appendix H (p46), Explanation of air pollution from aerated food waste compost.

Compost moisture: levels are holding in the high 90%, with increases during rainfall (dotted lines).

This is expected with the placement of the sensor being under the basket, it provides good indication of water levels in the wicking cell.



Quantity of food waste: 65kgs

Assumptions: 40 litre basket holds 30 kg food waste, two baskets in one installation hold 60 kg food waste

Quality of compost ie Compost pH 7-10,

Assumptions: this is a limited measure of quality as pH varies widely during the composting process and the measure is expected as pH levels take some time to become mature once food is deposited.

Rainwater harvested, river pollution avoided = 1.920 litres a year

Assumptions: All the surface area of the bench (including the seat) absorbs rain: .85m2

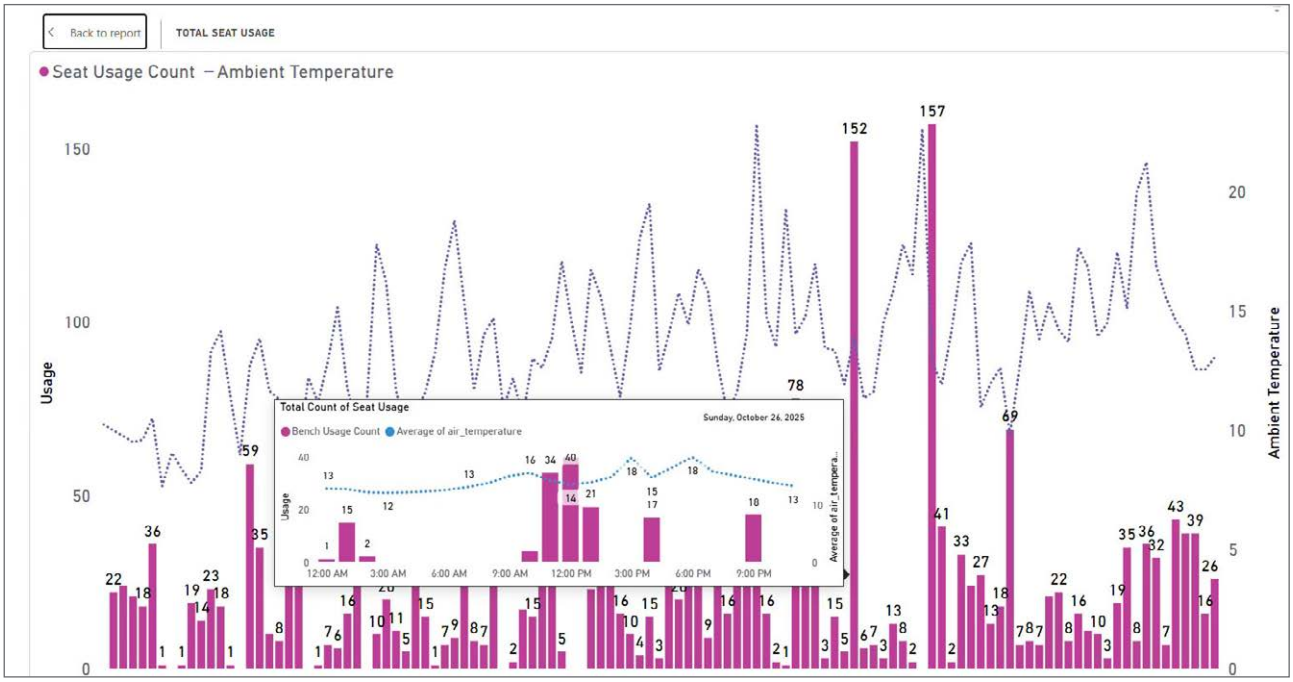
Average annual rainfall ~ 600 mm = 600 litres per m2

Bench harvests, stores ~ 480 litres a year

4 benches store \= 1,920 litres of rain fall a year

People using ie sitting on the seat assuming 85% accuracy = 1967 times people have sat on one of the two benches of St Ali.

Assumptions: We have used 85% as Council is seeing some anomalous data between 12am to 3am, not sure if this is caused by vibrations from large trucks or if someone is using the bench at those times – being reviewed



Explanation of data, sensors and data analysis

Moisture sensor:

It's essential to calibrate the moisture sensor in the first month of installation and food deposition and for periodically every 3 months thereafter if high accuracy is required. This is because the sensor calculates moisture levels by sending electric current between the 3 probes, the change in material composition of the compost based on what foods are deposited causes a change in dielectric permittivity in the medium resulting in a slow divergence over time.

3 monthly calibration is only necessary if 90%+ accuracy is required. For the worm benches it is not essential as we are only interested in sending alerts for extreme conditions i.e. moisture is

below 50%. The placement of the sensor below the basket does not exactly reflect the moisture levels of the compost in the basket but it does act as a crucial indicator that the bench needs some water.

pH sensor:

pH sensor does not equire calibration; initial findings show a great variation of pH levels with food deposits throughout the decomposition process, but there is a slow stabilisation over time as the compost matures.

The seat sensors show trends in usage which aligns with citizen commutes to and from work. Rain and heavy winds cause the sensors to trigger but this can be redacted by reducing/removing data points which align with BoM rain and wind data.

VOC and Co2 sensor:

No noticeable changes in Co2 or TVOC readings due to good ventilation in the bench. The readings match external environment.

Batteries:

Each sensor reports battery readings which Council can monitor. Council will add this to a private dashboard page which won't be available for public viewing.

The sensors are rated to operate for at least 1 year. Council will setup an alert systems for when batteries need replacement.

Data issues to clarify over the next few months

- a further refinement in bench usage sensor data.
- need to overlay rainfall and wind data to subtract outliers.
- The moisture sensor can be moved to sit parallel with the basket if it's filled with compost (instead of underneath the basket). In development.
- Calibration is required for the moisture sensor in the first month of installation. Once calibrated the drift in readings over time is minor and doesn't affect the accuracy required for the benches. All other sensors have not required calibration or any alterations.

Generally:

It is essential to conduct site visits through the trial period to validate the sensor data and understand relationships between bench conditions and measured parameters (moisture, temperature, pH and Co2).

7. Collaboration and strategic direction – some lessons

7.1 Collaboration

The four collaborators in this trial were:

- the Council project managers,
- the two creators of the composting options, and
- the business and residents of the Fishermans Bend community.

Businesses are dispersed across and dominate the existing Fishermans Bend community. Residents are perhaps less than a thousand citizens (no census data has been located) and most residents are located in nearby apartment towers beside the Yarra River on the northern sliver of the Fishermans Bend land known as Yarra Edge.

There are some generators and managers of food and waste in Fishermans Bend who were not directly involved in the project but whose roles are vital to understand for future strategic directions.

The main sources of food waste are from the nine or more large residential apartment towers with a few cafes and function areas and businesses contributing, too. Waste in the apartments is managed by building managers and the body corporates of the apartments appear to not be involved in the choice and contractual arrangements with waste service providers including the servicing cost arrangements.

It was observed but not confirmed by data that almost all food waste in Fishermans Bend is mixed with general waste and sent to landfill with various waste service providers, including Council, who truck away the different waste streams to locations not identified during the trial. Data on these waste streams and the sources, or amounts of different wastes, were not available during the project trial. There is uncertainty within the project team members about existing and future volumes and contributors and identities of the various waste service providers.

Despite these uncertainties and the novelty of the project idea, the bench installation at the one business, St Ali, and the one residential installation at Yarra Edge, was achieved with ready participation by the business and the residents. Collaboration leading to the installations and engagement afterwards by Michael Mobbs and council project managers has resulted in active use and maintenance of the benches at the two sites.

The daily data collection provides a platform for continuous communication between the project members. Continuing support and advice to the hosts is being provided by Michael Mobbs through to May 2026 when the final report by Council project managers on the project is expected to be published.

It is in this context, and at a time when some six or so months of data and collaboration remain to be carried out in the project, that some observations and lessons about collaboration are offered now.

When reviewing this project this comparable gardening project provides a useful Program Evaluation, My Smart Garden, Summary Report November 2022. There, an initial collaboration of two councils grew to 8 councils.

> **“The program has been greatly enhanced by cross-council collaboration. The ability to draw from a collective pool of resources and expertise has improved efficiencies and increased workshop variety and offering for participants. . . .**
>
> **However, despite the benefits, there are some challenges faced by councils when trying to run a program collaboratively. The variation in resourcing between councils was identified as a challenge to meaningful collaboration at times, including the efficiency at which actions occur.**
>
> **. . .**
>
> **Another key challenge to collaboration has been staff turnover within councils and the lack of structured handover processes. This has implications on knowledge retention and data consistency which may impact sustainability of the program moving forward.”**
>
> From, My smart garden, Program Evaluation, Summary Report, November 2022

In this Fishermans Bend project staff turnover and having four project managers has been a challenge. During the 11 month project there were some challenges with continuity including:

- four project managers;
- differing priorities between the project managers;
- the two prize winners, myself and Zoe Wang, agreed to provide separate designs thereby complicating communications and administration within the project team;
- the separation of duties and shifting controls or decision-making between the Council departments seemed to slow down or take up time for the project team, the communication team and other departments.

7.2 Strategic directions – some lessons

Greening Melbourne Permit and Street Garden Permit (Appendix E, p39)

Council policies require approvals for street gardens called "Greening Melbourne Permits" and "Street Garden Permits"; https://www.melbourne.vic.gov.au/street-garden-permits

See also comments in Appendix E (p39), Greening Melbourne Permit and Street Garden Permit.

The tables below list the estimated time and costs for these approvals. We have been unable to locate data on the cost and time to Council or permit applicants to obtain approvals.

What is the financial cost to council and a citizen and what is the time to obtain a street garden permit? Some estimates are in the table below.

The policies were made before, and without the benefit of, the September 2025 federal government's **Australian National Climate Risk Assessment;** see p13, above. Those newly quantified risks, postcode by postcode, indicate that, like most Australian policies at all levels of government, Melbourne's greening policies are not fit for purpose. That is, the rapid, dramatic increase in flood, fire, drought, insurance premiums, and premature death rates have overtaken many policies which now need revision if they are to respond to the risks.

Apply for a greening Melbourne permit	Time / $Cost
1. "Before applying, you should read the Street Gardens Guidelines below and check your site on the interactive map below. The next step is to contact the City of Melbourne to determine if your site is suitable. You can contact our Street Gardens coordinator on 03 9658 9658 or email street.gardens@melbourne.vic.gov.au.	1 hour/?
2. If your site is deemed appropriate, a street gardens notification sign (for public display) will be prepared for you.	**? 1 – 4 weeks?/$?**
3. Display the notification sign for four weeks to let the nearby community know you are proposing a street garden and give them an opportunity to comment.	4 weeks / $?
4. After four weeks, remove the sign and contact the City of Melbourne on 03 9658 9658 to determine if there are any objections.	1 week?
5. Complete and submit the street garden permit application form (DOC 319 KB) and pay the $56.40 application fee.	?1 week/$56.40
6. If your application is successful, you will be sent an Offer of Terms and Conditions.	? 1 – 4 weeks/$?
7. Once the Offer of Terms and Conditions is signed and returned and you have paid the bond of $76.90, we will issue you with a permit and you can go ahead with your street garden."	$76.90 / ? 2 – 4 weeks? Total cost / time to citizen > $133.30 / 11 to 22 weeks?

Street Garden Guidelines

The Street Garden Guidelines are for gardens on nature strips and median strips.

What is the cost to council and a citizen and the time to obtain a Greening Melbourne permit? Some estimates are in the table below.

Some data is provided in **Appendix E** (p p39) and estimates here of processing time and cost data to Council and applicants are offered without specific data to support the estimates.

Apply for a street garden permit	Time / $Cost
The Greening Melbourne team will conduct an onsite visit to discuss your greening ideas and explore what may be achievable for your site conditions.	
To request a site visit to discuss your greening intent, please contact City of Melbourne.	**? 1 – 4 weeks?**
1. If your site is deemed appropriate, you will need to complete and submit the Greening Melbourne Permit application. This will include a completed permit application, planning, maintenance and design layout of your greening proposal.	**3 – 8 weeks?**
2. Once your application has been reviewed, we will prepare a Greening Melbourne notification sign (for public display) for you.	? 2 – 4 weeks?
3. Display the notification sign on your building wall adjoining the greening for four weeks, to let the nearby community know you are proposing new greening and give them an opportunity to comment. All comments will be provided to our team for review.	4 weeks
4. After four weeks, remove the sign and contact our team (above) to determine if there are any objections or changes needed.	? 2 weeks?
5. If your application is successful, you will be sent an Offer of Terms and Conditions.	? 2 – 4 weeks?
6. Once you have accepted and returned the Offer of Terms and Conditions, a permit will be issued for a 12-24 month period. The permit will include conditions around maintenance, allowed dimensions and risk management.	? 2 – 4 weeks?
Principles for a successful Greening Melbourne permit	
• Applicants must implement and maintain the greening and manage risks appropriately. • Greening provides a benefit to the immediate environment, such as visual interest and amenity. • The proposal is supported by the adjoining neighbours, community members, and the City of Melbourne. • The greenery allows for the location to be safe, accessible and inclusive.”	Cost to Council? $Nil cost to citizen?

8. Budget Acquittal

All budget monies allocated for the two installations were met and no request was made for monies beyond the budget allocation.

Each installation included two benches while the budget provides for only one bench at each installation. Michael Mobbs paid for the cost of the two additional benches and did not seek payment from, or alteration of, the budget.

The Budget is Appendix I (p47).

Appendices

Appendix A: Letter from Yarra Edge compost Champions to Councillor Rowse proposing five locations for more benches 32-33

Appendix B: Bench Assembly Guide 34-35

Appendix C: Footpath Gardening Policy 36

Appendix D: A Policy Inventory 37-38

Appendix E: Greening Melbourne Permit and Street Garden Permit 39

Appendix F: Research – Reducing living costs for waste while growing community resilience 40-44

Appendix G: Worm Sensor Guide 45

Appendix H: Air pollution from food waste transport is significant 46

Appendix I: Worms at work – project budget 47

Appendix A

Letter from Yarra Edge Compost Champions to Councillor Rowse

From: **Heather Richards** hereiam@heatherrichards.com.au
Subject: Proposed Locations for Additional Worm Farm Benches at Yarra's Edge
Date: 14 October 2025 at 5:12 pm
To: andrew.rowse@melbourne.vic.gov.au

HR

Dear Councillor Rowse,

Following the recent installation of the worm farm bench behind 80 Lorimer Street, Yarra's Edge, several local residents have expressed enthusiasm for the project and a strong desire to contribute their household food scraps for composting. However, it appears that the existing location may not have sufficient capacity for the level of community participation we're experiencing.

To assist in planning additional installations, please find attached (in both Word and PDF formats):

- A document outlining suggested locations that would suit additional worm farm benches, and
- Accompanying notes for your consideration regarding these sites.

Each proposed location includes three design options for review.

In addition, please see photos of suggested locations for **additional benches in the parks adjacent to the Forge Apartments and Voyager Apartments on South Wharf Drive, approximately** 1 km from the existing site at 80 Lorimer Street. These sites would provide convenient access for more residents to participate in the composting initiative.

We would greatly appreciate your support in considering these proposed sites for expansion, to ensure that local residents can more easily participate in the composting program and further demonstrate community engagement in improving our local environment.

For your reference, registration for the official ***Worms at Work*** launch event—hosted at Susuro Wine Bar and St Ali at 5 pm on Thursday, 16 October—is available here:

👉 https://events.humanitix.com/worms-at-work-launch-event

We look forward to continuing our collaboration with the City of Melbourne to help grow this successful environmental initiative.

Warm regards,
Yarra Edge Compost Champions

📧 [Insert Email Address]

📞 [Insert Phone Number]

Appendix A

Letter from Yarra Edge Compost Champions to Councillor Rowse (continued)

Draft

Before and After Photos of Some Options for Kalgoorlie Coolseats
– Seat Locations Indicative Only
Yarra Edge Compost Champions
(Price to be provided)
https://www.sustainablehouse.com.au

https://www.coolseats.com.au

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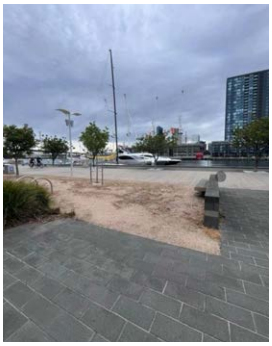	

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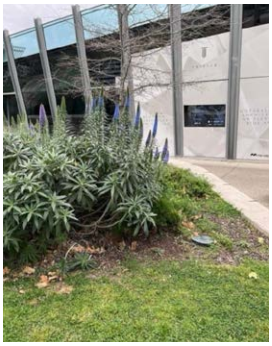
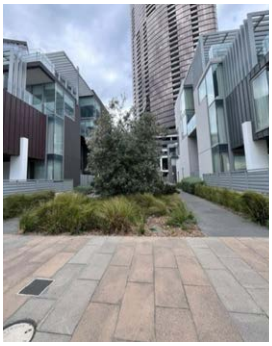
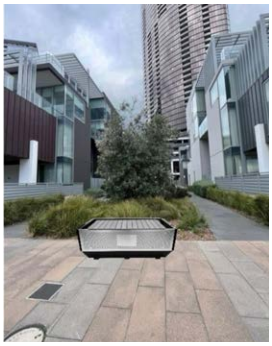
	
	

Explanatory note: other coolseat options shown in the document sent to Councillor Rowse not included here due to space restrictions.

Appendix B

Bench Assembly Guide (p1)

Coolseats

Assembly Guide

Kalgoorlie Model

6 CELL WICKING SYSTEM WITH SEAT + 2 COMPOST BASKETS

L: 1275mm x **W:** 860mm x **H:** 480mm

YOUR SEAT OF POWER

FREE DIRT FROM YOUR FOOD WASTE

FREE FERTILISER FROM YOUR FOOD WASTE

SIT ON YOUR SEAT WHILE YOU SAVE MONEY

A COOLSEAT IS:

- A seat to sit on
- A compost to produce rich compost
- A self-watering garden
- Produces rich compost juice to harvest
- A place for kids, humans to learn, play around and take time out

SALES AND INQUIRIES TO:
Michael Mobbs 0424 460 525
michael@sustainablehouse.com.au

Coolseats links

Australian made and designed | 100% Recycled | 80% Reduction in watering | Odour Free 2 x Bulk Storage | Flat Packed Easy transport and assembly

Manufactured in Melbourne, Victoria

coolseats coolseats coolseats coolseats coolseats1

Australian made and designed. A seat and a compact garden. 80% less water use with wicking beds. No odour, low maintenance

www.coolseats.com.au

WARNING: Ensure that coolseat is assembled on level ground footpath to prevent wicking-cell water leakage.

NOTICE FOR COOLSEAT ASSEMBLY:

Preparing the site and getting that site agreed by all involved before assembling the coolseat - and absolutely level - is vital to the long lasting life of the coolseat.

Your flat site will give you a productive compost juice harvesting action from your coolseat.

If the site is not level that may make the garden bed leak, or the rat proof seat not close fully and tightly.

TIP: Remember to place the cardboard packaging underneath panels when constructing the coolseat to prevent scratches to the wooden surfaces.

TOOLS NEEDED:

- Todd Phillips head screwdriver
- Spanner

TIP: Please **recycle cardboard packaging** into your compost in pieces, no bigger than your hand.

FLAT PACKED **ITEMS LIST**

WING NUTS **x20**	M5, 35mm BLACK HEAD BOLTS **x12**	M5, 16mm STAINLESS STEEL BOLTS **x8**	BOLTS WASHER **x20**	GAS STRUTS **x2**
45mm SPACER **x1**	SUPPORT BRACKETS **x2**	BASE FEET PANELS **x2**	CORRUGATED ZINC PANEL **x2**	INFLOW PIPE **x1**
5 CELL WICKING LINER & CELLS KIT **x1**	COMPOST BASKETS **x2**	OVER FLOW PIPE **x1**	ECOBOARD SIDE PANELS **x2**	ADJUSTABLE FEET **x4**
ECO BOARD SEAT **x1**	1000 x 1300 x 35mm (Don't throw away) FOAM SPACERS **x2**	ADJUSTABLE FEET **x4**		

2

SETTING UP **BASE+SIDE PANELS**

1 Screw **6 x rubber feet** into **black base.**

2 Attach **black square uprights** to **stainless steel back panel** with **M8 x 20mm bolts, washer** and **special slot nut.**

3 Attach **black curve uprights** to front **stainless steel panel** with **M8 x 20mm bolts, washer** and **special slot nut.**

4 Attach **M8 x 20mm bolts, washer** and special **slot nut** To left and right **stainless steel side panels .**

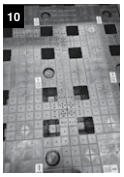
5 Attach **stainless steel back panel** to the **black base** with **3 x M5 x 20mm bolts** and **washer.**

6 Attach **stainless steel front panel** to the **black base** with **3 x M5 x 20mm bolts** and **washer.**

7 Slide left **stainless steel panel** with with the special **M8 slot nuts** into the slot of the front and back **black legs** all the way down to the base, and repeat for right side.

8 Attach left and right **stainless steel panel** to **black base** with **4 x M5 x 20mm bolts** and **washer.**

9 Attach left and right **coolseat black panels** to inside of **front panel** with **2 x M5 x 16mm** and **washers**.



10 Sit **6 x wicking cells** In the bottom.

11 Attach **back panels** to the **coolseat side panels** at the top holes only with **M5 x 35mm** and **washer.**

12 Attach bottom **20mm x 20mm steel support rail** to to the left and right of the **stainless steel side panels** with **2 x M6 x 35mm.**

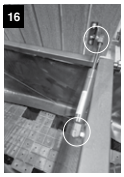
3

13 Attach the **bottom support rail** to the **coolseat black side panels** using **2 x M5 x 35mm and washer.**

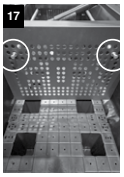
ATTACHING **SEAT / LID**

14 Place the **seat** on top of the two side supports.

15 Screw the **bolt handle** into the **seat back cross-rail.**



16 Push **gas struts** onto the **side support** and **seat brackets.**



17 Attach the two **basket support rails** through the holes that are on the sides (2 holes from the top and 2 holes down from the top).

18 Repeat step 21 to complete insertion of **support rails** and sit **baskets** into place.

19 Fill **perlite** to the top of each square feet.

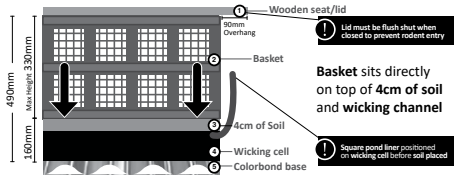
20 Check that all **wingnuts,** throughout the **coolseat,** are tightened.
Add **soil and plants** and then fill **wicking system** with water; and then you are all done.

4

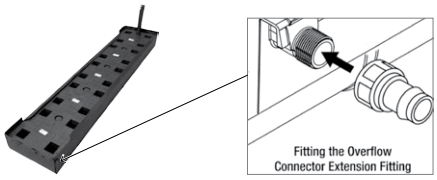
Appendix B

Bench Assembly Guide (p2-5)

INTERNAL STACKING DIAGRAM OF COOLSEAT



WICKING CELL OVERFLOW CONNECTOR FITTING

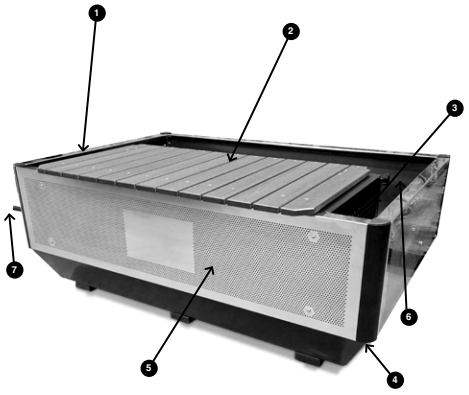


HOW TO USE YOUR COOLSEAT

DO	DON'T
Add equal amounts of carbon and food waste	Glossy paper, magazines, staples, plastic bags, shiny paper, labels.
Carbon = paper, shredded paper, newspaper (not multiple pages of coloured ads of commercial products and magazines) toilet rolls, cardboard, 'dead' leaves.	Almost all 'compostable' coffee cups – mostly, they're not. – Yes they do not compost.
Some but not much meat.	TIP: • With no food in waste in garbage you may be able to reduce garbage pickup frequency? • Food waste is about 50% water. • Expect to top up your water every 3+ months. • Harvest compost juice from the overflow pipe located low down at one end of the coolseat. *(See page 6 Diagram)*
Lemons.	
Coffee grounds, tea leaves.	
Stir the pile with a compost auger once a month or to extract compost for gardening fertiliser.	
Fill up the water when the red water level is at the bottom of the viewing pipe; fill it till the red level returns to the top of the viewing pipe.	
• Harvest compost juice from the overflow pipe located low down at one end of the coolseat. • Add water to it – 2 water : 1 juice then put on soil beside – not on – plants, trees both native or introduced. • Amount of juice depends on how much compost you create and whether the compost is too wet, too dry or just right. Use a transparent container so you can see the amount in it.	

5

USE & COMPONENTS IN YOUR COOLSESAT



1. **CAVITY FOR PLANTS:** This space can be used to fill with soil and grow plants that are being nourished by your food waste compost.
2. **WOODEN LID AND SEAT:** Sturdy seat that also functions as a lid, allowing ease of access to internal parts, compost and to deposit food waste.
3. **WICKING PIPE:** The wicking pipe can be opened to fill the cells below with water – lift the lid off and pour the water in.
4. **WOODEN SIDE PANELS:** Sturdy wooden sides giving the coolseat the visual feature of an outdoor seat.
5. **OUTER Colorbond SHEETS:** part of our 100% recyclable element, this durable panel survives the harshest of weather.
6. **CAVITY FOR PLANTS:** This space can be used to fill with soil and grow plants that are being nourished by your food waste compost.
7. **OVERFLOW PIPE:** Overflow pipe to harvest compost juice.

6

OUR COOLSEAT RANGE

COOLSEAT SINGLE GARDEN BED

Our compact model coolseat. Perfect for smaller spaces or as a connecting piece, with one space for a garden bed.

Size: L: 1650 mm **W:** 550 mm **H:** 520 mm

COOLSEAT DOUBLE GARDEN BED

Our standard signature model coolseat with two spaces for garden beds with a central compost section beneath a sturdy seat.

Size: L: 2050 mm **W:** 550 mm **H:** 520 mm

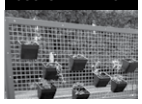
INBETWEEN CONNECTOR SEAT

The 'inbetween Connector Seat' works as a bridge between two coolseats. Its sturdy design, blends in with the organic aesthetic of the coolseats.

Size: L: 1095 mm **W:** 550 mm **H:** 520 mm

ADD ONS

SINGLE & DOUBLE **COOLSEAT LATTICE**



COMPOST **BASKET**

MIX & MATCH – **CONNECT YOUR COOLSEATS**

7

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Appendix C
Footpath Garden Policy

Purpose

This policy applies to the City of Sydney Local Government Area. The policy does not apply to the Central Sydney Area as shown on the attached map (see Appendix 4) because of high pedestrian activity.

This policy was adopted by the City of Sydney Council (the Council) in February 2013, and consent was provided by the NSW Division of Local Government in May 2013.

How this policy works

Part 1 – Exempt from approval

Residents and businesses in the City of Sydney do not need approval to install planter boxes or carry out gardening on a public footpath as long as they comply with policy criteria, outlined in the footpath gardening checklists. The criteria ensure any planter boxes or gardening on public footpaths respects other uses of the footpath and maintains access and amenity.

Residents who want to garden on the footpath will be asked to sign and complete a checklist and submit the checklist to the City for record-keeping purposes.

Part 2 – Review by City of Sydney representatives

Planter boxes or verge gardens that do not comply with the checklist criteria are not permitted to be installed. The City's Operations team can provide advice to residents and businesses about how to ensure their footpath garden meets the criteria and can also inspect a proposed site. Once a planter box or verge garden is installed, the City will monitor compliance and may issue clean-up notices or removal orders if the garden is non-compliant or adequately maintained.

Part 3 – Other matters

Appendix 1 – How to request a shared zone

Appendix 2 – Dial before you dig service

Appendix 3 – Major street planter box types

Appendix 4 – Map showing policy exclusion zone

Footpath accessibility

The policy encourages residents and businesses to green local streets and footpaths, as long as the footpath remains accessible for pedestrians and other users.

People with limited vision usually use the building line to help safely navigate the footpath, orientate themselves and locate businesses and premises. People with limited mobility and with prams need sufficient space in which to manoeuvre. To ensure the path remains accessible to everyone, planter boxes on the footpath should be positioned along the kerb line, with a sufficient gap between the planter box and the edge of the kerb. The planter box should also be placed away from street furniture and underground service access lids.

Planter boxes may have to be moved to allow access to utility service providers and the roads authority. In these cases, residents or businesses will be required to help the utility service providers to arrange removal or temporary storage and return after the works have been completed.

The City reserves the right to remove or relocate any planter box placed on the public footpath for any reason.

Screenshot

Appendix D

A Policy Inventory (p1-2)

"In their research on verge gardening behaviour in Melbourne, Marshall, Grose and Williams (2020) found that people's perception of council's attitudes strongly influenced their decision-making. Thus, council policies can become a barrier to verge gardening, influencing the implementation of food systems in cities."

10th State of Australasian Cities Conference (SOAC), 1-3 December 2021, Melbourne

Veggies in Verges: A Policy Inventory for Footpath Food Gardens across Greater Sydney

Kristina Ulm (University of New South Wales) and Maria Jose Zegarra Ayllon (University of Sydney)

Introduction

What if edible plants would grow along our footpaths, in verges or nature strips along the road? Underutilized spaces, like grassed verges, are an underexplored opportunity for urban agriculture. In light of increasing awareness to the consequences of climate change, limited fossil fuel resources and a growing urban population, calls for food system change (FAO, 2019) and 'healthy cities' (UN Habitat and WHO, 2020) are on the global agenda. As one way to address these challenges, urban agriculture, growing food within urban areas, is promoted.

Footpath food gardens or verge gardens are a form of urban food gardens, primarily non-commercial urban agriculture (Ulm, 2020). They offer benefits towards human and ecological health, climate adaptation and mitigation and community building (Säumel, Weber and Kowarik, 2016; Kingsley *et al.*, 2021). However, previous research in Australian cities found a lack of support for urban food gardens from policy and urban planning (Pires, 2011; Thornton, 2017). In their research on verge gardening behaviour in Melbourne, Marshall, Grose and Williams (2020) found that people's perception of council's attitudes strongly influenced their decision-making. Thus, council policies can become a barrier to verge gardening, influencing the implementation of food systems in cities.

This case study examines attitudes of councils towards verge gardening in Greater Sydney. A quantitative and qualitative comparison on the widely differing policy approaches to verge gardening is conducted through content analysis of publicly available policy documents of the 35 councils in Greater Sydney. The research questions include: What are council attitudes towards edible plants in verge gardening? Are the policy approaches cautious and risk averse or explicitly aiming to reduce barriers? Understanding how Australian councils are reacting to the growing trend of verge gardening with policies regulating their management is a crucial step towards healthier and greener streets, and widespread urban agriculture in the city.

Why Verge Gardening?

The verge is the space between the private lot boundary and the road kerb (Kingsley *et al.*, 2021). It can contain a footpath, grassed nature strips or both. The verge is publicly owned but residents at the adjoining property are often required to maintain a grassed nature strip. In some areas, residents can apply to plant something else apart from lawn or introduce planters on top of footpaths, thus creating so-called verge gardens. They are also known as public gardens, nature strip gardens, street

10th State of Australasian Cities Conference (SOAC), 1-3 December 2021, Melbourne

gardens, or footpath gardens. Verge gardens are at the intersection between private and public, on publicly owned land but privately maintained. So how can policies balance the shared responsibilities for verge gardens, reimagining verges beyond the standard lawn or concrete footpath?

Research on verge gardening policies is significant for two main reasons. First, verge gardens are a small and scalable nature-based solution to tackling some of the current challenges in society: climate change, food security, public and environmental health. More importantly, street verges are oftentimes underutilised space. Thus, small-scale urban agriculture in the road verge can be implemented without competing with other uses for precious urban land. Verge space is not to be underestimated. Grassed verges comprise a third of green open space in Australian cities (Marshall, Grose and Williams, 2019).

Second, verge gardening policies are an example of emerging models of collaborative governance. This trend in public policy towards seeing the state as an "enabler" rather than "provider" can be investigated through verge gardening. Wider academic and public debates that verge garden policies relate to are: Who is responsible for upkeep of the streets? What is ownership? What is public and private? Research in verge gardens shows that the distinction between public and private ownership and responsibility is not clear cut and people perceive concepts of public and private as overlapping complexities (Blomley, 2005). How councils attempt to navigate these complexities in different ways is demonstrated in our case study on policy approaches by councils within Greater Sydney.

Case Study: Greater Sydney

Greater Sydney residents have been growing food in verges for over a decade in some parts of the city (Mobbs *et al.*, 2020). These gardening practices prompted some councils to introduce policies regulating verge gardens. Our analysis found, however, that about half of the 35 local government areas of the metropolitan area of Greater Sydney have *no* explicit regulatory policy on verge gardening. Of those who do have a regulatory policy it varies significantly in form and content. Some councils have detailed street garden planting guidelines, while others dedicate a paragraph to verge gardens in their nature strip maintenance policy that focusses on lawn.

Many councils require checklists to be submitted, sometimes requiring neighbours' signatures, before approval is granted for verge gardens. Some councils collect approval or annual permit fees, creating barriers to verge gardening. Meanwhile, other councils remove the need for prior approval, asking for registration of the garden after its establishment, and providing resources. There is a general reluctancy towards allowing edible plants in verge gardens. Few councils in Greater Sydney explicitly permit or prohibit planting edible plants. Many do not consider food plants and some councils that are generally supportive of verge gardening, do not

Veggies in Verges: A Policy Inventory for Footpath Food Gardens across Greater Sydney
Kristina Ulm (University of New South Wales) and Maria Jose Zegarra Ayllon (University of Sydney). **P1-2**

Appendix D
A Policy Inventory (p3-4)

"In their research on verge gardening behaviour in Melbourne, Marshall, Grose and Williams (2020) found that people's perception of council's attitudes strongly influenced their decision-making.

Thus, council policies can become a barrier to verge gardening, influencing the implementation of food systems in cities."

recommend growing edible plants in verge gardens: "Growing food plants on the verge is not recommended mainly due to the risks associated with soil contamination" (Inner West Council, 2020, p. 1). However, other council policies address these risks in various ways, for example requiring raised planters for food plants or soil testing.

In summary, the policy approaches of local governments in Greater Sydney to edible verge gardening vary significantly.

Conclusion

By raising awareness for the different policy approaches, this research aims to spark a discussion on shaping the future policy responses to edible verge gardening. Creating small-scale edible gardens along our streets is a step towards establishing urban agriculture, a vital element of healthy and sustainable future cities.

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Veggies in Verges: A Policy Inventory for Footpath Food Gardens across Greater Sydney
Kristina Ulm (University of New South Wales) and Maria Jose Zegarra Ayllon (University of Sydney). **P3-4**

Appendix E

Greening Melbourne Permit and Street Garden Permit

Summary of Council Permits Relevant to Worms at Work

1. Greening Melbourne Permits

- Covers small-scale greening (pot plants, small planters attached to buildings).
- Free.
- Managed by Parks & City Greening.
- Designed for minor additions to footpaths (not suitable for benches or larger structures).
- 15 approved permits in FY 2024-25 (the figure does not capture the amount of enquires Council gets that do not proceed to an application or the occasional permit which does not get approved).
- The majority of permits are in the Central City and North Melbourne. As these permits are for temporary greening only, not for in ground planting, it makes sense that Central City and North Melbourne have the most as that is where most laneways are.
- More information at this link

2. Street Garden Permits

- Covers raised 1x1m garden beds on nature strips or median strips.
- Requires an application fee and a bond.
- Managed by the Street Trading team.
- More information at this link.
- **Constraints & considerations:**
  - Can only be installed on nature strips/medians, not footpaths or plazas.
  - Requires assessment by Urban Forest (tree roots, protection zones).
  - Requires Traffic Engineering assessment (sight lines, access, offsets).
  - Not allowed on Public Park & Recreation Zone (PPRZ) land.
  - Generally must be adjacent to the permit holder's property.
  - Cannot be used for in-ground planting, swings, or street furniture.

Current applications:

- 7 active permits across the municipality.
- Only 1 approved in the past 12 months (low volume due to zoning constraints).

*Street Garden permits are not a viable mechanism for Worms at Work installations, benches do not meet the definition of a Street Garden and are not eligible for this permit category.

3. Community Garden Licenses

- For shared garden spaces managed by community groups.
- **Nominal fee (~$1)**.
- Must be located on **Crown Land only**.
- Managed by the **Community Development team** (contact: Michelle James).
- Very few new licenses issued recently.
- More information at this link.

Only relevant if the community wants to manage a Worms at Work bench located in an existing community garden, on Crown Land (not the current case for Yarra's Edge).

- **15 approved permits in FY 2024-25 (the figure does not capture the amount of enquires Council gets that do not proceed to an application or the occasional permit which does not get approved).**

- **7 active permits across the municipality.**
- **Only 1 approved in the past 12 months (low volume due to zoning constraints).**

Appendix F

Research – Reducing living costs for waste while growing community resilience (p1)

Reducing living costs for waste while growing community resiliance

Key Points

- **Waste landfill costs are driven heavily by the waste levy, which is currently $174.20 per tonne in metropolitan areas. Because councils pay the levy on every tonne sent to landfill, any reduction in household waste directly lowers variable disposal costs.**
- **Pay as you throw programs (PAYT) are clear examples of how incentive models overseas achieve waste reductions.**

A study of 34 New Hampshire municipalities in the United States found that households in PAYT towns cut their waste by 42–54%, compared with non-PAYT towns.

US EPA guidance shows similar results, with several communities reporting 25–45% reductions in waste shipped to disposal facilities. These reductions often translate into lower overall waste-management costs for councils and in turn residents, because less waste is hauled and less levy is paid.

The NSW sources also reinforce the same message: reducing the amount of waste going to landfill is the most effective way to reduce disposal costs, including the waste levy.

This research aligns well with the Worms at Work outcomes and allows us to provide evidence to support changes proposed in the Recommendations in this report.

How Unit based (PAYT) collection has reduced waste

"In a study of 34 New Hampshire municipalities, households in unit-based (PAYT) towns reduced their yearly trash by 631–823 lb — equivalent to a 42–54% cut in waste compared with non-PAYT towns."

" When waste disposal is financed with property tax revenues, disposal costs for households with high quantities of trash are partially subsidized by households disposing of low quantities of trash. With unit-based pricing, households that generate less waste will pay less than households that generate more waste. Thus, unit-based pricing may appeal to households that actively practice recycling." [1]

How Unit Pricing Programs Reduce Waste and Cost in US

Some communities with unit pricing programs report that unit pricing helped their municipality achieve reductions of 25 to 45 percent in the amount of waste shipped to disposal facilities.

When the amount of waste is reduced, communities often find their overall MSW management costs have declined as well. [2]

Current Price levy NSW/Victoria per ton of Waste

Victoria: [11]

Table 1: waste levy rates for 1 July 2025 to 30 June 2026

Amount payable for each tonne received			
Prescribed municipal (metro) premises		Non-prescribed municipal (rural) premises	
Municipal waste	Industrial waste	Municipal waste	Industrial waste
$169.79/tonne	$169.79/tonne	$84.78/tonne	$149.33/tonne

1

Appendix F

Research – Reducing living costs for waste while growing community resilience (p2)

NSW: The 2025–26 waste levy rates apply from 1 July 2025. In line with the Waste Regulation, the rates have increased by the Consumer Price Index, and the calculated fees are:

- Metropolitan Levy Area: $174.20 per tonne
- Regional Levy Area: $100.30 per tonne. [3]

Why Reduce Waste in NSW/Victoria?

The best way to reduce the cost of waste to landfill including the NSW Government Waste Levy is to cut the amount of waste we generate and send to landfill. The new waste service in 2017 successfully reduced waste to landfill from our homes, however nearly half of the 'waste' in our household garbage bins could be recycled or re-used. [4]

Community Support for Garden Beds

"A survey of over 5,000 respondents who were asked about Sydney's future in relation to a diverse range of topics including two questions about gardens. These showed:

• 85% of people in Sydney wanted more street gardens and flower boxes

• 82% wanted urban farming on rooftops. [10]

Mental and physical Health Benefits of Gardening

Social and Physical Health Advantages (Vitamin D)

"It combines physical activity with social interaction and exposure to nature and sunlight. Sunlight lowers blood pressure as well as increasing vitamin D levels in the summer" [6]

Physical Health Advantages

Working in the garden restores dexterity and strength, and the aerobic exercise that is involved can easily use the same number of calories as might be expended in a gym and the fruit and vegetables that are produced have a positive impact on the diet. [7]

Delays Dementia

- "Furthermore, it has also been reported that the social benefits of such projects can delay the symptoms of dementia." [5]

"In a proportional hazards model for dementia, any intake of alcohol predicted a 34% lower risk, and daily gardening a 36% lower risk." [8]

Mental Health Advantages

2

Appendix F

Research – Reducing living costs for waste while growing community resilience (p3)

"In a Japanese study, viewing plants altered EEG recordings and reduced stress, fear, anger and sadness, as well as reducing blood pressure, pulse rate and muscle tension" [5]

Helps Veterans with Mental and Physical Disabilities

- "The particular benefit of gardening to veterans of the armed services has been fully reviewed. Both mental conditions, such a post traumatic stress disorder, and the effects of physical injuries can be improved"

"Gardening Leave is seen as having positive therapeutic benefits by the veterans who attend, and this was echoed by clinical staff. The project is helping individuals to cope better with many elements of their illnesses, learn new skills, and feel safe in an inclusive and understanding environment." [9]

Key Points from Sydney Analysis to Support the Community Gardens

"Composting is seen as a key role for community gardens and a reason people are interested in being involved. When asked to rate the importance of community composting, it was almost universally rated on the higher end of the scale"

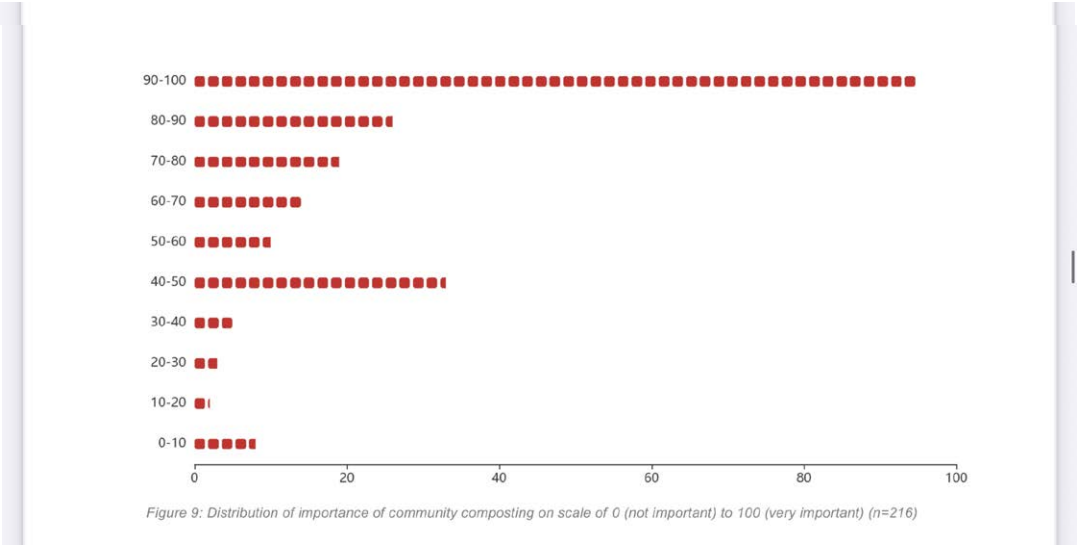

Figure 9: Distribution of importance of community composting on scale of 0 (not important) to 100 (very important) (n=216)

Out of the 216 people surveyed on the importance of composting roughly 100 said that it was very important 90-100 (on a scale of 0-100). Only roughly 18 participants believed that compost was unimportant 0-40. [10]

3

Appendix F

Research – Reducing living costs for waste while growing community resilience (p4)

"Those who rated community composting on the highest scale had two main reasons for giving this score. First was because of the importance of composting to reduce food wastage and to stop food waste going to landfill. Second was because they had experience of taking food scraps to their local garden." (Page 17)

"Community composting is very important to people in the City of Sydney. Respondents thought the City had a role in education and awareness about how to reduce food waste and what food products could be composted… People noted that there was a lot of work managing bins and controlling pests, but there was widespread support for the provision of composting bins for residents." (Page 26)

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4

Appendix F

Research – Reducing living costs for waste while growing community resilience (p5)

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5

Appendix G
Worm Sensor Guide

Worm Bench Sensor Guide

We've installed sensors on the worm bench to monitor its environment and keep it in great shape. Below is a picture of each sensor, what it does, its features, and why it's important for the worm bench.

Seat Usage Sensor

What it does: Detects vibrations to sense when someone is sitting on the bench.
Features: Small, accurate movement detection, battery-operated (long-term use), uses LoRaWAN network for wireless data.
Why it's important: Helps us understand how often the bench is used, so we can plan maintenance and ensure it's a welcoming spot for everyone.

Soil Moisture Sensor

What it does: Measures soil moisture levels to keep worms healthy.
Features: Accurate moisture readings, Soil temperature readings, Soil conductivity temperature compensation, corrosion-resistant, battery-operated (long-term use), uses LoRaWAN network for wireless data.
Why it's important: Ensures the soil stays at the right moisture level for worms to thrive, preventing it from getting too dry or too wet.

PH Level Sensor

What it does: Checks the soil's acidity to support worm health.
Features: Precise pH measurement, Soil temperature, battery-operated (long-term use), uses LoRaWAN network for wireless data.
Why it's important: Keeps the soil's pH balanced, creating a healthy environment for worms to live and work.

TVOC & CO2 Sensor

What it does: Monitors air quality around the bench.
Features: Measures TVOC, eCO2, Temperature and relative humidity, battery-operated (long-term use), uses LoRaWAN network for wireless data.
Why it's important: Ensures the air around the bench is clean and safe, protecting both worms and visitors.

Seat Status Sensor

What it does: Detects when the seat is opened to add food scraps.
Features: Uses a Hall effect sensor to detect open/close status, battery-operated long-term use), uses LoRaWAN network for wireless data.
Why it's important: Tracks when food scraps are added, helping us monitor feeding schedules and ensure worms have enough food.

Appendix H

Air pollution from food waste transport is significant

by Emilio Hugler

When fully counted air pollution from garbage trucks includes:

- Tailpipe emissions;
- Manufacturing, replacement, servicing, repair of garbage trucks;
- Adding an extra bin for FOGO – additional trips, trucks, repairs, infrastructure;
- Transporting compost or mulch from centralised (not local) processing sites to markets

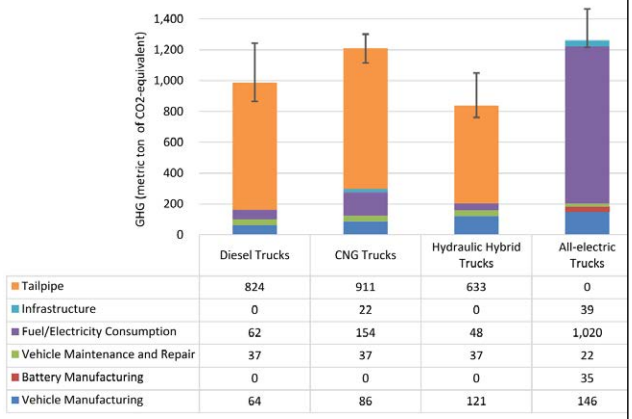
  (agricultural land or green spaces in a town or city).

We calculated the likely full scope of transport-related emissions to:

- Scale transport factors to include the full lifecycle emissions of a garbage truck rather than tailpipe emissions alone — see **Figure 1** and **Table 1.**
- Account for the additional operational burdens introduced by FOGO, including the effects of adding a new bin stream and the associated increases in collection frequency, routes, or vehicle requirements.

In the calculation we use the figure below which shows the full life cycle emissions of garbage trucks.

Figure 1. *Life cycle GHG emissions of garbage trucks*



Note. Graph is from Zhao Y. and Tatari O.'s work (2023) [4]

Assuming all garbage trucks run on diesel, we derive an adjustment factor from the proportion of emissions in a study that the NSW EPA refer to by Blue Environment and which is confined to tailpipe pollution. [2].

Table [1]. *Lifecycle component's proportion in scenario 1 and 2*

Element	Contribution in metric tons of CO2 equivalents	Scenario 1 Full Lifecycle	Scenario 2 Blue Environment's Scope
Tailpipe	824	83%	100%
Infrastructure	0	0%	0%
Fuel Consumption	62	6%	8%
Maintenance	37	4%	4%
Manufacture	64	6%	8%
Total	*987*	*100%*	*119.8%*

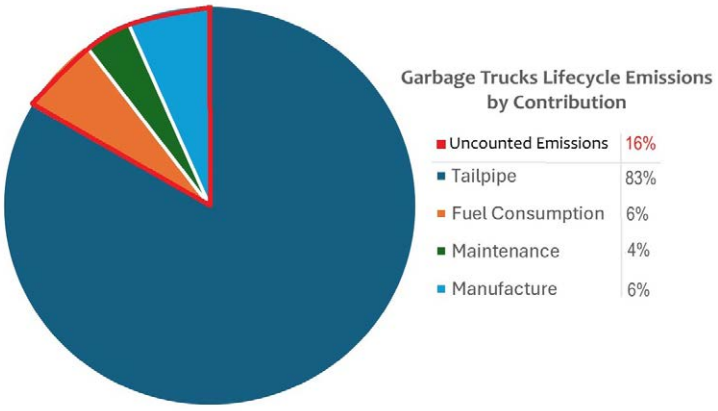
Note. Values in table were calculated with data from Figure 1 by Emilio Hugler

The table above shows that we must multiply Blue Environment's factors by 1.198 to more accurately reflect actual emissions. Using these adjusted factors, the following estimates provide a more complete representation of transport-related emissions for Greater Melbourne than those captured in Blue Environment's limited scope.

Table [2] *Re-scaled emissions comparative table for Greater Melbourne's yearly food waste*

Element	Business as Usual (Blue Environment's Estimate)	Re-scaled Business as Usual		FOGO implemented	
	(tonne-CO2/year)	*(tonne-CO2/year)*	*% Difference*	*(tonne-CO2/year)*	*% Difference*
Collection	17,775	21,295	20%	30,182	70%
Transport	18,192	21,795	20%	22,515	24%

The table above shows that the re-scaled estimates disclose a substantial portion of transport- and collection-related emissions that the NSW EPA study overlooks, leading to a significant underestimation of the true climate impact. This finding is significant when comparing air pollution from local and centralised composting projects.



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Appendix I

Worms at Work – Project Budget

Proposed budget as at 18/08/2025

Phase	Payment milestone	Task	Zoe			Michael			External			Total Cost (ex GST)
			Hours	Rate (ex GST)	subtotal ex GST	Hours	Rate (ex GST)	subtotal ex GST	Unit	Cost (ex GST)	subtotal ex GST	
Phase 1: Discover / Identification / Ideation												
	1	Stakeholder workshops	3	in-kind	$0.00						$0.00	$0.00
	1	Internal meetings	10	in-kind	$0.00						$0.00	$0.00
	1	Research and consultation	50	in-kind	$0.00						$0.00	$0.00
	1	This claim is for the period from winning the competition in September 2024 to the signing of the contract in January 2025 (five months) Scope of Works drafting and review	80	68.18	$5,454.55	20	150.00	$3,000.00		0	$0.00	$8,454.55
	1	This claim is for the period from winning the competition in September 2024 to the signing of the contract in January 2025 (five months) Collaboration Agreement drafting and review	10	68.18	$681.82	20	150.00	$3,000.00		0	$0.00	$3,681.82
Phase 2: Initiation / Planning / Design												
	2	Risk Workshop	0.50	68.18	$34.09	1	150.00	$150.00		0	$0.00	$184.09
	2	Stakeholder Mapping Exercise	3	68.18	$204.55	1	150.00	$150.00		0	$0.00	$354.55
	2	Technology and Worm Farm Research and expert consultations	12	68.18	$818.18		0.00	$0.00		0	$0.00	$818.18
	2	Community and Business Engagement Initial three stakeholder workshops, the first being at 18 Pence Lane Café where there is a compost bench and existing community participation	43	68.18	$2,931.82	30	150.00	$4,500.00		0	$607.00	$8,038.82
	2	Community Maintainer Recruitment	1	68.18	$68.18		0.00	$0.00		0	$500.00	$568.18
	2	Site Scoping	8	68.18	$545.45	5	150.00	$750.00		0	$0.00	$1,295.45
	2	Sensor/Tech Options	3	68.18	$204.55	1	150.00	$150.00		0	$0.00	$354.55
	2	Testing sensor signaling including sensor purchase	0	68.18	$0.00	2	150.00	$300.00		0	$0.00	$300.00
	2	Self-sustaining model planning	0	68.18	$0.00		0.00	$0.00		0	$0.00	$0.00
	2	Insurance		0.00	$0.00		0.00	$0.00		0	$872.73	$872.73
	3	Worm Farm Design	50	68.18	$3,409.09	34	150.00	$5,100.00		0	$0.00	$8,509.09
	3	Worm farm design drawing	40	68.18	$2,727.27		150.00	$0.00		0	$0.00	$2,727.27
	3	Recyclable material audit from CoM storage, recycling and transporting existing material (Suggested by Mitch, City Design)		68.18	$0.00		150.00	$0.00		0	$0.00	$0.00
	3	Engineer approval		68.18	$0.00		150.00	$0.00		0	$0.00	$0.00
	3	Obtain permits and approvals to install		68.18	$0.00		150.00	$0.00		0	$0.00	$0.00
	2	Technology requirements and Design	26	68.18	$1,772.73		150.00	$0.00		0	$0.00	$1,772.73
	3	Dashboard & Monitoring System Design	8	68.18	$545.45		150.00	$0.00		0	$0.00	$545.45
	3	User Feedback Workshop	8	68.18	$545.45	8	150.00	$1,200.00		0	$0.00	$1,745.45
	3	Detailed Project Plan	16	68.18	$1,090.91		150.00	$0.00		0	$0.00	$1,090.91
	3	Dashboard prototype development	4	68.18	$272.73		150.00	$0.00		0	$0.00	$272.73
Phase 3: Doing / Deliver												
	4	Manufacturing of seat incl engineering drawings		68.18	$0.00		150.00	$0.00	3	3636	$10,909.09	$10,909.09
	4	Signage artwork design	5	68.18	$340.91		150.00	$0.00		0	$909.09	$1,250.00
	4	Signage artwork printing/production and installation		68.18	$0.00		150.00	$0.00		0	$1,363.64	$1,363.64
	4	Sensor / technology procurement	2	68.18	$136.36		150.00	$0.00	3	2727	$8,181.82	$8,318.18
	4	Lock for benches including selection and purchase		68.18	$0.00		150.00	$0.00		0	$0.00	$0.00
	4	Dashboard development	4	68.18	$272.73	1	150.00	$150.00		0	$0.00	$422.73
	4	Technology deployment	2	68.18	$136.36		150.00	$0.00		0	$0.00	$136.36
	4	QR code reporting channel setup	2	68.18	$136.36	1	150.00	$150.00		0	$0.00	$286.36
	4	Maintainance notification channel setup	2	68.18	$136.36	2	150.00	$300.00		0	$0.00	$436.36
	4	10 gloves each bench		68.18	$0.00		150.00	$0.00	10	109	$1,090.91	$1,090.91
	4	3 compost augers each bench		68.18	$0.00		150.00	$0.00	9	73	$654.55	$654.55
	4	Containers for juices and compost and can be recycled and obtained for free		68.18	$0.00		150.00	$0.00		0	$0.00	$0.00
	4	2 paper shredders and papers		68.18	$0.00		150.00	$0.00	2	409	$818.18	$818.18
	5	Delivery, installation and testing	0	68.18	$0.00	0	150.00	$0.00		0	$0.00	$0.00
	5	Pilot launch event includes catering and space	10	68.18	$681.82	10	150.00	$1,500.00	1	455	$454.55	$2,636.36
	5	Community-led maintenance educational workshops	10	68.18	$681.82	10	150.00	$1,500.00		0	$0.00	$2,181.82
	6	Advice service on demand call/video/text	6	68.18	$409.09	10	150.00	$1,500.00		0	$0.00	$1,909.09
	6	Professional maintainer (Urgent mitigation when Michael and Zoe are not available on-site)		68.18	$0.00		150.00	$0.00	6	136	$818.18	$818.18
	6	Data collection and cleaning (for analysis with quantative data)		68.18	$0.00		150.00	$0.00		0	$0.00	$0.00
	6	Data analysis (incl qualitative survey and sentiment analysis)	24	68.18	$1,636.36	2	150.00	$300.00		0	$0.00	$1,936.36
	6	Maintenance and site visits	6	68.18	$409.09	15	150.00	$2,250.00		0	$0.00	$2,659.09
	6	Compost Lab Testing including delivery		68.18	$0.00		150.00	$0.00	3	364	$1,090.91	$1,090.91
	6	Community maintenance model evaluation	3	68.18	$204.55	1	150.00	$150.00		0	$0.00	$354.55
	7	User Feedback Workshop/Survey	5	68.18	$340.91	5	150.00	$750.00		0	$0.00	$1,090.91
	7	Detailed Report on Worms at Work seat Performance, viability and Community Participation	8	68.18	$545.45	5	150.00	$750.00		0	$0.00	$1,295.45
	7	Councils and Industry Events	8	68.18	$545.45		150.00	$0.00		0	$0.00	$545.45
	7	Story sharing through social media	8	68.18	$545.45	5	150.00	$750.00		0	$0.00	$1,295.45
Phase 4: Document and Done/Closure												
	7	Practical completion, documentation	2	68.18	$136.36		150.00	$0.00		0	$0.00	$136.36
	7	Internal presentation of findings	5	68.18	$340.91		150.00	$0.00		0	$0.00	$340.91
	7	Stakeholder feedback workshop	5	68.18	$340.91	8	150.00	$1,200.00		0	$0.00	$1,540.91
	8	Final Reporting	10	68.18	$681.82	8	150.00	$1,200.00		0	$0.00	$1,881.82
	8	Contract closure	2	68.18	$136.36		150.00	$0.00		0	$0.00	$136.36
TOTAL					***$30,102.27***			***$30,750.00***			***$28,270.64***	***$89,123***
Hours check (incl in-kind)			*504.5*			*205*						
Contingency (unallocated)												$877.09
Total Funding available												***$90,000.00***

Total funding available (ex GST)
$90,000

Unallocated funding (incl GST)
(contingency)
$877

Your seat of power

Smart worm bench project

2025

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