Composting as a Repair Methodology for Cultural and Ecological Revitalisation: Scaling Deep with Te Pā o Rākaihautū

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A thesis submitted to

Auckland University of Technology

in fulfilment of the requirements for the degree of

Doctor of Philosophy (PhD)

2025

School of Future Environments

Abstract

This practice-oriented thesis explores composting as a repair methodology for cultural and ecological revitalisation. Centred in a research partnership with Te Pā o Rākaihautū, a Kura-a-Iwi in Ōtautahi Christchurch, Aotearoa New Zealand, the project repositions composting beyond waste management to examine it as a relational, political, more-than-human, and ontological practice of rift-repair. The research asks how composting can support whānau-whenua reconnection, soil restoration, kai motuhake, and eco-cultural revitalisation while engaging the material, social, and institutional conditions shaping urban organic waste management.

The thesis is situated within practice-based design research, combining co-designed action research with a first-person, practice-embedded methodology. Knowledge is generated through sustained participation in composting across multiple sites, seasons, collectives, and governance interfaces, rather than through detached observation alone. Drawing on first-person and more-than-human design research, composting is treated as a living, time-based infrastructuring practice: an arrangement that convenes humans, nonhumans, materials, tools, whenua, regulations, and institutions within shared processes of maintenance, breakdown, negotiation, and transformation.

The study is grounded in field-based composting trials co-designed through 20:20 Compost Collective and developed in close relationship with Te Pā and Ko Mahi Ko Ora. These trials worked with food scraps, green waste, carbon materials, microbial processes, labour, odour, contamination, land access, and regulatory constraint. Across the research, composting operated across three inseparable scales: material practice, collective arrangement, and institutional interface. The Companion Flipbook supports the written thesis by visually documenting this praxis as it unfolded across sites and seasons.

Conceptually, the thesis brings more-than-human design scholarship into dialogue with Decolonising Methodologies, Metabolic Rift Theory, eco-feminist care ethics, and Te Ao Māori concepts including whakapapa, mauri, kaitiakitanga, and whanaungatanga. It argues that designing-with living systems in colonised landscapes cannot be reduced to interspecies attentiveness alone; it must also engage the institutional and colonial arrangements that shape how care is organised, whose responsibilities are recognised, and how relationships between people, place, and organic matter are sustained or disrupted.

The thesis contributes a situated account of composting as rift-repair: a methodology for reconnecting organic matter, soil, people, place, and responsibility. It also articulates intensifying attentiveness as a methodological capacity within first-person, more-than-human design research, where rigour emerges through prolonged care, documentation, responsiveness, and accountability. The conclusion frames composting as cultural infrastructure and as a way of scaling deep: not a finished model to replicate, but a living methodology for transforming values, relationships, and conditions so that discarded materials, damaged landscapes, and disrupted relations can become substrate for new forms of life, learning, and leadership.

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor used artificial intelligence tools or generative artificial intelligence tools (unless it is clearly stated, and referenced, along with the purpose of use), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Signed – Preston Bailey Peryman, 27 May 2025

Declaration of Collaboration

This thesis includes collaborative elements integral to the development and presentation of its practice-oriented components. In particular, the Companion Flipbook (with the same title as this written thesis) was produced with the support of community collaborators and whānau from Te Pā o Rākaihautū. While the design, written content, and final editorial decisions are my own, this visual work draws on collectively generated materials, shared practices, and co-produced fieldwork outcomes.

Any identifiable individuals included in images provided written or verbal consent, and their inclusion respects ethical agreements around anonymity and cultural sensitivity. The photographic and design elements were informed by dialogue with community participants, though the final compilation and aesthetic decisions were made by me as the candidate.

All collaborators are acknowledged in the Acknowledgements section of this thesis, and their contributions are recognised as essential to the relational, iterative, and kaupapa Māori-aligned approach to this research.

This research has been undertaken in the context of Aotearoa New Zealand, a bi-cultural and bi-lingual nation founded on Te Tiriti o Waitangi, The Treaty of Waitangi. As such, and in alignment with the partnerships embedded in this study, **Te Reo Māori is used throughout the thesis**. This includes the use of concepts, values, and terminology that reflect the worldview of tangata whenua, the first people of this land, Aotearoa.

Where specific terms or phrases in Te Reo Māori are not directly translated in-text, their meanings can be explored further using **Te Aka Māori–English, English–Māori Dictionary and Index**: https://maoridictionary.co.nz/, or other appropriate Māori language resources.

This inclusion acknowledges the importance of language as a vessel of culture and epistemology and reflects the commitment of this research to uphold the integrity of mātauranga Māori.

Mihimihi – Acknowledgements

Whakataka te hau, ki te Uru

Whakataka te hau, ki te Tonga

Kia mākinakina ki uta

Kia mātaratara ki tai

E hī ake ana te atākura

He tio

He huka

He hau hū,

Tihei mauriora[1]

Kei te mihi ki ngā tohu whenua o tēnei rohe, whakaruruhau ngā mauka – tēnā koutou kātoa. E rere ana ōu koutou awa – kei te mihi nui ki a koe. Ki te mana whenua o tēnei rohe – Ngāi Tahu – kei te mihi, kei te mihi, kei te mihi maioha ki a koutou kātoa.

I tipu ake au ki te taha me te ahua pai o Te Ihutai, rātou ko Tuawera, me Rapanui, i te taha o Te Moana-nui-a-Kiwa – tēnā koutou kātoa. Ngā mihi mō tō whakahaumaru ki ngā whānau maha i noho i te rā rohe.

Kei te noho au ki Te Waipapa, Diamond Harbour, ki raro i te maru o Te Ahu Pātiki – e huri noa ki te Mana Whenua, te Mana Moana o tēnei rohe Whakaraupō – Te Hapū o Ngāti Wheke – kei te mihi ki a koutou kātoa.

To my wife, Michelle, and children, Jonah, Amber and Evie. I love you all and wish you many lifetimes of joy and adventure. Thank you for all your support for me doing the extra, extra time all these years I was on this kaupapa. The work was made so much better by you all as my family.

Oliver – your presence is woven throughout this project. You appear in the flipbook, yes, but more importantly in the earliest years of dialogue that shaped our respective interests in many things, not least in composting stuff. From the first compost piles we built together, and most recently in

[1] Honorable Justice Joseph Williams (Ngāi Tahi) talks about the whakapapa of this Karakia and a story about how he translates it, retrieved 31 March 2025 from: https://theseeds.nz/podcast/the-honourable-justice-joseph-williams-explaining-the-karakia-whakataka-te-hau/

the kaupapa that evolved into what we have done through Ko Mahi Ko Ora, your thinking and commitment, through years of kōrero, helped seed much of what this project became for me. Thank you for being You.

Ki a Nōku Te Ao me te whānau whānui o Te Pā o Rākaihautū – ki a Taua Reihana, rātou ko Hākui Rangimarie, Matua Tauira, Whaea Terina, Whaea Gayle, Whaea Dy, Matua Maani, Matua Miru, me Whaea Jojo, ā, ki te tini me te mano o koutou mā – tēnei te mihi maioha, te mihi nunui ki a koutou katoa. I am honoured to have been afforded the trust, responsibility and many opportunities you have enabled for me and my whānau. I am prepared to continue fighting for and enjoy the kaupapa nui that is Te Pā o Rākaihautū, ki raro i te korowai o Te Tautarinui o Matariki. I trust I have done a service to you and to the community of Te Pā o Rākaihautū with the work I am representing here as my doctorate.

Ki a Matua Keith, taku teina a Oliver, Hākui Tītī, me te whānau o Ko Mahi Ko Ora – e mihi nunui ana hoki ki a koutou katoa. He kōrero iti nei, engari he nui rawa atu te aroha mō tō koutou manaaki ki ahau, me taku whānau hoki. Mauri ora tātou!

> "Toitū te marae o Tāne, toitū te marae o Tangaroa, toitū te iwi – When land and water are sustained the people will prosper"
>
> "Te toto o te tangata, he kai; te oranga o te tangata, he whenua – While food sustains our bodies; our wellbeing is drawn from the land"
>
> "Whatungarongaro te tangata, toitū te whenua – As man disappears from sight, the land remains."[2]

Huia Lambie, Erin Crampton, Gavin Sole, Te Marino Lenihan, Jono Campbell, Anake Goodall and Claire Newman – thank you for believing in and supporting the kaupapa of composting, 20:20 Compost, and what has become the work of Ko Mahi Ko Ora through Te Pā o Rākaihautū. Your appreciation for the value of this mahi has made a hugely positive impact on me and the trajectory of this project towards being about 'scaling deep with Te Pā o Rākaihautū'.

Annie Ramsden, Lawrence Tau, Bex Dawson, Josh Broadhurst, and my brother Oliver again – thank you for being willing to confront the unknown quantum of six tonnes of (juicy!) food scraps. Beth Goodwin for your mentorship and microscopy early on, helping me decipher the biological oddities of our first attempts at the SPICE method. Gerry Gillespie, you're a legend in my eyes, thank you for being so welcoming and generous with sharing your knowledge with me and the 20:20 Compost team. David Hardwicke and Simone Dilkara, while only brief encounters, you were

[2] https://ngaitahu.iwi.nz/connect-2/connect/news-and-stories/for-us-and-our-children/

also generous in providing feedback that benefitted our technical application of the SPICE method in this study.

I couldn't publish in the name of composting without also acknowledging the many friends, communities and hāpori whānui that have supported me in one way or another throughout Aotearoa – through our mutual passion for the many things composting ties us to. I am honoured to represent the Aotearoa Composters Network in the 'Tiriti-dynamic' project that is Whakahaumanu a Hineahuone and in ways this collective deserves a share in the attributions of this work. It was conceived during the same time-period as this thesis, and this thesis inspired some audacity in me to believe I could be a leader of this kaupapa. Karawhiua e te whānau!

This research project was supported through the Building Better Homes, Towns and Cities (BBHTC) Urban Wellbeing programme, a four-year National Science Challenge programme funded by the New Zealand Government and led by Associate Professor Amanda Yates. Amanda is Ngāti Rangiwewehi, Ngāti Whakaue, Te Aitanga a Māhaki and Rongowhakaata from Aotearoa, New Zealand. The programme researches how cities and communities can broadly transition to more resilient and regenerative systems, particularly within the context of complex ecological emergencies (IPBES 2019; IPCC 2018, 2019). The research centres around a primary transition towards holistic social, cultural and ecological wellbeing as a necessary strategic response to contemporary crises. Indigenous knowledge of ecological and social wellbeing is central to the programme (Yates et al., 2022; Yates, 2021).

In the early stages of the project was administered through the Te Whare Wānanga o Waitaha | University of Canterbury where Associate Professor Kelly Dombroski was my lead supervisor, Dr. Gradon Diprose (Manaaki Whenua Landcare Research) was second supervisor; and the project had formal cultural advisory and support from Professor Angus MacFarlane and Dr. John Pirker. When the project transferred to Auckland University of Technology (AUT) and the School of Future Environments, Associate Professor Amanda Yates and Professor Frances Joseph took on the role of Primary and Secondary Supervisor, respectively. I am grateful for the patience, flexibility and perseverance of you all in the professional and academic contributions you have made to keeping this study afloat and on the best course possible. Thank you for believing in this project especially through the times when I did not give you much to be confident about.

"To "know" something is to locate it within a whakapapa" (Roberts et al., 2004, p. 4)

The knowledge co-produced in this study is inseparable from the whakapapa of Te Pā o Rākaihautū and the whenua on which the composting practices took place. Te Pā o Rākaihautū

has not only hosted but actively shaped this research as a critical partner and co-producer. Its vision, tikanga, and kaupapa provided the cultural, educational, and relational frameworks within which this work could take place.

Te Pā carries its own whakapapa – through its conception, evolution, and the ancestral grounding of Rākaihautū, the eponymous tīpuna of the Waitaha people. With his Kō, Rākaihautū carved the freshwater bodies of Te Waipounamu, and his legacy lives on in the whenua, wai, and whānau of Te Pā. This whakapapa is not merely context for the research; it is an active agent in its design, its purpose, and its accountability. The research was inspired and held to account by the stories of this island, Te Waipounamu – including the pūrākau of Te Waka o Aoraki, of Rākaihautū, and of the first peoples of this whenua. These stories offered both creative stimulus and ethical grounding throughout the project.

While I do not believe I am sharing knowledge that is not already in the public domain, I do acknowledge that this work has benefitted from privileged access to mātauranga unique to Te Pā. I do not claim this knowledge as my own. Rather, I have been entrusted with it in ways appropriate to the relationships built through this kaupapa, and I seek to reflect it with care and respect.

Te Pā o Rākaihautū operates as a Kura-a-Iwi under the mantle of Te Hapū o Ngāti Wheke, and its whakapapa is shared with multiple hapū connected to this research. Of the eighteen Papatipu Rūnanga that comprise Ngāi Tahu, two – Te Hapū o Ngāti Wheke and Te Rūnanga o Ngāi Tūāhuriri – hold direct mana whenua relationships to this practice and inquiry. I acknowledge their ongoing roles as kaitiaki and the holders of genealogical and cultural authority in these landscapes.

I also offer my sincere thanks to the wider network of rūnanga who uphold relationships with Te Pā and its kaupapa: Koukourārata, Taumutu, Wairewa, and Ōnuku. Kei te mihi nui ki a koutou katoa. The integrity of this project rests, in part, on acknowledging these relationships and understanding that the work presented here is situated within, and accountable to, the whakapapa, mana whenua, and cultural narratives of these rohe.

Ko Wai Au

Ko Inarangi te whenua

Ko North Sea te awa

Nō Celts, rātou ko Vikings, Saxons, me ngā Germanic Tribes ōku tipuna.

I whanau mau ahau ki Whāngarei.

Ki te taha a tōku Māma, I tae mae ōku Koroua rāua ko Kuia ki Tāmaki Makarau (Auckland), I te tau Kotahi mano, iwa rau, e ono tekau (1958).

My mother's family emigrated to Aotearoa from Finchley, England – arriving in Tāmaki Makaurau Auckland before settling in Matamata, Waikato in November 1958. My mother was born in Barnet, Hertfordshire, England, and was only a few months old the time she arrived in Aotearoa. Her family moved back to Tāmaki Makaurau in 1967 where she eventually met my father.

Ki te taha a tōku Pāpā, I tae mae ōku tipuna ki Whakatū (Nelson), I te tau kotahi mano, waru rau, e rima tekau ma waru (1858).

My father's family emigrated to Aotearoa from Market Lavington, England, arriving in Nelson before settling in Tai Tapu in 1864. My grandfather was the last generation born in Tai Tapu. The family relocated to Christchurch in the early 1900s and this is where my father was born in 1953.

Three generations of Perymans farmed in Tai Tapu and promoted the values of the Wesleyan Church, as some of our whanaunga had also done in Adelaide, Australia – where we sailed to from England before sailing on to Whakatū, Nelson. More is written about the Peryman family and their arrival in Tai Tapu in the book *Elizabeth of Lavington*, by Lorna Jean Trusk. I want to acknowledge the naming of the church at Taumutu – 40km south of Tai Tapu – *Hone Wetere*, a trans-literation of the name John Wesley of the Wesleyan Church. I have no evidence of such, but I can imagine, through faith, somehow my ancestors have previously connected with ancestors of those who I work with today at Te Pā o Rākaihautū.

Intellectual Property Rights

This doctoral research was conducted in partnership with Te Pā o Rākaihautū, who has served not only as a research participant but as a co-design and co-creative partner in the conceptualisation, development, and implementation of the project. In recognition of this role, Te Pā o Rākaihautū is acknowledged as the primary benefactor of any future use, development, or application of the intellectual property generated through this research. All rights to the knowledge, methodologies, creative outputs, and applied practices developed within the scope of this thesis are held jointly by the author and Te Pā o Rākaihautū. Any future use, dissemination, or commercialisation of these materials shall be determined in agreement between both parties, upholding the principles of shared sovereignty, cultural integrity, and active protection.

Ethics Approval

Ethics for this project was approved externally by University of Canterbury Human Ethics Committee (see Appendix A1). The reference for this is: (UC) HEC 2021/109, dated 4 February 2022, for Preston Bailey Peryman, School of Earth and Environment UNIVERSITY OF CANTERBURY.

The UC HEC process included Māori Consultation approval by the Ngāi Tahu Consultation and Engagement Group at the University of Canterbury (see Appendix A2).

Altogether, this approach has been deemed valid by the AUT Ethics Committee for the final submission (see Appendix A3).

Letters of approval are included in Appendix A.

Māori Consultation was submitted in August 2021 by the Ngāi Tahu Consultation and Engagement Group at the University of Canterbury. A complete Human Ethics application was submitted to the University of Canterbury Human Research Ethics Committee (HREC) in January 2022.

Ngāi Tahu Consultation and Engagement Group at the University of Canterbury approved Māori Consultation in August 2021. UC HREC approved the ethics application in February 2022. The reference number is HEC2021/109.

An application for Institutional Approval of Research Approved by an External Ethics Committee (EA5) was submitted to Auckland University of Technology Ethics Committee (AUTEC) in February 2023 to align with the PGR9 process. A letter of ethics approval subject to conditions was sent by AUTEC in May 2023 (reference: 23/81). These conditions were met in February 2023 through the PGR9 process. An additional memo was sent in May 2025 stating:

> As recruitment and human data collection were completed prior to student transfer, the University of Canterbury ethics approval number is the valid approval to use in the thesis submission and publications.

Finally, noting that in their approval letter, Ngāi Tahu Consultation and Engagement Group requested a summary of the findings on completion of the current project. The author will fulfil this request after successful completion of this project.

CHAPTER 1: INTRODUCTION

In the years leading up to the start of this project, the landscape of organic waste management in Ōtautahi Christchurch was going through a significant, generational-scale change process. This was signalled through the drafting of the Christchurch City Waste Minimisation and Management Plan 2020 (Christchurch City Council, 2020), for which I was consulted during workshops including subject matter experts in the field of organics. From my standpoint as a composting practitioner trained in public policy and urban planning, this was an opportune moment to observe and participate in that change process, particularly the ontology of that transition – meaning the way the wording of this transition was conceptualised and structured in thought, and whose thoughts specifically, along with the regulatory drivers entangled with its politics. The ontology of this transition was clearly oriented towards continuing with the incumbent: industrial, large-scale technical solutions for organic waste. These were the pre-conditions giving rise to the organics systems of 2026, locked in now for the next generation of waste infrastructure in Ōtautahi.

This thesis is positioned within practice-based design research that treats infrastructure as a technical domain, *and,* as a site where values, agency, and ontological assumptions become stabilised over time. The work has immanency and importance for Ōtautahi through its Treaty-based partnership with Te Pā o Rākaihautū, named in the title of this project, and part of a detailed and critical context for the research provided for the reader ahead. In that context, organics systems are understood as designed arrangements that convene particular “ways of being” with organic matter - what counts as waste, who is authorised to act, and which actors (human and nonhuman) are enrolled or excluded. The drivers of urban organics systems today are synonymous with the forces of industrial urban capitalism, expressed through designed infrastructures that configure who and what can participate in the circulation of organic matter. Following more-than-human design scholarship, I treat these infrastructures as active arrangements that distribute agency – foregrounding certain capacities such as standardisation, containment, scale; at times useful, but often marginalising others from local stewardship, relational accountability, and acts of cultural and ecological reciprocity (Wakkary, 2021).

In this project, I grapple with this dominant system and how it can both extract organic materials from communities and protect itself structurally from alternative proposals to transform that system. This is one aspect of the diverse context engaged with through the research methodology of this project, and where the written component of this work begins. At the same time the project has enabled me to participate in driving the exploration and design of alternative methods to

counter and repair harm caused by the dominant organics system. This work was never a purely academic exercise, and that is why the practice-oriented format of this doctorate was chosen for the project. Methodologically, this project proceeds from embedded practice toward conceptual articulation: I work with composting as an enacted research practice, and then analyse what that practice makes possible – technically, socially, and ontologically – within the specific constraints of Ōtautahi's organics governance.

This research is conducted as practice-based design research, combining co-design action research with a first-person, practice-embedded approach. The inquiry is generated through my sustained participation in the everyday work of composting across multiple sites, collectives, and institutional interfaces. In this respect, the study aligns with first-person methods and design research that foreground the researcher's lived involvement as a legitimate starting point for knowledge production, supported through reflexive writing, making artefactual statements, and the documentation of decision-making as it unfolds over time (Desjardins et al., 2021). My role as practitioner-researcher is not separable from the field of inquiry; knowledge is generated through sustained participation and iterative adaptation in live composting and governance contexts, rather than through detached observation alone. Rigour is pursued through triangulation across practice logs and reflections, photographs and material traces, operational documents, formal correspondence, and publicly accountable records arising from advocacy and regulatory engagement. This stance also makes my positionality and accountability part of the method, particularly in relation to partnership with Te Pā o Rākaihautū and the ethics of working within Kaupapa Māori environments.

Conceptually, the thesis is framed through more-than-human design scholarship, treating composting as a living, time-based practice that convenes humans, nonhumans, and materials within shared processes of transformation (Wakkary, 2021). Compost is approached not only as an output but as a "designed arrangement" whose outcomes depend on the vitality and agency of materials, microbial and fungal dynamics, and the conditions created through human stewardship. This framing is used cautiously and specifically: biological concepts are introduced only where they strengthen analytic "listening" to nonhuman processes through multi-sensory observation and measurement. This orientation aligns with contemporary more-than-human design research that treats organisms and materials as participants in shaping design worlds (e.g., Wakkary, 2021; Keune, 2021). At the same time, this study situates more-than-human participation within a colonised eco-cultural landscape and an Indigenous-led partnership context,

where questions of whenua, tikanga, and institutional power are not background conditions but central to what composting can become as rift-repair.

Methodologically, the work proceeds across three inseparable, interdependent strands: (1) composting as rift-repair with Te Pā o Rākaihautū, grounded in whānau-whenua reconnection; (2) the technical development of community composting methods capable of handling meaningful volumes while remaining place-based and community-governed; and (3) engagement with municipal governance and regulatory frameworks that stabilise or constrain organics infrastructure in Ōtautahi. These strands are treated as one integrated design-research trajectory: material practice generates learning and evidence; collective arrangements make that practice viable and accountable; and institutional interfaces shape whether the work remains marginal or can endure and proliferate over time. Chapters Two and Four deepen the methodological and theoretical foundations for this approach, including the ethical difficulty and slowness of first-person, more-than-human research in live, contested infrastructure settings.

This project weaves composting and decolonising methodologies to support the reconnection of whānau and whenua, offering a unique contribution through the bridging and binding of these previously distinct approaches. Far from being merely instrumental, about making compost, this work reflects a situational and relational practice of composting and decolonisation – a reflexive, ontological endeavour rooted in place-based ethics, tikanga Māori (tribally-specific Indigenous practices in Aotearoa), and the non-human communities we are tied to simply through being in this living world. This requires a first-person, practice-embedded stance: the research is carried through sustained participation, responsibility, and reflexive documentation, rather than through a detached observational posture. The project generates a unique methodological design aimed at enduring and repairing the rifts caused by waste management systems in Ōtautahi, transcending the generic or material production of compost as a tool for managing organics. That said, the project has proven instrumental by demonstrating that ‘would-be industrial’ volumes of organic materials can be sustainably managed within a community-based model, supporting eco-cultural system revitalisation.

While not perfect, without trouble, or complete by some critical measures, the aforementioned sustainable management was achieved through relatively modest means compared to the resources of the civic-commercial complexes that dominant organics in Aotearoa. This is a threshold that has so often limited community composting: how to scale-up and appropriately mechanise composting methodologies to meet increasing demand for alternatives to the dominant paradigm. Very few initiatives endure beyond this threshold for longer than a few years.

This is a local, nationwide and global challenge. While institutional reform of organic waste management in Ōtautahi was not achieved in this study, the approach it helped to seed is designed to achieve systemic change in organic waste management practices in Ōtautahi over an intergenerational timescale. This project is about scaling *deep (Fraser, 2023; Fraser et al., 2016)* to support transformation.

1.0 Positioning Statement

In this section I briefly outline my background, experience and longer-term relationship to this project. This acknowledges my interests and engagements with various stakeholders as well as with communities in which I have built relationships over time. This will help the reader to understand more about how I have arrived at my position in relation to the aims and objectives of this research, the broader thrust behind the various initiatives interconnected to it, and my overall body of work as a practitioner. This also helps for building up the 'first-person(a)' research methodology introduced above. I have grouped these things loosely under the headings of 'Local Food and Organics', 'Transitional Land Use and Planning', and 'Ōtākaro Avon River Corridor and Te Pā o Rākaihautū'.

1.0.1 Local Food and Organics

I have a track record of initiating, co-designing and developing a range of pioneering local food initiatives in Ōtautahi, including roles in national bodies and enterprise projects. This began in 2008 under the mentorship of the late Margaret Jefferies (ONZM), leading to a proposal for a community garden in Sumner in 2009, the seaside village where I grew up and was living at the time. I was inspired by the concept of community gardening and motivated by the looming challenges of peak oil, climate change and biodiversity decline arising in my undergraduate studies. When the 2010-11 Canterbury Earthquakes hit our region, this crystallised my interest in local food systems, food security, and ultimately led to awareness of food sovereignty practices in other regions. When I finished my studies, I wanted to continue with grassroots work which meant forging a livelihood and with that, social enterprise became a strong area of interest. I got a major break in 2013 through the Vodafone New Zealand Foundation in the form of a World of Difference Grant Award, affording 12-months dedicated to starting up an initiative designed to build economic resilience into local food systems.

The start-up I created with my wife Michelle was Garden City 2.0, a local organic fruit and vegetable distribution company that was eventually taken over by Ooooby[3]. As the name might suggest, I was interested in reimagining the 'garden city' moniker that is synonymous with colonial settler Christchurch, this time following the principles of organic farming. I was engaging in local planning processes throughout this time, advocating for a range of related issues such as protecting productive soils from suburban sprawl that was accelerated by a major shift north and west of the city, created in part by the displacement of housing damaged during the earthquakes. My experience with Garden City 2.0 enabled multiple urban farming initiatives, including Agropolis Urban Farm – launched during the Festival of Transitional Architecture 2014. Around the same time, the Vodafone New Zealand Foundation opened a new grant programme for alumni to collaborate on a youth development initiative. This is when I created Cultivate Christchurch with Fiona Stewart (nee Hargreaves).

Cultivate became an award-winning social enterprise combining youth development and urban farming. Cultivate gave me a public profile to promote the projects I was leading at the time. I was confident that this would lead to a transformation in the wellbeing and resilience of people and their local ecologies – primarily because we could increase access to the benefits of organic farming for a wider and larger range of people living in urban areas. I thought that localisation of food systems could drive a broader change in the way land use decisions and communities are being planned and developed. However, this was never the leading message or focus of the work I was leading for Cultivate at the time. The potential for an alternative urbanism (Tornaghi & Dehaene, 2020) remained a personal interest until this research project became a possibility.

I saw community gardening and then urban farming as a productive way to build better pathways for communities, especially young people, to develop healthier, more ecologically literate livelihoods. The more strenuous physical activity of composting was often identified by community gardeners as a suitable task for younger bodies to get involved with. This is primarily how my approach to building urban gardens began – by collecting and composting locally available materials to build soil. Most of the local food and organics projects I started have involved walking wheelie bins of food scraps to various plots of land I could access for growing food. I did this from the local supermarket to the very first community garden in Sumner. I did it in the inner city of Ōtautahi Christchurch to create Agropolis Urban Farm, a transitional initiative on a rubble lot (that remains vacant at the time of writing). The Agropolis organics system was adopted and scaled up

[3] https://www.ooooby.com/

by Cultivate to become a viable enterprise that provided others with inspiration for a nationwide movement in urban farming. And I have done it at the beginning of this research project – collecting food scraps from the Riverside Market to test new methods of organics processing designed by the 20:20 Compost collective. I have seen the potential for localised composting systems to create foundations for more than urban farming. This is why the critical geographies of urban agriculture (McClintock, 2010; Tornaghi, 2014) and more-than-human entanglements (Tsing, 2015) are important to this study. And it is why I led this work through action research that applied decolonising methodologies to my own thinking and practice of composting. I unpack these terms and thoughts a lot further in the chapters that follow.

1.0.2 Transitional Land Use and Planning

Transitional land use arrangements are a constant in all the experiences outlined above. Many of these arrangements were brokered by *Life in Vacant Spaces*[4], and always involve a degree of community engagement. The 'transitional city' movement in Ōtautahi was interested in trialling new ideas for spaces left vacant following by the earthquakes. It asked more aspirational questions of what we would like to build towards different futures, instead of simply building back what was. It opened space for conversations about civic health, resilience and sustainability – much like the architectural roots to the Garden City model promoted by Ebenezer Howard. Amongst many positives, I liked how transitional practices enabled participation in the testing of alternative land uses, and learning by doing.

Another constant factor more specific to my experience with transitional local food initiatives has been exploring how communities engage with agricultural activities in urban environments. Transitional projects were given more leniency in post-earthquake Christchurch, particularly by grey-areas in the regulatory branches of local government. Arguably, transitional projects benefited from this leniency and helped to determine and define the grey-areas along the way. This meant that the political landscape was more accommodating for activities that the pre-earthquake regulatory and planning framework did not typically anticipate – such as a social enterprise operating a small-scale intensive market garden on a demolished Inner-City lot. These two factors – transitional land use and appropriate scaling of urban agriculture – are significant factors in this research project that will be explored further. For now, at least it is important to say that the underlying thrust of the transitional movement is to generate alternatives for how life can

[4] https://livs.org.nz/

be expressed when given the opportunity to reimagine the use of space. It opens a conversation about how people want to live and perhaps how we could live in a better relationship with a place.

In a post-disaster context, the transitional land use movement crossed from a creative arts base into the realm of urban planning and design, including place-making and the incorporation of alternative spatial design thinking in urban revitalisation projects. As a professional planning undergraduate, I was critical of the planning profession in New Zealand during the various phases of the earthquake recovery, for not utilising more place-based, collaborative and community-led approaches. I was reluctant to accept at the time that the local planning agencies had their hands tied by the emergency powers used by the New Zealand Government to install an over-arching planning system. The aspirations that communities were expressing were largely over-ridden, leaving people to fight for scraps and resource recovery in a trail of disaster capitalism. The insurgent potential of transitional land use and all its posturing about alternative urbanism never really transformed the broader fabric of the city rebuild, not beyond isolated patches, yet many still speak into the opportunity spaces it generated. This is why the literature on urban agroecological praxis was relevant and provocative for me, as it offered language, an ontology, for the limitations of my own experience with urban agriculture, despite knowing first-hand of its transformative potential. This research project built on my experience and further experimentation with an agroecological praxis of my own design.

1.0.3 Ōtākaro Avon River Corridor and Te Pā o Rākaihautū

At the time of writing, 15 years on from the earthquakes, the Ōtākaro Avon River Corridor (ŌARC) is one of the last frontiers of the post-disaster recovery. In 2011, 400 hectares of land in the eastern suburbs of Christchurch was 'red zoned' (see Figure 1 below) by the New Zealand Government ('the Crown'), with 5500 homes demolished after a government buyout worth $1.9bn[5]. There was a lot of discontent and anguish surrounding this decision, some of which is unresolved today and remains a source of trauma for the affected parties. I grew up in the seaside village of Sumner, one of 50 clusters where properties were red zoned due to life risk. In the large aftershocks of June 2011, I personally witnessed major damage to properties and collapse of the cliff faces and hillsides that caused a loss of life in the village. I was actively involved in the conversations around the recovery planning for the village which over time extended to an interest in the recovery planning for the natural environment across the city. The Crown's role in planning

[5] https://www.dpmc.govt.nz/sites/default/files/2017-03/cera-rrz-surveyreport-feb2016.pdf

for the red zone culminated in 2019 with the gazetting of the Ōtākaro Avon River Corridor Regeneration Plan (2019)[6]. Responsibility for implementing this plan now sits with the Christchurch City Council ('Council', CCC) and Mana Whenua – Te Ngāi Tūāhuriri Rūnanga[7].

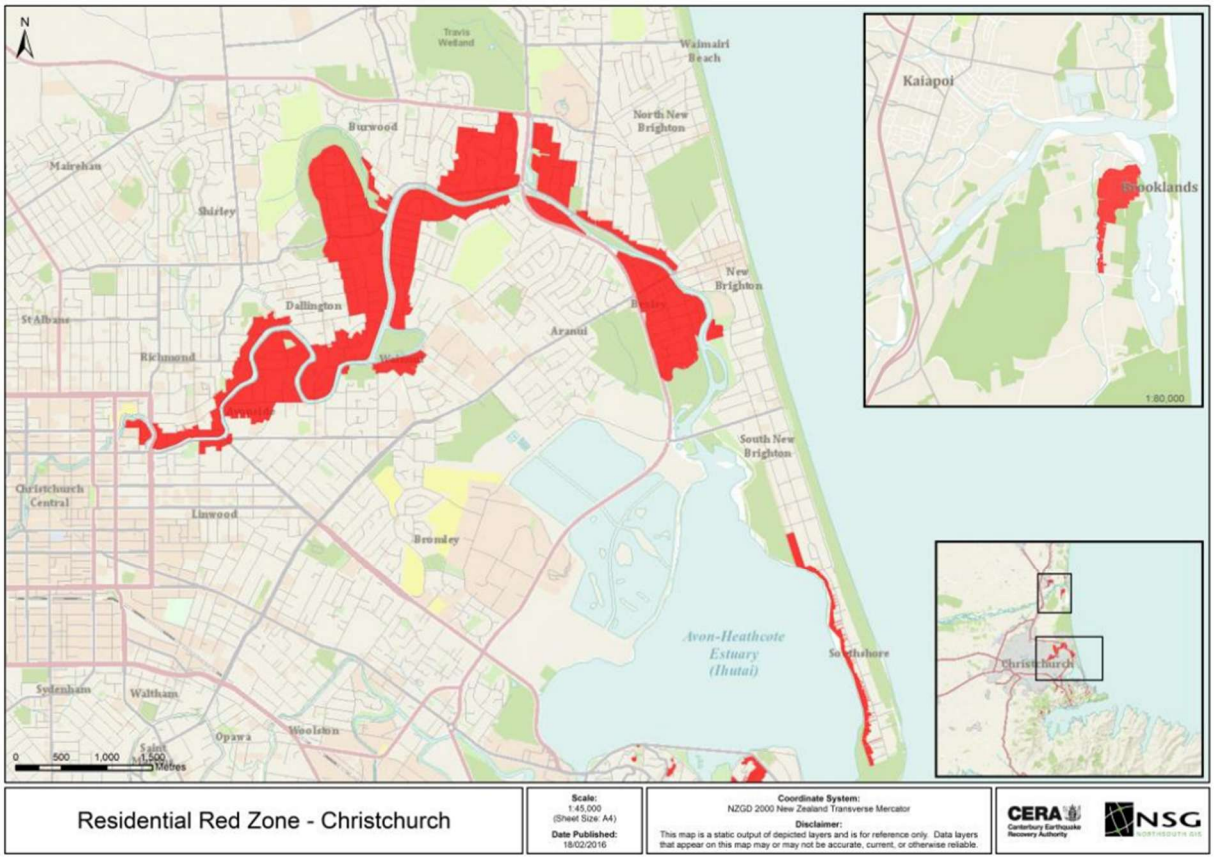

Figure 1: Residential Red Zone, Canterbury Earthquake Recovery Authority, 2016.

I remained engaged throughout the recovery planning process until the time of writing where I was involved in the transitional regeneration of a red zone area as a representative of Te Pā o Rākaihautū and Nōku Te Ao Charitable Trust. In the earlier stages, I made submissions, attended workshops and in 2012 I drafted my first proposal for interim land use in the Red Zone areas that became known as the Ōtākaro Avon River Corridor (ŌARC). This was declined by the central government agency in charge at the time, but I remain involved in numerous discussions around edible gardening and local food within the recovery planning process as this evolved. This

[6] https://www.dpmc.govt.nz/sites/default/files/2019-08/Otakaro%20Avon%20River%20Corridor%20Regeneration%20PlanReducedSize.pdf

[7] https://ccc.govt.nz/assets/Documents/The-Council/Committees/2022-2025/OARC-Co-Governance-Establishment-Committee-Terms-of-Reference.pdf

included a role within Soil & Health Canterbury as the lead agency contributing technical advisory to ‘support community gardens, local food production and urban forestry’.

In 2013, I attended a ‘Wānaka Tiriti’ presented by the late Reverend Maurice Gray on the topic of “the history of the Tiriti here in Christchurch and rights around the rebuild of the city” (Personal Communication, Network Waitangi Ōtautahi, 2013). Little did I know, Reverend Gray is a relative of whānau in senior leadership positions at Te Pā o Rākaihautū which was being conceived around the same time, with aspirations for a return to land within the red zoned areas. In the same Wānaka in 2013, Reverend Gray had mentioned outstanding claims on land in the red zones that were of high interest to local Iwi. I learned that years later, in 2020, I had circled one such site as an ideal area for productive land use. This was while performing a contract role facilitating activation of the red zone for community interests on behalf of the Christchurch City Council. I had previously been made aware of Te Pā o Rākaihautū’s interest in land immediately north of the site (literally over the dissecting road) I had circled by the former lead for recovery planning at Regenerate Christchurch, Rob Kerr. It was because of this interest that in June 2020, I eventually met the Chairperson of the Board of Trustees for Te Pā o Rākaihautū, Rangimarie Parata-Takurua. A few months later I had the opportunity to show Rangimarie the site I circled and subsequently gain access to it with Te Pā on a transitional basis.

It is important for me to acknowledge that at roughly the same time I connected with Te Pā, I was working alongside Huia Lambie (Ngāti Mutunga, Te Atiawa) while conceptualising the 20:20 Compost initiative. The following is an excerpt also included in a blog post (see Appendix G) about the closing of 20:20 Compost that reflects some of Huia’s connection to the project:

> “I was inspired by Parihaka,” Huia says, “and the idea of Māori reactivating their place on ancestral land. When the project started, my vision for composting at Te Pā was to be part of a project to enable tangata whenua to reconnect and restore our land, as well as increase food resilience... Whatever happens next, I think the project is already doing what I envisaged when it started. That land has been reactivated; in such a short time, we have already touched so many whānau.” (H. Lambie, personal communication, 2025).

Huia had strong existing relationships with Rangimarie and a number of other whānau involved with Te Pā since its inception. Huia also had extensive involvement in the earthquake recovery across several portfolios including arts, cultural heritage, food resilience and systems innovation. We share a passion for organics and Huia provided me with immeasurable support while navigating my position as a Pākehā entering into the full immersion Kaupapa Māori context at Te Pā. It is largely because of Huia, Rangimarie and Te Pā o Rākaihautū that I could meaningfully carry out this research project, offering my experience with urban agriculture in exchange.

The first thing I did with Te Pā's caretaker and māra kai expert, Matua Keith Murphy, was have lunch then make compost together. This continued at a weekly and at times even a daily basis until October 2023 when I moved to Te Waipapa, Diamond Harbour, forty-minutes' drive from Te Pā. I was also employed into a different role within Te Pā in 2022, liaising between Te Pā and the Ministry of Education to secure a permanent location and budget prioritisation for He Pā Wānanga, a 21st century learning village (another story altogether). This meant I remained deeply connected with Te Pā but not as present and active within the māra in 2024 and 2025. It is from this position I have completed this research project. Various threads from previous experience and experimentation have been pulled through into this research context.

1.1 Research Context

The research context is primarily the places and people I made compost with and focuses on those things as being interactive, connected and relevant to one another. Making compost, composting, is the process by which dead and dying organic matter is digested by natural laws and reformed into soil. Composting in its most natural form is easily recognised in forests and isn't disrupted by humans. Fallen leaves, branches and logs that reach the forest floor, start to decompose, forming layers on layers of plant litter – dead and dying organic matter. Beneath these layers you will find an abundance of interconnected life forms that, in simple terms, are a part of and always becoming and contributing to soil. Entire, complex and vast landscapes emerge over geological timescales with this simple engine room of continuous renewal – and at the core of the engine room driving it all is microscopic lifeforms and intricate webs of intelligence (Sheldrake, 2020; Stamets, 2005).

Composting in the context of waste management is a deliberately designed process carried out by people, in a controlled environment, and yet it relies entirely on non-human species to do the actual work of decomposing materials. The *cultural* landscapes introduced further in chapter two are a nexus, an intersection for what I think of as *eco-cultural* connections between humans and soil. We as humans are also always becoming soil and we cannot be separated from this ancient phenomenon. The term "humus" originates from the Latin word *humus*, meaning "earth" or "soil," reflecting the foundational role of soil in sustaining life[8]. This linguistic connection extends to the word "human," derived from the same Latin root, *humus*, underscoring the intrinsic bond between humans and the earth. This term and connection between humans and soil is so ubiquitous, it

[8] https://www.etymonline.com/word/humus

literally connects us to the creation of life on Earth. Yet this connectivity is entirely absent from the politics of Western organic waste management systems. The primary place this intrinsic human-soil bond is recognised in our regulatory frameworks in Ōtautahi is through whakapapa Māori detailed in the Mahaanui Iwi Management Plan 2013 (Te Rūnanga o Ngāi Tūāhuriri et al., 2013). Further context is provided in Chapter 2 to unpack and locate the eco-cultural and regulatory landscapes that form important points of reference in this study.

Anthropological studies further explore this human-soil nexus, illustrating how soil influences various aspects of human culture, civilisation, livelihood, and health (Minami, 2009). For instance, soil quality affects agricultural practices, which in turn shape societal structures and cultural rituals. Soil influences and is influenced by the cultural practices, beliefs, and societal developments of communities residing in specific regions (Minami, 2009). Cities, towns and villages of all sizes and infrastructures are now entangled in the living systems of becoming soil. Yet whole civilisations have risen, 'decomposed' and returned to soil, of course, leaving remnant landscapes as a reminder of the legacies of concentrated, anthropocentric forms of material resource extraction and accumulation.

Besides the mysteries of the deepest, primordial origins of life and creation, and the powerful histories of civilisations old and anew, there is no simple stop-start process to decomposition of plant litter. Plant litter itself is habitat for many life forms that were already resident and interacting with the host plant material. These microcosms of decomposition are entwined with soil-plant complexes that are also living, alive, and in their healthiest forms, are densely populated with billions of organisms (Barea et al., 2005; Chauhan et al., 2023; Nannipieri, 2020; Paredes & Lebeis, 2016; Wang et al., 2024; Williams et al., 2023). These life forms are naturally occurring close by and have flown, blown or dropped in to get to work decomposing organic materials – just living their best lives. They may have already been living on or with the plants and amongst various other fauna. Who and what exactly is host, or visitor, being fed on or becoming food for another life form, is also a vast, abundant and diverse world of interactions. This is a snapshot of the working life and the biological diversity of composting that is captured in this project.

Regardless of who is who, and who is food, the life cycles inherent in composting (and soil) are tied to water, to whakapapa, and to practices that support wellness in people, particularly through relationships with plants and other non-human beings. Again, turning to etymology, the term

"wairākau" in Te Reo Māori is commonly translated to mean compost, manure, or fertiliser[9]. The word is composed of "wai," meaning water, and "rākau," meaning tree or wood. Each of these terms have their own whakapapa of course, and so on; the linguistic diversity of languages, ecologies and cultures unfolds through life. The composition of *wai* and *rākau* suggests a connection to traditional practices where plant materials were processed with water to create substances beneficial for soil enrichment. Wairākau is also a term for natural dyes produced by extracting pigments from tree saps and other plant materials, for textiles and as part of Māori healing practices (Sanson, 2012, citing Reinfield & Pihama, 2007). These references are from resources developed in relation to studies in the region of Taranaki, a different branch of Māori lineages to the distinctly southern Māori tribes of Aotearoa. The first peoples in lands within the context of this study were *Waitaha*; led to Te Waipounamu (the South Island) by Rākaihautū. I have encountered a range of Māori ancestry, language and traditional practices that relate to composting and soil life while working in the context of Te Pā o Rākaihautū, and the landscapes first occupied by its eponymous ancestor, Rākaihautū; and, while these are vital within the context of this study, I have not recorded or done a detailed exploration of these as subjects in this project.

Ngāi Tahu are now the principal Iwi (tribe) of New Zealand's South Island – *Te Waipounamu*. Ngāi Tahu hold a profound connection to Te Waipounamu and they view soil as part of environmental health here, and environmental health as integral to the overall well-being of their people. Dr. Jessica Hutchings (Ngāi Tahu, Gujarati), is a Kaupapa Māori and Indigenous Māori research leader and Hua Parakore practitioner. Hutchings emphasises this profound connection, connecting soil health and Mātauranga Māori in the Ministry for the Environment's (2022) triennial environmental report for Aotearoa New Zealand:

> "When I hold soil or living compost in my hands, there's a feeling of intrigue, of mystery, about its creative potential for growth and for nurturing ngā kākano (seeds) into life. I have reverence for soil because she is my tupuna and there is no separation between me as a human being and the soil as my ancestor." (Hutchings, cited in Ministry for the Environment, 2022)

This perspective underscores the ancestral bond between people and soil and highlights the importance of sustainable practices that renew soil health, especially if we are taking food and materials for sustenance. This same report emphasises Māori approaches to soil health that centre whakapapa (genealogy) and mauri (life force) – key terms that are discussed further in chapter three – as integral to sustainable land use. In this study, these traditional practices,

[9] https://maoridictionary.co.nz/word/9070

including composting and regenerative farming methodologies, are foundations to soil restoration (Ministry for the Environment 2022).

Ngāi Tahu's traditional practice of *mahinga kai* refers to the customary gathering of food and natural resources, encompassing birds, plants, fish, and other life-sustaining resources (Reid et al., 2025; Te Rūnanga o Ngāi Tūāhuriri et al., 2013). It reflects the value placed on natural resources and their role in sustaining life, including human life (Canterbury Regional Council, 2024). Incorporating these traditional practices and perspectives into this study recognises their significance to Ngāi Tahu and their cultural landscapes, and again, places an emphasis on the significance of soil health and sustainable land management that acknowledges and works with the deep interconnections between environmental and human well-being. The *Environment Aotearoa 2022* report referenced above also included these statistics on soil and land use in Aotearoa:

> "An estimated 192 million tonnes of soil are lost annually into rivers, with 44% of this erosion coming from pastoral land;
>
> Heavy agricultural use is compacting soils, reducing microbial diversity, and affecting nitrogen cycles;
>
> The area of highly productive land unavailable for crops and livestock increased by 54% between 2002–2019 due to housing expansion." (ibid, pp 28-30)

Mahinga kai restoration is a priority for Ngāi Tahu, and with this specific cultural context included in this project, composting efforts to restore the mana and mauri of soil must align with this objective.

Indigenous knowledge systems never separated humans and natural systems such as composting at any conceptual level (Puig de la Bellacasa, 2015). In Te Ao Māori, soil is thought of by some Iwi as the puku, stomach of Papatūānuku, Earth Mother (Boasa-Dean & Bryce-Hare, 2020). And because Papatūānuku is also Earth and soil, composting is intrinsically linked to the digestive, renewal and fertility cycles of her body. Living and thinking with these cycles, with soil and with compost, is embedded in lifeways that have sustained Māori communities for millennia. Living with soil is fundamentally an enduring *mātauranga* – Māori indigenous knowledge system (Hikuroa, 2017) – that is unique to Aotearoa. This interaction with ancient and enduring embodiment of renewal and transformation is vital and inevitable for all people, and can be cultivated in their lives, especially.

In recent times, many Māori communities have been forcibly separated from enduring connections with their lands and waters and layers on layers of living relationships with

ecosystems. When viewed as a web of relationships, these connections span oceans and go between continents as the ancient trails of an enduring civilisation. They tie civilisations to the heavens with cosmologies of wholeness, prosperity and thriving through geological scales of time – time being in and of the living world. The forces of separation, at the hand of colonial powers, have been disrupting the practices of Māori interaction and connectivity with the living world for at least eight generations in some communities, and continuing to this day (Reid et al., 2017). This is also critically important context in this project.

Similarly, urban composting systems have become disconnected from their natural role in sustaining soil health, ecology, and indigenous culture. Unlike forest floors and wetlands, which seamlessly recycle organic matter, urban environments have replaced these regenerative ecologies with infrastructures that fragment and distort ecosystem functions. From the muck and night carts of pre-industrial cities (Steel, 2008) to today's large-scale urban waste networks (Lehec, 2020) and emerging industrial biotechnologies (Ecogas Limited Partnership, 2025), organic matter is increasingly managed in ways that separate people from the life cycles of decomposition. This separation, rooted in colonial urban settlement patterns, has contributed to the rise of the concept of waste (Diprose et al., 2023) – transforming what were originally viewed as vital resources into a problem to be managed. Ngāi Tahu perspectives on waste are documented by Māori scholars (Ataria et al., 2016; Pauling et al., 2010) and these views are contextualised further in Chapter Two of this study. Mahinga kai practices are relevant in this study in terms of the urbanised landscapes of today, and while mahinga kai is integral to Ngāi Tahu's urban cultural revival in post-earthquake Ōtautahi (Prendergast & Brown, 2017), these practices are a *taonga* (meaning 'treasured') and it is not my place to discuss these in detail here. However, I can see how composting methodologies could be considered as intrinsic to indigenous-led customary management of ecosystems and this would make for useful inquiry in the future.

At the core of this research is the urgent need to reconnect displaced and urbanised whānau Māori (Reid et al., 2017) with whenua and the life cycles of the living world – *Te Ao Turoa* (Hutchings et al., 2012). I was encouraged to pursue this in my earliest engagements with Te Pā. This project explores how Maori-led practices of māra kai (gardening) and kaitiakitanga (care praxis in relation to ecosystem interdependency), and the mātauranga Māori embedded into this work – *mahi,* can help with enduring and healing rifts resulting from colonial violence that contributed to and maintains the displacement of Māori communities from their whenua. It is thus invaluable that this project is situated in partnership with the indigenous Māori community of Te

Pā o Rākaihautū (Te Pā), a 21st century learning village, *He Pā Wānanga*, located in Ngāi Tahu territories in Te Waipounamu, Aotearoa.

Te Pā is a willing and vital partner to this research project where composting methodologies are being co-created within the context of a much broader vision for place-based, whānau transformation (Ataria & Parata-Takurua, 2012; Macfarlane et al., 2019). Doing this work within Te Pā and an educational Te Ao Māori paradigm provided a base to locate composting as something more than an abstract component of education for sustainability, or waste minimisation, as it is typically taught in Western schools. Composting is one part of a broader objective of building towards a self-determining food system for Te Pā as a community, and to support more whānau on their own journeys towards the same objective – kai motuhake. In the context of this initiative with Te Pā, composting is entangled with a long history of colonisation. **Composting here becomes a mahi and methodology of revitalisation, supporting a rebuilding of culture and identity, language, traditional practices, and wellbeing.** This is the foremost, unique and important contribution of this project.

1.2 Research Question & Contribution

The research is guided by one primary question, supported by two subsidiary questions that attend to different but inseparable dimensions of the inquiry:

- How can composting be enacted as a rift-repair methodology that supports cultural and ecological revitalisation within the specific context of Te Pā o Rākaihautū, while engaging the material, social, and institutional conditions shaping organic waste management in Ōtautahi Christchurch?
    - How do community-based composting practices – co-developed with Te Pā o Rākaihautū and more-than-human composting species – generate new capacities for kai motuhake, soil restoration, and eco-cultural reconnection?
    - What limitations and possibilities emerge when these composting practices interface with municipal governance, regulatory frameworks, and incumbent organic waste infrastructures in Ōtautahi, and how can such interfaces be navigated as part of a rift-repair methodology?

These questions are asked across three interconnected scales of practice: (1) composting as rift-repair with Te Pā, (2) the technical development of community composting methods at meaningful volume across multiple sites, and (3) institutional engagement with citywide organics governance.

Questioning the possibilities for composting as a repair-methodology recognises that there are imperfect conditions for composting today, and that the social license for composting has changed in Christchurch City – the largest colonial settlement in Te Waipounamu. This research has indeed been motivated in part by change processes signalled and implemented during this project by the Christchurch City Council in the name of waste minimisation and organic waste management. The research has further benefited from a diversity of new relationships, aspirations and mātauranga existing within the community of Te Pā. These factors, each with intergenerational implications, have provided a rich context for experimentation. The ensuing entanglement of composting, reflexive action research based in an Indigenous community, and regenerative practice is the central narrative of this research project. Together, embodied as everyday care work, collectives that were entangled in this project are promoting “simple and sophisticated” changes for organics (Personal Communication, Huia Lambie 2020), for education, and for addressing social and ecological emergencies in this corner of the globe.

The contribution of this research lies in the development and articulation of composting as a rift-repair methodology for cultural and ecological revitalisation. Rather than treating composting as a singular technical intervention or symbolic practice, the thesis demonstrates how composting can operate as an integrated design-research methodology enacted across multiple, interdependent scales. At the level of situated practice, the research contributes a detailed account of how community-based composting, co-developed with Te Pā o Rākaihautū and more-than-human composting species, can support kai motuhake, soil restoration, and eco-cultural reconnection. Through sustained, first-person engagement, the thesis shows how composting functions as a relational and more-than-human practice that builds capacity, trust, and ecological vitality within a specific Indigenous-led context.

Intended academic audiences for this thesis include: (1) design researchers working with more-than-human theory, relational ontology, and first-person/longitudinal methods; (2) scholars engaging decolonising and Indigenous methodologies within ecological design, infrastructure studies, and place-based research; and (3) researchers and reflective practitioners concerned with the governance of urban environmental infrastructures and the politics of socio-technical transitions. Within these conversations, this thesis contributes a situated, practice-grounded account of composting as a time-based, more-than-human infrastructuring practice – showing how knowledge is produced through sustained involvement in the maintenance, breakdown, negotiation, and iterative reconfiguration of composting systems in live community and institutional settings. The contribution is therefore methodological and conceptual as much as it

is technical: it clarifies what becomes knowable when composting is treated not as a discrete intervention or “solution,” but as an ongoing design-research condition that convenes humans, nonhumans, materials, and governance arrangements over time.

A further contribution – signalled here and developed through the practice accounts in Chapters Five and Six – is the articulation of intensifying attentiveness as a methodological capacity within more-than-human, first-person design research. In this study, intensifying attentiveness refers to the disciplined, repeated work of learning-from within composting constituencies through multisensory observation, documentation, and responsive adjustment across seasons, sites, and institutional interfaces. Rather than claiming a finished framework, the thesis positions intensifying attentiveness as a valuable area for further development in design research: a way to strengthen rigour in radically situated work where “what the system is” and “what it requires” become legible only through prolonged care, maintenance, and accountability.

At a broader systems level, the research contributes insight into how such composting practices interface with municipal governance, regulatory frameworks, and incumbent organic waste infrastructures in Ōtautahi Christchurch. By tracing moments of friction, negotiation, and possibility, the thesis reveals how community-scale composting initiatives can engage institutional systems as integral sites of rift-repair work. Taken together, these contributions position composting as a design-research methodology capable of working simultaneously with material processes, social relationships, and institutional conditions. The thesis advances knowledge by showing how rift-repair can be enacted through practice – bridging community-led ecological restoration and systemic transformation – within the complex realities of contemporary urban environments.

I am assuming that composting will endure for generations to come as an essential practice for revitalising soils, particularly the heavily modified soils of urbanised cultural landscapes. In the research context where kai motuhake and the revitalisation of mahinga kai resources is both an intergenerational and a daily concern of the community, how is the practice of soil restoration being limited, and how can these limitations be succeeded with a rift-repair methodology? As an experienced composting practitioner, I rely on an embodied knowing of what works and what is limiting the revitalisation of soils on a day-to-day basis. In this project, my embodied knowing is developed and drawn out in a collective space where this knowledge of composting and connectivity with soils was embraced by a community and culture working on its own story of revitalisation.

Part of the contribution of this project to existing knowledge also lies in the experimental application of regenerative design to the failures of urban organic waste management infrastructures in Ōtautahi. Composting methodologies created a time-space for reimagining alternatives to the eco-cultural damage done in our city by waste infrastructure. This is particularly important in the face of large, low-lying urban areas in Ōtautahi Christchurch that are exposed to sea-level rise. Managed retreat from these landscapes poses a significant challenge, although Christchurch has some unique experience navigating these complexities following the 2010–11 Canterbury Earthquakes. This project contributes a new rift-repair methodology that is fit for purpose in this landscape, and this could have applications in many parts of the world where changes to coastal and wetland ecosystems are impacting on urban populations.

These research contributions were made possible by a convergence of factors:

- my unique positionality as an agroecological practitioner in Christchurch;
- my familiarity with the regeneration planning for the Ōtākaro Avon River Corridor (ŌARC), a 600 hectare area of land cleared of housing post-earthquake;
- my familiarity with waste management planning concerning the Organics Processing Plant; and,
- the positive dynamic of people and entities connected to me and this project, and our shared commitment to harnessing organic materials for community-based food sovereignty.

Together, we have tested new composting methodologies within living landscapes, under public scrutiny, and within the constraints of regulatory frameworks that govern composting in the city. Against the backdrop of failing waste management infrastructure and ongoing eco-cultural degradation, this project generated new insights into connectivity and liveliness by working with soil as an agent of cultural, community, and ecosystem revitalisation.

Composting and decolonising methodologies, repositioned as a methodology of revitalisation and repair, have the potential to shift Christchurch's organics waste management system into a more correct relationship with the living eco-cultural systems of this bioregion. This shift requires integrating regenerative practices informed by both modern soil science and ancient Indigenous wisdom. This research proposes and tests elements of a holistic strategy for ecological and cultural restoration by foregrounding the transformative potential of soil microbiomes as energy pathways for restoring soil health – while simultaneously elevating cultural revitalisation efforts in communities like Te Pā o Rākaihautū. This approach of foregrounding ecologies is not unique or

new knowledge in many Māori communities, in fact, this is integral to whakapapa ties that connect people and places. However, it is not the role of only Māori to advocate and speak for holistic approaches to be given effect in political decision-making, such as the significant public investments being made to change organic waste management infrastructure in Ōtautahi.

By targeting a reformation, a composting of the incumbent organic waste management system in Ōtautahi Christchurch, this project addresses an urgent need for better practices to be heard, seen and tested as alternatives. The project demonstrates alternatives that are viable within the existing political landscape for organic waste management, and it provides a comprehensive framework for progressing with meaningful work to heal degraded landscapes like the Ōtākaro Avon River Corridor and Te Ihutai Avon-Heathcote Estuary. The project builds on the understanding that ecological regeneration and cultural revitalisation are inseparable and an essential basis for more appropriate forms of organic waste management in our city. This project leads with the assumption that transformation is possible for organic waste management in Ōtautahi Christchurch, and that it is already happening. It builds a new methodology for composting and decolonising organics that can and will continue to endure the current conditions until the next generation is ready to take up the task at hand. It builds a rift-repair methodology that is not only consistent with Te Ao Māori, it contributes to an uplift of Māori communities into positions of authority, ownership and empowerment with composting as a rift-repairing practice.

1.3 Composting as Practice, and practice-based research

Practice-based research is common in a wide range of fields, including health care (Fogarty & Mauksch, 2014), social work (Dodd & Epstein, 2012) and creative arts (Skains, 2018). Practice-based research means being reflective and pragmatic when designing a research project. These are well-documented subjects that recognise the transformative power of doing, making and knowing as a force for positive change in the world (Dixon, 2020; Schön, 1983). One focus of practice-based research in the field of *design* is on making (Ingold, 2013), which is similar to Donna Haraway's notion of 'making-with' (Haraway, 2015; Haraway, 2016). As cited by Wakkary (2021) both Ingold and Haraway consider the "vitality of materials", recognising the aliveness and flowing state of making things. For example, making compost could also be thought of as collaboration with more-than-human lifeforms to naturally recycle locally accessible nutrients, minerals and organic matter – transforming these into fertile soils for food production.

Wakkary (2021, p. 152), drawing on Ingold, cautions against approaches that foreground the "agency of objects" while overlooking the "vitality of materials" – a world "at a constant boil," in

which making occurs through practices such as gardening, cooking, and building, where practitioners “gather diverse materials to combine and redirect the flow and movement in anticipation of what might emerge.” In this framing, makers do not impose form upon matter; they work with materials that have their own tendencies and temporalities, and with worlds that do not hold still (Ingold, 2010, p. 93, as cited in Wakkary, 2021, p. 152). Methodologically, this aligns with longitudinal first-person design research where sustained participation – designing, maintaining, and adapting a system from within everyday life – becomes a legitimate mode of knowledge production rather than a limitation (Desjardins & Wakkary, 2016; Lucero, Desjardins, & Neustaedter, 2021). This thesis adopts that orientation: composting is treated as a living, time-based design practice that convenes humans and nonhumans in a shared process of transformation.

This more-than-human design stance also helps clarify why the research unfolds through multiple, interrelated threads rather than a single linear intervention. From a design research perspective, composting is not only an artefact or output but an infrastructural practice that simultaneously shapes (1) local, place-based rift-repair work with Te Pā o Rākaihautū and whānau-whenua reconnection; (2) the development of composting methods capable of handling meaningful volumes while remaining locally-stewarded; and (3) engagement with the institutional and municipal conditions that stabilise or constrain organics governance in Ōtautahi. These strands are methodologically inseparable because each configures the conditions of possibility for the others: material practices of composting generate evidence and learning; collective arrangements make those practices viable; and institutional interfaces determine whether such practices remain marginal or can endure and proliferate over time.

Throughout the thesis, composting is treated both as an enacted practice and as a generative metaphor for authentic transformation: a mode of repair that is slow, layered, and contingent on the conditions that enable life to reorganise. Where biological concepts such as quorum sensing are introduced, they are used cautiously and explicitly – as an analytic support for “listening” to nonhuman composting dynamics through multi-sensory observation and measurement, rather than as a loose analogy. In other words, biological signalling becomes relevant as it sharpens attention to what composting communities (microbial, fungal, and human) are doing and responding to over time, and how those responses can be learned from within the practice.

With this more-than-human and practice-based orientation established, composting acts as a creative practice in this study by way of the inherent capacity for composting methods to bring forward life, to support revitalisation. Composting methods activate connections, build

communities and regenerate living systems. This includes the physical working of materials by communities including non-human counterparts, to create the conditions for decomposition, for the digestive functions of ecosystems. It also includes the social-political work of writing, photographing and dialoguing as part of engaging with the practice beyond the physical forms that composting takes. For the purposes of this project, capturing the physical forms with photographs was essential to document the journey and support reflections on the practice throughout the process. As such, I have compiled an annotated Companion Flipbook to this text that will help the reader to visualise the practice as I reflect on these in more detail in Chapters Five and Six.

LINK TO COMPANION FLIPBOOK

The creative practice discussed here spans multiple sites where methods have been experimented with and developed with an overarching aim of building and enhancing soil as a foundation for kai motuhake and future mahinga kai practices. Each site had different communities, participants and conditions that shaped the nature, scale, intensity, duration and succession of the composting methods and the direction of the project overall. These sites are captured in the Companion Flipbook and at least two are locations where I continue to be active with composting practices at the time of writing.

The primary strategy to enact decolonising methodologies was inspired by Huia Lambie and embraced by our other two colleagues that formed the 20:20 Compost collective – Erin Crampton and Gavin Sole. This strategy was to prioritise Māori communities who were (and still are) disproportionately impacted by food *insecurity* in Ōtautahi, yet are high functioning and strong centres of community leadership by many other definitions. Te Pā became a focal point for the project largely due to a shared focus on achieving a form of composting system and architecture that could make working with larger volumes of compostable organic materials more manageable for the community. This aligned very naturally and symbiotically with 20:20 Compost and my research practice was guided throughout by the 20:20 Compost maxim of building one compost heap at a time, a practice of taking small steps towards self-determination. These ‘small steps towards self-determination’ echo and foreground the seminal text for decolonising methodologies written by Distinguished Professor Linda Tuhiwai Smith – referenced and explored in further detail throughout the chapters that follow here.

A core challenge of the practice was to navigate the negative associations of composting in a city dealing with failing composting infrastructure that was directly impacting the same communities

this research was practiced in. This meant that the composting methods had to include a political strategy that consisted mostly of writing and dialoguing with local regulatory bodies. This political strategy took the form of document analysis, maintaining a watching brief on decision-making processes concerning organics, and a proactive advocacy effort to see the composting methodologies of this practice included in the city's replacement organics infrastructure. Writing and dialoguing with partners and local authorities also took the form of safeguarding the practice when it became subject to official compliance measures and local regulatory frameworks. For example, a health and safety management plan, an operations manual, an adaptive management plan and remediation strategy, and a pre-application for resource consent were all co-authored with collaborators who were aware of this project documented here[10]. These documents were required for the purposes of protecting the composting methodologies and their participants, including the non-human landscapes and organisms we implicate with composting methods. References to these documents and other writing are found in the chapters that follow, including more in-depth reflections in Chapters Five and Six.

It should by now be abundantly clear to the reader that composting practices are much more than composting alone. As I connected with people, collectivised and strategised on the practice of composting in the contexts introduced in this study, the space became a fertile and highly productive environment for design research. There are many threads to this work that could have been explored further and would merit this as a research endeavour. The final section of this introduction breaks down what has been included in this thesis and where the journey led me towards the formation of composting as a rift-repair methodology.

1.4 The Outline

In this first Chapter (One) I have introduced the research context, the core questions, my role and the contributions of this work, and finally composting as a creative, design research practice. Chapter Two further contextualises composting as a material practice, as a living system, and as an ecological infrastructure, situating composting as a repair methodology for cultural and ecological revitalisation. It discusses composting as both an art and a science, detailing the processes that support decomposing and life-supporting organisms. With this foundation of liveliness and connectivity, the chapter examines the current composting landscape in Ōtautahi,

[10] These documents have not been included as appendices because they are tools and capacities earned through hard work and the practice over time. They are effectively digital assets that Te Pā o Rākaihautū has used as part of building whānau enterprise for the benefit of Nōku Te Ao and Te Pā whānau.

highlighting systemic problems and opportunities for functional transformation. These discussions are anchored in the cultural landscapes of Ngāi Tahu, within which the sites of composting practice and knowledge production are embedded. Drawing on these interconnected landscapes, composting is introduced as a transformative system that offers both ecological function and metaphorical depth. This chapter outlines the theoretical foundations and methodological trajectory of the research, identifying composting as a catalyst for reimagining waste systems and restoring eco-cultural vitality. The concept of revitalisation – of soils, relationships, and governance – threads through each subsequent chapter, positioning composting not only as a technical response but as a socially and culturally embedded practice.

Chapter Three introduces the critical context for this project, responding to changes in the cultural landscape impacted by the legacy of waste infrastructure in Ōtautahi. It situates organic systems within this historical landscape and presents my role in influencing the future landscape for organics in Ōtautahi. This chapter also links to a rich body of theory, supporting an ontological shift from extractive waste management to composting methodologies that centre living systems, return organic matter to soils, and uphold responsibilities to tend to the mana and mauri of soil. Key concepts from Te Ao Māori perspectives on connection, liveliness, and care frame the discussion, followed by research that considers 'thinking with' non-humans and fostering care-full entanglements. The analytical tool of Metabolic Rift Theory is used to critique dominant separation ontologies in organic waste management, before ending with the interconnected networks of mycelial worlds and multi-species entanglements as described by Anna Tsing (2015). This theoretical and conceptual foundation underpins the rift-repair methodology central to this study – a literal and prefigurative reconnection of dispossessed and disrupted cultural landscapes through composting.

Chapter Four details the key methods used in this project and explores composting as a productive, exploratory, and time-based methodology. The chapter describes how iterative composting trials were aimed and co-designed to support community engagements, and how key methodological tools emerged to meet these aims of the project. Reflexive practice is employed as a lens to examine my positionality as an urban farmer, alongside literature on urban agroecology that acknowledges both the challenges and transformative potential of urban farming. Decolonising methodologies (Smith, 1999) inform an examination of my position as a Pākehā conducting participatory action research in a kaupapa Māori community, confronting the inherent risks of colonising behaviours and extractive research methods. I reflect on my decision to abandon traditional Western social research tools in favour of composting tools and culturally

appropriate research methods. I illustrate how the iterative layering of reflective practice and co-design processes led to the methodology of composting as a rift-repair practice.

Chapter Five focuses on the exploratory dimensions of composting practice, situating hands-on trials as both technical experiments and relational engagements. These composting methods were co-designed with Te Pā o Rākaihautū and unfolded as practices of mutual care, repair, and listening – rooted in place, people, and whenua. This chapter reflects on formative composting experiences that predate this doctoral study and follows the evolution of those methods through community partnerships and praxis. Composting here emerges not only as a tool for building soil but as a methodology for building trust, relationality, and eco-cultural resilience. Across its sections, Chapter Five maps the development of a composting methodology that is deeply responsive to social, cultural, and ecological relationships, anchoring the research in lived practice and collective intention. In doing so, it shows how composting actively contributed to cultural and ecological revitalisation, connecting deep with the soils of Te Pā o Rākaihautū. Together with Chapter Six, these chapters provide the empirical basis for the thesis's methodological contribution to first-person, more-than-human design research – particularly the role of intensifying attentiveness as a disciplined practice of learning-from within living infrastructures.

Chapter Six builds upon these exploratory trials and co-created composting practices to explore the shift toward institutional and systems-level engagement. Composting, in this context, expands beyond material process to become a political and cultural intervention – reimagining waste systems in Aotearoa through a Kaupapa Māori lens. The chapter tracks the transformation of 20:20 Compost from a grassroots project into a vehicle for systems disruption and regenerative infrastructure planning, supported through the partnership with Te Pā o Rākaihautū. It documents strategic interactions with Christchurch City Council, revealing both openings and barriers within planning, procurement, and regulatory environments. Through this narrative, Chapter Six examines composting as a multi-layered methodology – operating at the intersections of cultural restoration, community sovereignty, and institutional transformation. The chapter concludes by reflecting on the emergence of *Te Puku Māra* and the enduring potential of composting as a method of rift repair – not only for soils, but for governance, relationships, and cultural determination.

Chapter Seven brings the project to a reflective close, gathering the threads of composting as a methodology, a practice, and a cultural intervention. This final chapter does not offer conclusions in the traditional sense, but composted insights – slow, layered reflections formed through hands-on work, relational entanglement, and iterative learning. It reframes composting not just as a

technical solution or methodological tool, but as a living cultural infrastructure: one that binds people and place through cycles of care, decomposition, and regeneration. Drawing together the tangible outcomes of the research with deeper ontological shifts – from waste to whakapapa, from disconnection to coherence – the chapter offers an invitation to continue composting as an enduring, adaptive, and relational practice. It highlights how composting supports ongoing cultural and ecological revitalisation through both small acts of care and large-scale systems transformation, and how its rhythms can continue to nourish the landscapes and communities who take up composting as their own.

CHAPTER 2: CONTEXTUALISING COMPOSTING

2.0 Composing / Decomposing

Composting is a material practice and living system, a transformative process connected to various layers of eco-cultural infrastructure, regardless of where it is practised. Composting is a technical management practice and a situated encounter with the biosphere as a living, metabolic system, one in which material exchange (Weber 2013), lived processes, and the activities of decomposing organisms are inseparable from the conditions that sustain life. Weber (2013, p. 11) contends that a worldview which explains the world only in the "third person," as if all matter were ultimately non-living, excludes the very actors whose metabolisms continuously shape and sustain life. In further framing the context of this project, I discuss the material practice of composting as a cascading, living system and its core impulse: creating the conditions for a proliferation of decomposing and life-supporting organisms. This impulse can be trusted as a guide for authentic transformation, by *designing with* living systems, precisely because the work of decomposition is carried by the agentic qualities of non-human organisms (Wakkary 2021, Bennett 2010) whose metabolic orientation is toward soil formation and ecological coherence. When humans assemble conditions and then stay sufficiently out of the way, composting proceeds in service of soil health through processes that are enacted through relational, more-than-human capacities.

With this root context of liveliness and connectivity, I then detail how composting was being performed in Ōtautahi during this study, the problems with its architecture as a system in this city, and contrast the ontology of this status quo with the opportunities I identified for composting methodologies to produce a regenerative, transformative system as an alternative to the current state of organic waste management. The underlying foundations for this context are the eco-cultural landscapes of Ngāi Tahu in and around the city of Ōtautahi Christchurch, which include the significant cultural landscapes of Waitaha and Te Ihutai. The sites of the composting practice in this project were based on these respective landscape foundations. As a biological infrastructure, I describe the ancient, current, and potential dimensions of composting practice in relation to these cultural landscapes, their ecology, and the kai they produce.

2.1 Composting as Material Practice and Living System

2.1.1 The Transformative Power of Decomposition

People who call themselves composters could, in truth, rather be called imposters. The work of decomposing organic materials and forming soils belongs to non-human organisms which exist in prolific diversity. Only these organisms can actually do the literal work of decomposing organic matter and rebuilding it into soil particles. Recognising humans as facilitators rather than agents of decomposition shifts attention from control to conditions, and from intervention to listening. The intelligence of composting is co-located in both the human-centred technique *and* the responsive capacities of non-human communities – whose collective activity reveals itself through temperature, smell, texture, and rate of transformation. Even the human body is largely made up of non-human organisms:

> "Seventy to ninety percent of all cells in the human body are bacterial, representing perhaps 10,000 different species. Genetically, we get even less real estate: 99 percent of the unique genes in our bodies are bacterial. This population of over 100 trillion microorganisms makes up our microbiome: a collection of microbial communities that has evolved alongside Homo sapiens to orchestrate basic life processes, beginning at birth. It should be no surprise that the microbiome plays a major role in health, especially immunity and metabolism – nor that disrupting this ancient equilibrium could have serious consequences" (Applewhite, 2025, citing Blaser, 2014).

Just as microbial communities drive human health, they are also the primary agents of composting that can also be located in whakapapa (see Chapter 3.2). In *Teaming with Microbes* and its companion texts, these microbial communities are described as the 'soil food web': an intricate network of organisms responsible for decomposition and nutrient cycling (Lowenfels, 2013, 2017, 2022; Lowenfels & Lewis, 2010). Its key decomposers include bacteria, fungi, actinomycetes, and protozoa. Bacteria initiate decomposition by breaking down simple organic matter like food scraps. Fungi, such as moulds and yeasts, tackle tougher materials like wood and plant fibres by secreting enzymes that act like invisible scissors, snipping complex organic matter into smaller pieces that are absorbed as food. Actinomycetes – a type of (filamentous) bacteria that grow in long, microscopic hair-like threads – decompose more complex substances while producing natural antibiotics. Protozoa are also microscopic, single-cell organisms that are constantly moving and changing shape, like a squishy balloon which feed on bacteria like miniature vacuum cleaners, helping to recycle nutrients back into the system.

Detritivores, from microscopic organisms to earthworms and insects, also play a crucial role in composting. Earthworms (*Lumbricus terrestris*) enhance soil structure and fertility by consuming

decaying matter. Termites (*Isoptera spp.*) break down cellulose-rich materials, recycling nutrients into the ecosystem. Blowfly larvae (maggots) process decaying plant and animal matter, contributing to decomposition. Together, these organisms transform organic material into nutrient-rich compost that supports soil health and plant growth. While humans may assemble composting materials, the real transformation occurs through the cascading and cyclical interactions of these non-human lifeforms. In this project, this shift from control to conditions was repeatedly encountered through practice. Temperature spikes, anaerobic collapse, odour events, and contamination episodes required iterative adjustments in recipe, aeration, and labour. Knowledge of microbial vitality emerged through sustained embodied participation rather than laboratory analysis alone. This distinction matters methodologically: composting intelligence became legible only through remaining-with the pile long enough to observe its fluctuations.

These processes are life-affirming (Weber 2013) and exemplify the *vitality* of compost, and organic waste materials, as introduced earlier in reference to Wakkary (2021) and Ingold (2013): a world in continuous formation where outcomes cannot be imposed, only negotiated through engagement with living matter.

> "The biosphere is a process, not a state… everything is in continuous change – as the body that exchanges all its atoms with the environment every a few years through the process of metabolism. Any process goes through 'good' and 'bad' states. Process is not stable, but rather a constant fluctuation" (Weber 2013, p. 69).

Humans make good and bad compost too (I certainly have been confounded by 'bad' batches, and yet life goes on). The intelligence of decomposition lies in these ancient, non-human communities, reminding us that humans are recent participants in an ongoing symphony of life. Decomposition is not just an above-ground process within compost piles, it also occurs below ground, where microbes, insects, and invertebrates are the architects of soil formation. Plant root systems interact with decomposers, enhancing soil-building processes up to thirty times faster than above-ground biomass decomposition (Jones, 2008). Dr. Christine Jones' work on the *Liquid Carbon Pathway* highlights how fungal networks transport energy, minerals, and nutrients between plant roots and soil organisms[11] to build more and better functioning soils. This can be considered as modern regenerative soil science:

[11] Dr. Christine Jones also discusses these concepts in several of her talks, such as "Building New Topsoil Through The Liquid Carbon Pathway" (YouTube) , "Biological Pathways to Carbon-Rich Soils" (YouTube) , and "Healthy Soil's Impact on Carbon Pathways & Microbial Diversity" (YouTube) . In these presentations, she delves into how diverse microbial communities supported by the Liquid Carbon Pathway contribute to soil health and carbon sequestration, underpinning the ecological processes that sustain life.

> “If you’re still thinking about the classic soil food web model, then you need to put that one aside and look to the ‘fungal energy channel’... Photosynthesis and plant root exudates are now recognised as the primary pathway for soil-building.” (Jones, 2021, citing Liang et al., 2017 and Bradford, 2016).

Through photosynthesis, plants convert sunlight and atmospheric carbon dioxide into organic compounds exuded through their roots, feeding a diverse soil microbiome. This microbial activity transforms organic matter into stable humus – carbon-rich compounds that can persist for centuries.

> “Under appropriate conditions, a large proportion of the soluble carbon channeled into aggregates via the hyphae of mycorrhizal fungi undergoes humification, a process in which simple sugars are resynthesised into highly complex carbon polymers. These organo-mineral complexes form a stable and inseparable part of the soil matrix that can remain intact for hundreds of years… Once atmospheric carbon dioxide is sequestered as humus, it is highly resistant to microbial and oxidative decomposition. The soil conditions required for humification are diminished by herbicides, fungicides, pesticides, and synthetic fertilisers – but enhanced by root exudates and compost-derived humic substances.” (Jones, 2008).

This transformative process underscores the deep interconnectedness of soils and ecosystems, a principle that resonates with the eco-cultural landscapes of Ngāi Tahu where there are clear examples of living with soils as a process of ‘making’, over a sustained period of co-habitation. Williams (2004) compiled an examination of Waitaha and southern Ngāi Tahu resource management practices from the time period before colonisation by Western agents. This work notes extensive archaeological evidence of “micro environmental adaptations” (Williams 2004, p. 130) to landscapes for the purpose of cultivating food crops, referred to as “made soils” in the archaeological literature (Willams 2004, p. 273).

Design, More than Human Design, and Human-Computer Interaction (HCI) researchers have increasingly explored what it means to live with, care for, and design alongside nonhuman organisms, particularly where agency, metabolism, and cohabitation are involved (e.g., Keune 2021; Zhou et al. 2024). These works share with composting practice an orientation toward sustained engagement with living systems whose behaviour cannot be fully controlled. Soil and plant microbiome diversity foster resilience against environmental stress, reinforcing the living, symbiotic systems that sustain life. This resilience is a base condition of composting as a material practice that is life-affirming and transformative through cohabitation and attentiveness over time. This base condition offers a model for repairing disrupted ecological and cultural relationships. The processes of composting organisms reflect a return to the cycles of the living world – with Te Ao Turoa – providing a foundation for the regenerative design research methodologies explored in this project, as detailed below.

2.1.2 Decomposition and Soil Building as Authentic Transformation

Building on the understanding that microbial activity transforms organic matter into stable humus – carbon-rich compounds that can persist for centuries – this project drew on composting as both a literal and figurative process to reform colonised landscapes into enduring communities, as remembered in the whakapapa of Rākaihautū. In partnership with Te Pā o Rākaihautū, where this research was embedded and based, the composting methodologies supported the Kura-a-Iwi's revitalisation efforts, contributing to the restoration of the soils that once sustained the great Waitaha gardeners who nourished their people for generations in these landscapes (Williams 2004). The Education Brief of Te Pā o Rākaihautū, prepared in 2023 for the Ministry of Education, situated its pedagogy within this whakapapa, highlighting the diverse, legendary achievements of the Waitaha people:

> "Waitaha people were renowned gardeners, scientists, and astronomers; they planted by the stars, and the journey of Rākaihautū from Rapanui was guided by the constellations above. The characteristics of Waitaha in the fourteenth century were of hard-working people who cultivated gardens; who were peaceful; and blessed with inquiring minds. We want to draw on those ethics; alongside conviction and courage – to be confident in our capacity to take up our obligations and responsibilities, compelling us to act in certain ways. We don't want to be led by agendas not of our making. We seek to restore and rebuild, to reignite the spirit, to carve out new worlds" (Nōku Te Ao, 2023, p. 67).

This vision of restoration mirrors the soil-building process, where decomposition fosters resilient structures that endure for centuries, much like the enduring communities of Waitaha. By integrating traditional composting with modern regenerative soil science and mātauranga Māori, this project positioned composting as a method through which ecological restoration and Māori cultural revitalisation could be practically enacted within the cultural landscapes of Waitaha and Te Ihutai. The work highlighted how composting, as a rift-repair methodology (that is unpacked further throughout this text), served as a literal and prefigurative act of rebuilding the soils of these landscapes, honouring the legacy of the Waitaha gardeners and their soil-making, while reweaving relationships with whenua that have been disrupted by colonisation. Ecological regeneration and cultural revitalisation were thus intertwined, both essential for a sustainable future rooted in the wisdom of *Mana Whenua* – the Iwi holding ultimate authority over these lands.

Composting in this project was more than a technical process; it was a model for authentic transformation that restored disrupted pathways within the non-human living world, fostering connectivity and liveliness in both ecological and cultural terms. The endurance of Indigenous knowledge systems, as reflected in the whakapapa of Rākaihautū, mirrors the resilience of healthy soil ecologies. Recent scholarship has suggested that soils themselves can model

integrity in relationship building (Krzywoszynska & Marchesi, 2020). Through their relational materiality, soils connect with plants and energy cycles, flowing through life and recycling through death – a process that composting replicates to return life forces to the whenua. In this way, composting in this project became an act of honouring whakapapa, acknowledging the origins and destinations of materials within the domains of Papatūānuku, while seeking to dismantle the anthropocentric forces that have disrupted Indigenous wellbeing. Importantly, this was not a symbolic gesture but a daily infrastructural commitment: sourcing materials, negotiating access, documenting failures, and maintaining continuity across seasons. The regenerative claims of composting were therefore tested against the friction of institutional constraint, community fatigue, and material unpredictability. This lived testing distinguishes the work from speculative or workshop-based engagements with soil. This project models a resistance to industrial models directed towards optimisation of a singular end-state, in this case for the management of organics as waste materials. Instead, it situates composting as a practice of ongoing metabolic participation. In partnership with Te Pā o Rākaihautū, this project contributed to co-creating conditions for soil, landscapes, and culture to thrive once more, laying the groundwork for the transformative systems explored in section 2.2.

2.1.3 Designing with Living Systems

This section articulates what ‘designing with living systems’ means in practice, building on the trust placed in decomposition’s nonhuman agency outlined in the introduction to this chapter (section 2.0). Continuing further with Wakkary’s (2021) framing, *designing with* living systems is an approach this project took to better align composting and decolonial organic systems to the metabolic processes of soil formation and its immanent ecological coherence. Other authors in design research fields have contributed to academic literature on these matters (Keune 2021, Giaccardi et al 2025, Nicenboim et al 2025). Keune (2021, p. 13) discusses the way textile design and production processes “control and manipulate” the growth of living organisms for product benefits, leaving little space for “more than anthropocentric approaches” and the potential for “living organisms to express themselves in diverse ways”. Like Wakkary (2021), Keune is also drawing inspiration from feminist thought leadership of Haraway and Puig de la Bellacasa:

> “Engaging with living organisms is intrinsically connected with different levels of care. They have to be maintained or cared for in order to be used in a design process or to collaborate with them.” (Keune 2021, p. 14)

Similarly, composting in this project is an enacted design practice of maintaining and caring for living organisms in order to collaborate with them in the production of a rift-repair methodology.

In Figure 3 below, Keune (2021) proposes a conceptual framework representing a “more intense engagement with the living” world in design. I position this project as continuing with a multispecies perspective I developed through practice in years preceding this project, and intensifying that commitment through practice-oriented doctoral research. This intensification required bringing the full extent of my autobiographical involvement into the research, treating composting not as an object of study but as a living system designed-with over time.

Situating the research as autobiographical aligns it with more-than-human and regenerative trajectories within first-person HCI traditions. Longitudinal first-person research methods offer the opportunity to investigate the mundane, ongoing, and ubiquitous presence of systems in everyday life while acknowledging the researcher’s positionality in design and inquiry (Lucero et al., 2021). Desjardins et al. (2021) describe autobiographical design as “designing a system with yourself as a target user with genuine needs and evaluating and refining the design through your own self-usage,” and further as “being one of the actors that design and build the system bottom up” (pp. 4-5). In this framing, design knowledge emerges through sustained living-with an evolving system rather than through short-term evaluation (Desjardins & Wakkary, 2016; Desjardins et al., 2021). Composting, as practiced here, operates within that tradition: a longitudinal, situated engagement with a multispecies assemblage whose transformation unfolds across seasons, infrastructures, and institutional interfaces. While autobiographical design in HCI often centres on digital artefacts or interactive systems, this project extends that trajectory into materially entangled, multispecies infrastructures. Here, the “system” designed-with is not a device but a living compost ecology embedded within the Indigenous governance of an educational transformation, land tenure, and municipal waste regimes, requiring accountability beyond the self and beyond the laboratory.

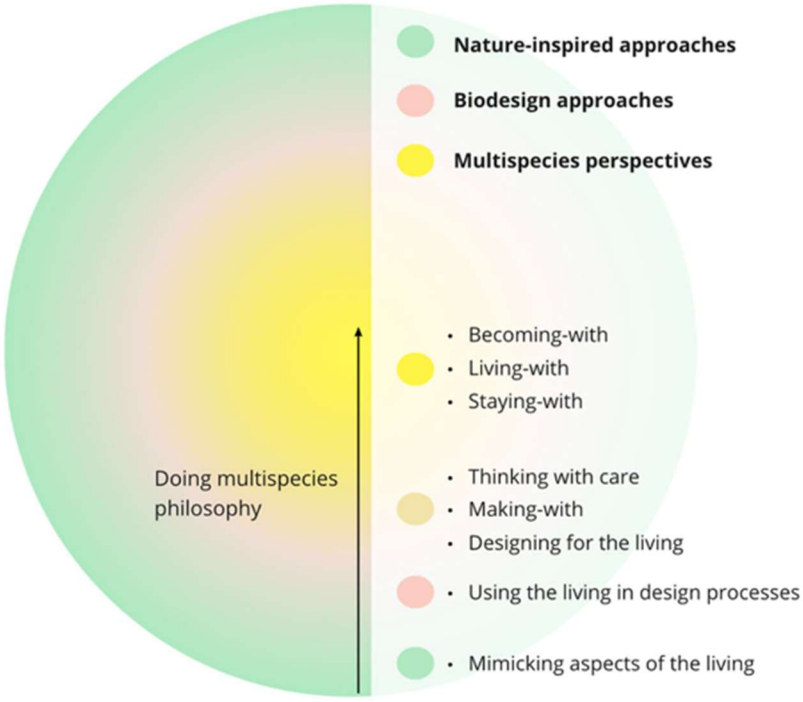

Figure 3: “A graphical representation of the conceptual framework that relates nature inspired approaches with biodesign and multispecies perspectives” (Keune 2021, p. 26).

Authors in the more than human design field have also articulated some of the difficulties of designing with living systems and “turning toward more than human orientations” (Giaccardi et al 2025, p. 3). In my project, these difficulties were encountered in everyday decisions about compost recipe, pile architecture, tarping, aeration, handling contaminated inputs, and the practical limits of working in shared community spaces with multiple stakeholders. In this sense, the “turn” toward more-than-human orientations was enacted through repeated, mundane negotiations with material conditions – negotiations that carried ethical consequences because the stakes were not only ecological but also cultural, relational, and institutional.

Nicenboim et al (2025, p. 215) suggest that the decentering of anthropocentrism “should not only be studied in relation to large paradigm shifts but also encountered in more subtle and mundane design decisions and tools”. This reinforces why the context of this research was defined as it was: the mundane task of composting food scraps is situated within a deeper concern for the rifting of Indigenous peoples from their cultural landscapes, and the degradation of the eco-cultural systems that sustain mahinga kai and relational wellbeing. Nicenboim et al (2025, p. 215) also note that “issues of power and decoloniality might need to be better articulated in the posthumanist HCI discourse”. While this project does not position itself as a direct intervention

into HCI discourse, it does make power and coloniality explicit as conditions shaping the design of Ōtautahi's organics system – particularly in how participation is configured, whose values are encoded in infrastructure decisions, and how "waste" is governed and territorialised. These issues are taken up at the system scale in Section 2.2 and returned to reflectively in Chapter 7.

Several design researchers have published work specifically relating to composting and designing with living systems. Wun and Wakkary (2025, p. 267) work with vermicomposting kits, showing how "small, subtle shifts" occur because of design practice and the accountability that emerges with the participation of humans and nonhumans. This is relevant to my study because a series of mundane, incremental shifts in composting practice – what materials were accepted, how they were mixed, how smell and moisture were managed, how labour was distributed, and how "quality" was judged – became signals for wider system possibilities. In my case these shifts were not confined to household practice; they were observed in community and institutional contexts where small operational changes exposed larger questions about governance, logistics, consent, and responsibility.

Wun and Wakkary (2025) acknowledged time constraints that limited their study, a four-month duration that supported meaningful outcomes but suggested that a longer-term field study could reveal better ways for participants to integrate composting into practice. This point is directly relevant here, because composting is itself a temporal medium: it requires extended duration to stabilise microbial ecologies, to build rhythms of care, and to reveal what becomes possible when practices persist beyond relatively brief interventions. The timescale of doctoral research (3-5 years) supported this project to remain embedded long enough for composting to move from "trial" to infrastructural routine in some contexts, and to surface institutional friction where routines could not be sustained without broader system redesign.

Tao and Vyas (2025) consider alternative sanitation systems from a posthumanist design perspective (Wakkary 2021), analysing how composting toilets mediate human-nature relations, such that alternative infrastructures *and* human relationships with the natural world become possible. They emphasise the need for design to support "the needs and values of non-human entities, from soil microbes to infrastructures, that have often been overlooked in anthropocentric frameworks" (Tao and Vyas 2025, p. 681). This emphasis aligns strongly with the ontological approach of my project: composting is treated as an ethical and infrastructural practice that must attend to microbial life, soil conditions, and broader waste infrastructures that constrain what can be done with organics. In my research context, working with food and greenwaste repeatedly brought me into contact with adjacent infrastructures – particularly wastewater and sewerage

systems imposed on these landscapes – and with the socio-political limits that determine what counts as acceptable “waste management”. Where Tao and Vyas (2025) identify socio-political limitations for scaling DIY alternatives, this study carries those limitations into the foreground as part of the methodological problem: the question is about how alternative infrastructures function as well as how institutional logics, contracts, regulation, and land histories configure what is possible.

Wakkary et al (2025, p. 3) consider the backyard as a site for design research that “signals the value and necessity of proximity and time (cohabiting) in designing-with more-than-human worlds”. My backyard operated as a minor but significant research site because it enabled continuity, close observation, and iterative adjustment without the access constraints of institutional spaces. This was particularly important due to the impacts of COVID-19 on participation in society at large within the timeframe of this project. In parallel, Te Pā o Rākaihautū’s Linwood campus functioned as a kind of shared “backyard” in the sense that composting was situated within a place intentionally organised as a learning village – centering the natural world as first teacher, and driven by the intent to embed composting and gardening into everyday rhythms. This frequent, ordinary contact mattered: it made composting available to students and staff not only as a technique but as a repeated encounter with living systems, responsibility, and care.

Bianco (2025, p. 7) created two workshops entitled ‘Becoming Compost’ that highlighted the effectiveness of radial soil chromatography for “stimulating curiosity and reflection on soil complexity”. In reflecting on the workshops, Bianco (2025) also acknowledges the time constraints typical of many studies influenced by feminist care ethics and soil natures, noting the challenge of designing experiences that persist beyond initial amazement and become embedded in lived practice.

> “a broader scale would be helpful, involving local communities and interdisciplinary research networks to develop increasingly effective models of regenerative coexistence” (Bianco, 2025, p. 7).

This observation aligns with my research context, where attentiveness had to be sustained through seasons, operational setbacks, and institutional negotiation. It reinforces a key point for composting-as-method: the quality of engagement is not only a matter of “awareness” but of continuity, shared routines, and the capacity to maintain conditions over time.

While many more-than-human design studies focus on artefacts, household kits, workshop interventions, or short-term field studies, this project operates at infrastructural scale and over multi-year duration. Composting here is not introduced as a discrete design artefact but as a

sustained relational practice entangled with land governance, municipal regulation, Indigenous-led partnership, and material throughput at meaningful volumes. This extended duration and institutional entanglement distinguishes the project from shorter autobiographical or domestic-scale MtH studies, positioning composting as a site of infrastructural negotiation rather than solely intimate encounter.

Together, these works help articulate why composting is a useful site for design research concerned with more-than-human agency, care, and infrastructural change: it is a mundane practice that becomes consequential through time, and it makes ethical relations materially observable through processes of maintenance and breakdown. What this project contributes to that literature is an explicitly place-based and decolonial orientation, anchored in Ngāi Tahu eco-cultural landscapes and in a research context where composting is more than a household intervention or a speculative workshop device. Composting in the context of my research is a living method embedded in institutional settings, governance constraints, and Indigenous-led partnership responsibilities. The extended duration and proximity of this study – across domestic, community, and kura sites – enabled composting to be encountered as an enduring practice that reveals how system architectures shape what forms of care, participation, and repair can persist. This sets up the shift in the next section: from composting-as-living practice to composting-as-transformative system, where the research context takes on this expansive architecture to include how Ōtautahi's organics infrastructure currently configures participation and value, what is structurally misaligned with eco-cultural wellbeing, and what alternatives become plausible when composting is treated as regenerative, relational infrastructure rather than an end-of-pipe service.

2.2 Composting as Transformative System

This research examined the formation, disruption, healing, and endurance of cultural landscapes through the lens of composting as a replicable, transformative process. At its core, this work engaged with restorative and regenerative processes in soil, composting, and Indigenous knowledge communities, amplifying the inherent restorative capacities of these collectives and placing them in dialogue with the incumbent paradigm for organic waste management. Drawing on the interconnectedness of decomposition and soil building, as well as the eco-cultural revitalisation efforts of Te Pā o Rākaihautū, this section explores how composting methodologies can support colonised landscapes toward enduring, resilient systems that honour the whakapapa of these places.

2.2.1 What Systems Are in Place Currently

In Ōtautahi Christchurch, organic waste management remains largely structured around municipal kerbside collections and centralised industrial composting. The city operates a green waste collection system that diverts organic materials from landfill, processing them at a large-scale commercial facility (Christchurch City Council, 2020). However, this system, while reducing landfill contributions, reflects corporate waste management models that separate people from the composting process itself. Organic material is treated as waste rather than a resource for localised soil restoration, and the system lacks place-based approaches that could reconnect communities with whenua and regenerative food production. At the same time, grassroots composting initiatives – ranging from urban farms and community gardens to kaupapa Māori-led land restoration projects – work outside this mainstream system, applying regenerative practices at a local scale. These initiatives represent an alternative infrastructure, one that decentralises organic waste processing and prioritises soil health, food sovereignty, and community resilience. However, they operate within a regulatory environment that often favours large-scale corporate systems over decentralised, relational, and Indigenous-led composting practices.

Home and community gardening is common in Aotearoa, and composting is intrinsic to this practice at household and neighbourhood scales. In Ōtautahi, community composting efforts include small-scale projects like those found in the dozens of School and Community Gardens around the city, where local residents compost food scraps and garden waste to enrich urban soils, though these efforts remain fragmented and under-resourced compared to municipal systems. Across Aotearoa more generally, community composting is supported by initiatives like the Compost Collective[12], and Para Kore[13], which provide education and resources to households and groups, including whānau and hapū, yet these efforts struggle to scale and transform against the dominance of industrial waste management.

Meanwhile, 85% of Aotearoa population is living in urban towns and cities (EHINZ, 2025). Despite our composting and gardening heritage, in urban areas, the majority of organic materials are disposed of or collected under the governance of local authorities, acting in turn within statutory waste management frameworks set by Central Government. At least two of Aotearoa's largest cities – Auckland and Christchurch – are moving away from managing organic waste by composting, to technologies that no longer return some or even any of this organic material to

[12] https://compostcollective.org.nz/
[13] https://parakore.maori.nz/programmes/

soils (Ecogas Limited Partnership, 2025). This study is primarily interested in the changes happening in Ōtautahi Christchurch at a city-wide scale and how thinking with composting can support a methodology for repair and revitalisation.

Composting in cities has been distorted to fit with an industrial model of collecting and processing organic materials in large volumes. City governance authorities in Aotearoa have been legally mandated to assume the responsibility of managing organic materials as a waste product (New Zealand Government, 2008). The act of depositing organic materials into a standard wheelie bin with a green coloured lid and pushing this bin to the kerbside for a weekly collection is the basic extent of human participation in this management system. From the point of collection onwards, local authorities assume the role of managing organic materials. This role has attracted significant commercial interest because of the substantial revenues generated through taxes levied against individual households to fund the provision of this service. Waste-related services, which includes collection and processing, are part of a billion-dollar industry in Aotearoa (Meier, 2023). Cities have developed organics processing plants and infrastructure around the most cost-effective forms of service delivery. In practice, this looks like fleets of heavy vehicles collecting hundreds of thousands of bins every week, amounting to thousands of tonnes of household organic materials being tipped at one central location for processing.

In Ōtautahi, the city's composting facility is identified as the Organics Processing Plant, however at the time of writing this facility is only partially functional, with budget committed to its relocation and redesign (Christchurch City Council, 2023). An anaerobic digestion technology is planned to replace composting as the processing method for the city's organic materials (Ecogas Limited Partnership, 2025). The collections system was not included in the redesign of the organics processing facility. The collection system relies heavily on residents sorting organic waste into green bins, which are then collected weekly by council-contracted trucks and transported to the Organics Processing Plant, maintaining a centralised approach that limits community involvement.

In contrast, Ngāi Tahu perspectives, rooted in whakapapa and kaitiakitanga, emphasise a relational approach to waste and land use, as outlined in the *Mahaanui Iwi Management Plan 2013*, authored by the six local sub-tribal entities that are Manawhenua for the lands and waters of Ōtautahi. The Plan defined eco-cultural systems as interconnected ecological and cultural values, stating:

> "The term 'eco-cultural system' acknowledges that there are ecological and cultural values associated with water, that these are related, and that both are integral to the relationship between tāngata whenua and land and water. For example, aquatic ecosystems are not

> separate from mahinga kai. A waterway with good flows, riparian margins and water quality enhances cultural well-being. The use of the term overcomes the division of culture and nature. The starting point when managing an ecosystem must be developing an understanding of the relationship of tangata whenua with the land and water. The protection of the eco-cultural system must be the priority for land and water management… integral to the survival of indigenous culture is restoring the ecological communities that are central to their traditional life-ways and that are woven into stories, ceremonies, songs and practices" (Te Ngāi Tūāhuriri Rūnanga et al., 2013, p. 83).

This perspective, informed by whakapapa as a connection to more-than-human entities (Hikuroa, 2017; Marsden, 2003; Roberts et al., 2004; Yates, 2016; Yates, 2021), highlights the need for resource management practices that honour these relationships. The Plan's Papatūānuku chapter further detailed Ngāi Tahu's values on waste management, drawing on traditional practices documented by Pauling et al. (2010; see also Ataria et al., 2016):

> "Ngāi Tahu have established cultural traditions and associated cultural practices in relation to managing different types of wastes, particularly those associated with the human body;
>
> These traditions continue to play a role in contemporary life and influence the way Ngāi Tahu respond to waste management issues;
>
> Ngāi Tahu issues and values associated with waste and waste management are consistent and specific with regard to maintaining the separation between food chain and human waste streams and utilising natural services (e.g. using land or constructed wetlands as a medium); and,
>
> Ngāi Tahu are solution focused, pragmatic and open to alternatives for sustainable waste management, but are limited in their ability to influence current waste management paradigms."

The *Mahaanui Iwi Management Plan 2013* also includes specific references to reducing the volume of waste entering the system through measures such as composting and recycling programmes (Te Ngāi Tūāhuriri Rūnanga et al, 2013; p. 112), and as part of design guidelines for subdivision and development – continuing the link between settlements and resource management practices:

> "While subdivision and residential land development activities can have adverse effects on cultural values, they can also provide cultural benefits, including opportunities to reaffirm connections between tāngata whenua and place… Working to ensure developments have 'light footprints' with regard to building design, water, waste and energy also provides cultural benefit and is consistent with achieving the values-based outcomes set out in this Iwi Management Plan" (Te Ngāi Tūāhuriri Rūnanga et al. (2013), p. 105).

This enabling framework aligns with Te Ao Māori principles, prioritising the protection of eco-cultural systems and the use of natural services like wetlands for waste management, while promoting composting as a means to reduce waste and restore relationships with whenua.

However, the centralised, industrial system in Ōtautahi has failed to give effect to these values, separating communities from the composting process and neglecting the cultural and ecological integrity of the landscape. The tension between industrial efficiency and Ngāi Tahu's relational approach set the stage for examining the shortcomings of the current systems in the next section.

2.2.2 What's Wrong with the Systems in Place

The current waste management paradigm in Christchurch prioritises efficiency over relationships, treating organic materials as part of a mechanised system rather than a living cycle. This reinforces a linear, extractive economic model, where waste is managed at scale rather than reintegrated into local eco-cultural systems. As Dallyn et al. (2024) argue, dominant sustainability narratives often promote corporate-friendly solutions while ignoring the structural changes necessary for genuine ecological regeneration. This is evident in how composting is managed – kept within centralised, regulated frameworks that prioritise economic viability over ecological reciprocity. More critically, the existing system reflects a settler-colonial governance of land and resources. Composting in this context is disconnected from Indigenous ecological knowledge and reproduces settler-colonial logics of land control. As Moewaka Barnes & McCreanor (2019) discuss, settler-colonial systems persist by distorting relationships to land – viewing whenua as property to be managed rather than a living entity requiring whakapapa-based stewardship. By outsourcing composting to corporate and municipal structures, these system designs render as structurally marginal, and contribute to erasure of the Indigenous-led methods that prioritise whanaungatanga (relational wellbeing), reciprocity, and long-term ecological restoration. This has led to the following core problems with organics material management in Ōtautahi:

- No source separation of organic materials - besides green, red, yellow bin system – and the exclusion of 'uncompostable organics' resulting in these materials being landfilled (Christchurch City Council, 2024);
- No acknowledgement of historical harm and ongoing damage to cultural landscapes and ecosystems.

If we think with the cultural landscape context for this study – coastal wetland forest and home to a deltaic Indigenous culture (Reid et al., 2025) – the way organic waste management is being planned and operated arguably does not represent a form that is appropriate for where it is located. Further, the distortion of composting methodologies for commercial priorities have clearly separated these practices from the archetypal abundance, prolific digestive functions and liveliness of thriving wetland forest ecosystems. It has also separated the practice of kaitiakitanga

for organics from Māori communities, and implicitly denies this for many households in Christchurch. This ultimately impacts on the ability to practice mahinga kai and its many dimensions of eco-cultural system care.

The practice of mahinga kai is of high cultural value to Ngāi Tahu and the land base for this extended across Te Waipounamu, the South Island (Te Ngāi Tūāhuriri Rūnanga et al., 2013). Traditionally, Māori settlements were interdependent with food gathering areas – including more seasonal locations known as kainga nohoanga – connecting communities and their places of sustenance, wellbeing and identity (Tau, 2016). Following the arrival of colonial settlers and the signing of Te Tiriti o Waitangi | The Treaty of Waitangi ('Te Tiriti'), large blocks of land were purchased from local Iwi by agents of the Crown of England. Settlements have been confined to the Māori Reserves that were allocated as property titles following lands sales, although these reserves are small percentages of the land area that was stipulated to be set aside in the contracts for these land sales (Te Rūnanga o Ngāi Tahu, 2025). Not only did Māori lose sovereignty over land and resources, they also lost governing authority over the means to economic prosperity. Local chiefs were also forced to sign purchase agreement contracts at short notice and under the threat of losing all lands entirely if not signed. Further, access to mahinga kai sites outside of these reserves was often restricted by the new private landowners and eventually displaced altogether through changes in land use for intensive farming, housing and civic infrastructure. This context is important in this study as it amounts to the rifting of Indigenous people and land in Aotearoa – explored further in Chapter Three.

The cultural landscapes of Te Ihutai, a place of immense cultural, ecological, and historical significance for Ngāi Tahu, have been central to the metabolic rift in Ōtautahi Christchurch's organic waste management systems. For over a century, under local authority governance, Te Ihutai has become a dumping ground for the city's waste, its confiscated lands degraded by industrial infrastructure. The Wastewater Treatment Plant (WWTP) occupies Māori reserve land (MR900 Te Ihutai), which was compulsorily acquired by local government with inadequate compensation in 1956, further misappropriating land originally set aside in honour of contracted purchases (Lenihan, 2014). The WWTP pumps treated wastewater into the coastal marine environment, contravening Ngāi Tahu's cultural preference for using land or constructed wetlands for discharges (Ataria et al., 2016; Pauling et al., 2007, 2010). A 2021 fire at the WWTP caused severe odour issues and limited sewage treatment capacity for months, exacerbating ecological harm in the area.

Adjacent to the WWTP, the Organics Processing Plant (OPP), though planned for relocation, occupies land near the confiscated MR900 site, its use commodified for commercial purposes under the guise of waste minimisation and public benefit. Yet, this process has no beneficial relationship with Te Ihutai's cultural health. Over 100 hectares of surrounding council-owned land was used as landfills that are now closed but remain at risk of leaching contaminants into Te Ihutai and its tributaries (see Figure 2). Cultural health monitoring scores Te Ihutai poorly, with its ecological health so compromised that provisioning food from this environment poses risks to human health and cultural practices (Lang et al., 2012; Pauling et al., 2007). The underlying soils and ecology, once part of an abundant eco-cultural system, have been severely disrupted by urbanisation and industrial activities, requiring multiple generations of repair to mend these metabolic rifts. This highlights the difference between decomposing and degenerating: while the status quo assumes it is managing organics, it is complicit in the degeneration of Te Ihutai's eco-cultural systems. These conditions illustrate ecological degradation and a structural separation between metabolic processes and the communities historically responsible for their care. This separation, conceptualised later through metabolic rift theory, is material and infrastructural: participation in decomposition is displaced from households and hapū into centralised systems whose logics are privileged economically before they are careful and relational.

Figure 2: A map showing old landfill sites identified as at risk from climate change by Christchurch City Council (CCC). Red sites are on land owned by the CCC. Pink sites are privately owned land. The main water body in the centre is Te Ihutai, although before colonial settlement this would

have been much larger and contiguous as a coastal wetland ecology. The current location for the Organics Processing Plant is circled in green. MR900 Te Ihutai is circled in light blue.

2.2.3 What's the Opportunity

Reframing composting as a decolonial, place-based practice presents an opportunity to shift Christchurch's waste management paradigm from an extractive, centralised system to a network of localised, relational composting sites. Composting, as Lange (2024) argues, is more than just an ecological process; it is a way of breaking down harmful ideologies and repatterning relationships with the living world. This aligns with kaupapa Māori-led initiatives that see composting as an act of cultural and ecological resurgence – not just waste management, but an integral part of whenua-based healing, kai sovereignty, and long-term ecosystem regeneration. Te Pā o Rākaihautū and other kaupapa Māori projects offer models for how composting can serve as both an ecological and social intervention. These initiatives demonstrate that composting is not just about organic material breakdown – it is a tool for reconnecting communities to whenua, challenging settler-colonial governance logics, and embedding regenerative practices into daily life. Composting in this context is a methodology of resistance and repair, transforming extractive waste systems into flourishing, interconnected ecologies. By challenging the dominant models of organic waste management and advocating for decentralised, Indigenous-led composting infrastructures, our cities can become places of composting-as-transformation. The opportunity is to reclaim composting as an act of whakapapa, an assertion of mana, and a strategy for healing the land and people together.

This opportunity begins with using organic materials to power up alternatives and channel metabolic energy from soil and decomposing micro-organisms into the restoration of degraded landscapes. There are many sites to test this on, including the Ōtākaro Avon River Corridor (Figure 1.) and the areas identified in Figure 2 for example. Rather than funneling organic waste into an anaerobic digester, it could be redirected to composting sites that remediate sites like Te Ihutai, leveraging microbial activity to rebuild soil health and filter contaminants. This shift requires a change in mindset from waste minimisation to regeneration, viewing organic matter not as a problem to be managed but as a resource for ecological renewal.

Thinking with the languages of natural abundance to diversify nutrient flows into significant benefits and returns offers a transformative vision. By mimicking the prolific digestive functions of wetland ecosystems, composting could supercharge nutrient cycles, supporting food sovereignty and revitalising cultural practices like mahinga kai. Te Pā o Rākaihautū exemplifies this, where

composting integrates with land restoration to foster community resilience and education. Organics systems in Aotearoa are competing with the economics of landfills and dominated by large corporate commercial interests and controlled through industry professional-bureaucratic complexes. Yet, reframing composting as an act of whakapapa disrupts these dynamics, offering a decolonial alternative that heals whenua and people together, and is mana enhancing.

2.3 Composting as Ancient, Eco-Cultural Infrastructure

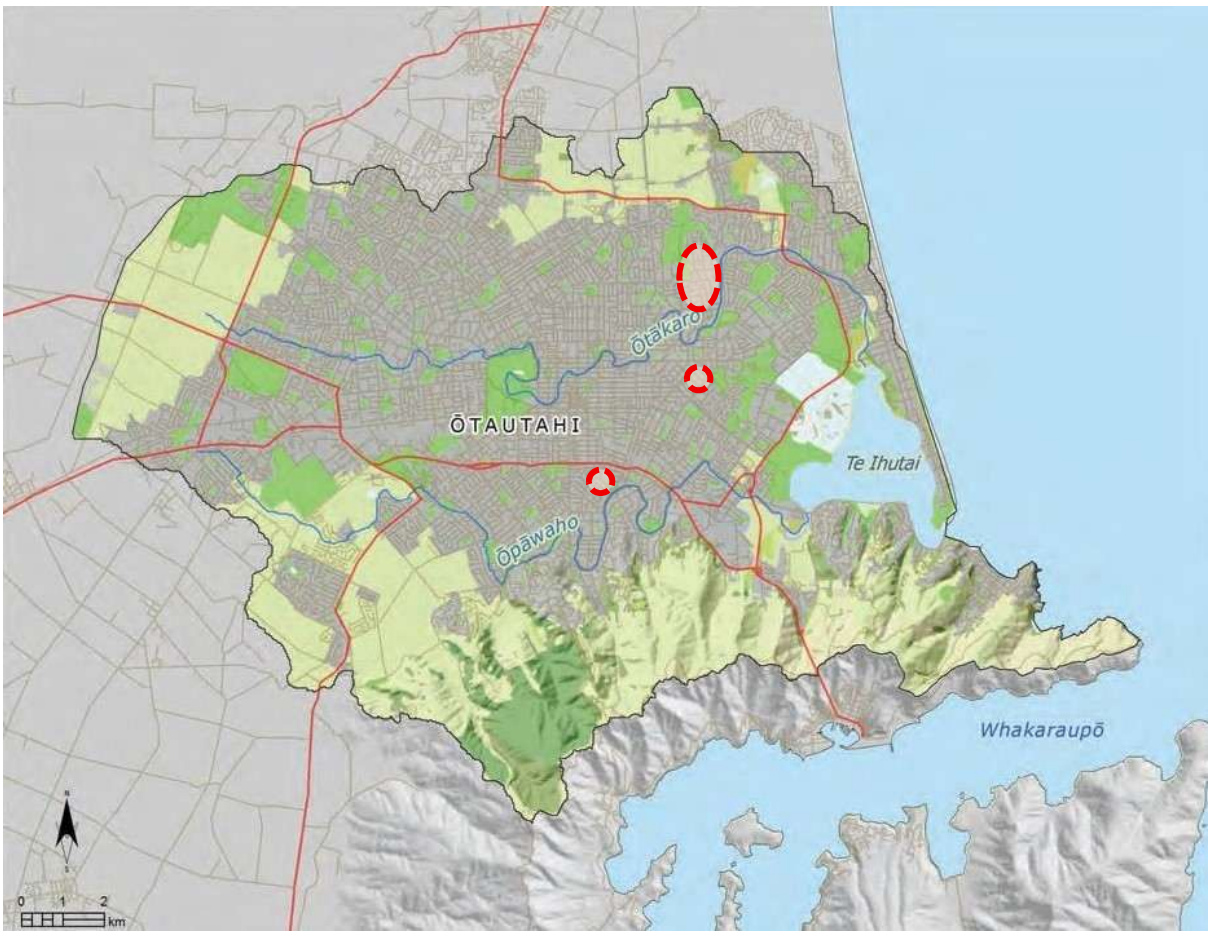

Figure 3: A map of Te Ihutai as a catchment (Te Ngāi Tūāhuriri Rūnanga et al., 2013). Dotted red lines indicate the sites of Seven Oaks (bottom), Te Pā o Rākaihautū (middle), and Te Ōraka (top).

The ancient ecological infrastructure of Ōtautahi Christchurch emerges from the coastal wetlands that sit upon the dynamic confluence of the Pacific and Indo-Australian tectonic plates, where the westerly flows of the ‘roaring 40s’ latitudes meet Te Waka o Aoraki, Te Waipounamu and the South Pacific Ocean, and where braided rivers flow from the Southern Alps, down the Canterbury

Plains to meet the coastal environment – Te Poupou o Rokohouia Delta (Reid et al., 2025). Known as Kā Pākihi Whakatekateka a Waitaha, the Canterbury Plains form a vast, fertile expanse shaped by glacial and fluvial processes, cradling the eco-cultural landscapes of Ngāi Tahu. Within Ngāi Tahu oral traditions, Kā Pākihi Whakatekateka a Waitaha is revered not only for its expansive fertility but also as a testament to the journeys and settlements of their ancestors. This vast plain was a crucial corridor for seasonal migrations, facilitating access between the abundant mahinga kai available from the mountains to the sea. The name itself reflects a landscape prepared and adorned, indicative of its readiness to support and sustain human life.

These landscapes were once much richer with biodiversity, supporting a web of life that included wetlands teeming with fish, birds, and plants vital to Māori sustenance and identity. Customary species such as tuna (eel), inaka (whitebait), and pātiki (flounder) thrived in these ecosystems, forming the cornerstone of mahinga kai practices that were integral to Ngāi Tahu's way of life. The whakapapa of Hineahuone, formed by Tāne from the sacred red clay of Kurawaka, underscores this deep interconnection between humanity and whenua (Hutchings & Smith, 2020; Roberts et al., 2004). According to this tradition (Taonui, 2006), Tāne crafted Hineahuone from the earth, and upon breathing life into her, she sneezed, giving rise to the phrase "tihei mauri ora" – the sneeze of life – a testament to the intimate bond between people and the land.

This origin story is not merely symbolic but a lived reality in places like Te Ihutai, where the confluence of the Ōtākaro and Ōpāwaho rivers created fertile soils. The sandy soils at the mouth of the Ōtākaro, enriched by estuarine nutrients, were historically ideal for cultivating kūmara and aruhe (Pauling et al., 2007), staples that sustained Māori communities and reinforced their relationship with the land (Mahaanui Kurataiao Limited, 2022). The cultivation of these crops would have involved methodical soil preparation (Williams 2004) and adherence to seasonal rhythms, embodying tikanga and mātauranga passed down through generations. This connection between Hineahuone and Te Ihutai's soils reflects a profound relationship: just as Hineahuone was shaped from the earth, the soils of Te Ihutai have shaped and sustained human life through their fertility and capacity to support essential crops. Moreover, atua such as Papatūānuku, the earth mother, and Tāne, the progenitor of humankind, are deeply revered in this context, symbolising the life-giving properties of the land and its vegetation.

The trajectory of composting infrastructure has shifted markedly over time. The transition from localised, community-centered composting – deeply embedded in mahinga kai and kaitiakitanga practices – to centralised, industrialised systems reflects broader socio-environmental changes. This evolution has often led to the marginalisation of indigenous practices and disconnection from

the land's cultural and ecological rhythms. Te Ihutai, once a vibrant source of life, now bears the burden of adjacent wastewater treatment plants and closed landfills, leaching contaminants into the estuary and severing the link between people, land, and kai production. The historical grievances associated with this site, particularly the compulsory acquisition of Māori Reserve land in 1956 for sewage treatment purposes, have left enduring wounds within Ngāi Tahu communities. Acknowledging this history is crucial, as it recognises the sensitivities and complexities surrounding current and future engagements with Te Ihutai.

The potential dimensions of composting as ecological infrastructure lie in reimagining it as a biological system rooted in these cultural landscapes. By decentralising composting into community-led sites, organic waste could be transformed into a resource that heals degraded areas like Te Ihutai, restoring soil fertility and supporting indigenous biodiversity. This approach resonates with the principles of the ancient infrastructure – liveliness and connectivity – integrating them with contemporary ecological knowledge. It offers an opportunity to revitalise mahinga kai practices and re-establish the reciprocal relationships that are foundational to Ngāi Tahu's eco-cultural heritage in these landscapes.

In alignment with this vision, my research undertook composting trials at three sites within the Te Ihutai watershed: McLean Street, Linwood – the site of Te Pā o Rākaihautū; Horseshoe Lake Reach of the Ōtākaro (ŌARC), known as Te Ōraka Pā; and, Seven Oaks in Waltham, in close proximity to the historic settlement of Ōpāwaho, also the name now associated with the river close by. These sites were selected through situational opportunities unique to my existing positionality and the relationships of collaborators to this project (this is explored in more detail in Chapters Five and Six). They were also selected for their potential to serve as models for community-led composting initiatives. Each location embodies unique characteristics and challenges, yet collectively, they exemplify the transformative potential of reconnecting organic waste management with the cultural and ecological fabric of the landscape.

As a Pākehā practitioner working within Ngāi Tahu landscapes, my engagement with these eco-cultural infrastructures required continual reflexive attention to authority, legitimacy, and partnership boundaries. Composting here was not an attempt to recover Indigenous practice, but to support Indigenous-led aspirations through material contribution and infrastructural alignment. The soils of Te Ihutai, intertwined with Hineahuone's whakapapa, offer a foundation for this potential: a regenerative system where organic matter cycles back into the earth, sustaining both ecology and community in a manner that honours the past while building a resilient future. In this endeavour, the wisdom encapsulated in the whakataukī, "Toitū te marae o Tāne, toitū te marae

o Tangaroa, toitū te iwi" (If the domain of Tāne is healthy, and the domain of Tangaroa is healthy, so too will the people be healthy), serves as a guiding principle, emphasising the interconnectedness of environmental and human well-being.

CHAPTER 3: THINKING WITH COMPOSTING

This chapter deepens the conceptual and theoretical groundwork underpinning this research by exploring key ideas that have emerged throughout the study. It seeks to clarify the foundations of this inquiry by elaborating on central terms and frameworks, drawing on the contributions of Indigenous scholars, knowledge holders, and critical academic thinkers. In doing so, I aim to establish the conceptual parameters and genealogies that this study relates to, while also identifying the intellectual terrain within which its unique contributions can be meaningfully asserted. This chapter does not offer a traditional literature review, but rather traces the whakapapa of ideas that have shaped the research, positioning them in relation to wider scholarly and cultural conversations. Methodologically, this chapter also makes explicit that *Decolonising Methodologies* (Smith, 1999) is not simply a contextual reference point in this thesis, but a driver that shaped how the research could be conducted ethically, what forms of participation were appropriate, and how accountability was maintained across relationships, sites, and institutional interfaces.

3.0 Thinking with Composting

"Thinking with Composting" is used in this project to establish that non-human things, like plants and animals, have their own power and agency in the living world. It looks at how we are connected to and care for the living world beyond just humans. Indigenous ways of knowing and practices of care for the more-than-human world inspire and guide this research and are articulated here as foundational. ‘Thinking with’ is language used by researchers in the field of more-than-human geography (Goburdhone & Dombroski, 2023; Haraway, 2015; Haraway, 2016; Krzywoszynska et al., 2020; Salazar et al., 2020) to position research on different grounds to Western cultures of environmental domination, “...inviting scholars to openly experiment with different ways of thinking, researching and storying in times of ecological crisis and disruption” (Dombroski et al., 2022). *Thinking with compost* is an invitation to think with living worlds in relational terms, as a diverse community, as compatriots, as collectives that the human communities in this story are working *with.* This is important because it decentres myself as the individual researcher doing all the caring for soil and communities in this study (Puig de la Bellacasa, 2017; Puig de la Bellacasa, 2014). This framing also aligns with more-than-human design research, where “thinking with” is articulated as designing-with humans and nonhumans in relational, accountable ways (Wakkary, 2021; Keune, 2021). In this project, composting becomes the primary site through which such designing-with is enacted. Read through a first-

person design lens, composting in this study functions as lived infrastructure – closer to “living in a prototype” than to a bounded intervention or speculation – where maintenance, care, breakdown, and repair are constitutive of what can be known (Desjardins & Wakkary, 2016).

Recent more-than-human design research provides language for this move. Following Wakkary’s (2021) shift from human-centred design toward *designing-with* – where humans are decentered and accountability is distributed across human and nonhuman agencies – composting can be understood as a designed-and-designing relation that I enter into through practice. Keune’s work on “designing and living with organisms” offers a compatible orientation here: knowledge emerges through sustained entanglement and the iterative ethics of living-with, rather than through distancing the researcher from the living system. The shift to thinking and designing with the living world is important for building a study on ethical grounds in terms of *how* to care, rather than just the material *what* we are caring for (Bellacasa 2017). Thinking with composting in the context of this study focuses specifically on the urban environments of Ōtautahi Christchurch, a city that has more recently been thinking with composting through the lens of organic waste management. It is commonly accepted that organic waste management is required so that the ‘what’ in this equation – organic materials – are not sent to landfill. There are problems with *how* this organic material is being managed as waste in Ōtautahi and therefore an inquiry into the thinking that is driving this system is warranted. The main points of the chapter and theoretical drive of this study are my expectations that thinking with composting:

1. Considers the specific Māori context and key cultural concepts from Te Ao Māori perspectives.
2. Prioritises care for soils, with soils, making soils visible as partners in the context of organic waste management.
3. Benefits from analytical tools like Metabolic Rift Theory to describe separation created by the dominant forms of organic waste management.
4. Can learn from the mycelial world as a theoretical and conceptual foundation to the rift-repair methodology – a literal and pre-figurative reconnecting of dispossessed and disrupted cultural landscapes.

Why thinking with *composting*? Composting is restorative socially, ecologically and culturally – but, as seen with the failure of the organics plant in Christchurch, it matters *how* composting is done for it to be effective. In my experience, when done well, and done collaboratively, composting feeds life that builds connectivity below ground in soils and reconnects people above ground with whenua. Thinking with composting and Te Ao Māori in the specific cultural context of Ōtautahi

and Te Pā o Rākaihautū is to think with Ki Uta Ki Tai (Reid et al., 2025) – a 'whole of landscape' approach (Hutchings & Smith, 2020). Composting is accepted within the specific Māori cultural context of this study because it embodies a way of upholding whakapapa, enhancing mauri, and supporting the practice of kaitiakitanga. These key cultural concepts are considered further in the next paragraph, after which the 'care-full' (Dombroski et al., 2018; Sharp, 2019) approach to the project is discussed with a particular focus on embodiment and ethics as practiced through composting. The theory of metabolic rift is introduced as an analytical tool and applied to the conceptual drive of this project. Finally, the interconnectedness and symbiotic relationality of mycelial life – the unseen fungal webs threading through composts and soils – is discussed in last section of this chapter. Altogether, these texts and critical concepts from the literature will frame the methodology of rift-repair for the colonised landscapes at the heart of this practice-oriented project.

3.1. Te Ao Māori: Whakapapa, Mauri and Kaitiakitanga

Māori communities are important partners to this research project where nurturing soils and thinking with composting are common grounds and natural priorities that I can connect through. These natural priorities are woven throughout the local indigenous knowledge systems of Aotearoa – better known as Mātauranga Māori (Hikuroa, 2017). Mātauranga Māori references more-than-human worlds to form bonds to landscapes, to biophysical entities, through whakapapa; the kinship ties between human and non-human beings (Roberts et al., 2004; Yates, 2016; Yates et al., 2022). Mauri is considered as the life forces and energy fields associated with all entities in the living world, material and immaterial (Yates, 2016), as the energy that binds the physical and spiritual states of soil (Hutchings & Smith, 2020). Kaitiakitanga – an ethic of care and stewardship concerning the living world – is considered as inherent when tending to mauri (Dionisio et al., 2023; Yates, 2021). Mauri, Whakapapa and Kaitiakitanga are considered further in the following paragraphs to highlight their importance to this research project. While more-than-human design scholarship offers useful language for relationality and co-constitution, this research does not treat Mātauranga Māori as an example of a theoretical turn. Rather, whakapapa, mauri, and kaitiakitanga are understood as living knowledge systems that precede and exceed contemporary design discourse, and which ground the ethical conditions under which composting is practiced in this study.

Mauri is located within Te Kore, the “formless void” that is sometimes referenced during the recital of whakapapa – the genealogical framing Māori use to locate entities in relation to primordial roots and ancestral origins (Roberts et al 2004, p. 3; see also Yates 2017; Yates et al 2022). Humans are considered as teina (junior relatives) in this lineage that live amongst and can tend to the vitality of mauri, of all things as connected through whakapapa, and through the life-field(s) that is mauri (Yates 2016). Mauri is life force that anyone who cares to look will see when working respectfully across human and non-human worlds. Thinking with composting is to purposefully and attentively work with the mauri of decaying organic matter, through a process of transformation that brings forth new life forms and liveliness, connecting outwardly as a revitalised life force in the living world.

Whakapapa is considered for its inherent power to centre and prioritise the iterating and layering nature of life, as ties that bind humans and the natural world, and as an important way of knowing, of locating a person or a thing in time and in space (Yates 2016).

> “Traditionally, these genealogical relationships aided our movements through this world. They helped us to understand our relationships to the trees, to the animals and the elements, and their relationships to each other. Whakapapa helped us to consider the consequences of our actions across multiple spaces, and make sense of what was happening around us. Indeed, relationships – whakapapa – are regularly cited as a foundational principle of Te Ao Māori” (Ngata, 2018).

Whakapapa is a Māori mental construct for a multi-species genealogy, an interconnected living world with layers on layers of natural orders that span material and non-material entities (Smith and Hutchings 2020; Yates 2016; Roberts et al 2004). Whakapapa is about connectivity and how life is “always coming into presence” (Yates 2016, p. 265). In many ways, composting concerns the act of layering, a whakapapa of, organic materials as a methodology for revitalising soil health that is done with respect to all living worlds. There are many soil pūrākau (ancient legends) across the Iwi (Māori tribes) of Aotearoa, some of which “embed [Māori] beginnings as a people in Hine-ahu-one (see Figure 4 and paragraph below), making visible Māori names and associated meanings of the soil” (Hutchings and Smith 2020, p. 19). Hutchings and Smith (2020) identify composting specifically when framing whakapapa within the Māori Indigenous Food Sovereignty verification system called Hua Parakore:

> “The kaupapa of whakapapa within a Hua Parakore framework is a call to protect the integrity of soil through natural practices such as composting... it requires sustainable land management practices and forgoes a singular focus on economic productivity, instead prioritising soil health and wellbeing.” (Smith and Hutchings 2020, p. 21).

This project is positioned in service of supporting the integrity of whakapapa as understood and held by mana whenua partners, and of aligning composting practice with those responsibilities where I am invited to participate. This includes forming respectful relationships with deities, particularly those most closely related to composting and soils. Some of these deities are identified in the following quote from Harmsworth (2020) and shown in Figure 4 below from Roberts et al (2004, p. 6).

> "Tāne is a celebrated figure. Among his many feats was the creation and moulding at Kurawaka of the first woman, Hine-ahu-one, whom he formed from the soil and then breathed life into. Tāne had a daughter named Hinetītama... it is said these are the ancestors of humankind" (Harmsworth 2020, p. 31, in Hutchings and Smith 2020).

There are many Atua and respective domains that could be considered, the whakapapa of composting practices in this study primarily relate to the domain of Hineahuone (Harmsworth 2020; see also Boasa-Dean and Bryce-Hare in Hutchings and Smith 2020). Many of the specific 'agents' of composting are identified in the previous chapter (see section 2.1.1), but these are not explored in depth in this study in terms of a whakapapa. For the purposes of this study, a thinking with whakapapa and composting is more of a commitment to trace and remain accountable to the many layers of relations – microbial, material, cultural, and institutional – through which soil repair becomes possible.

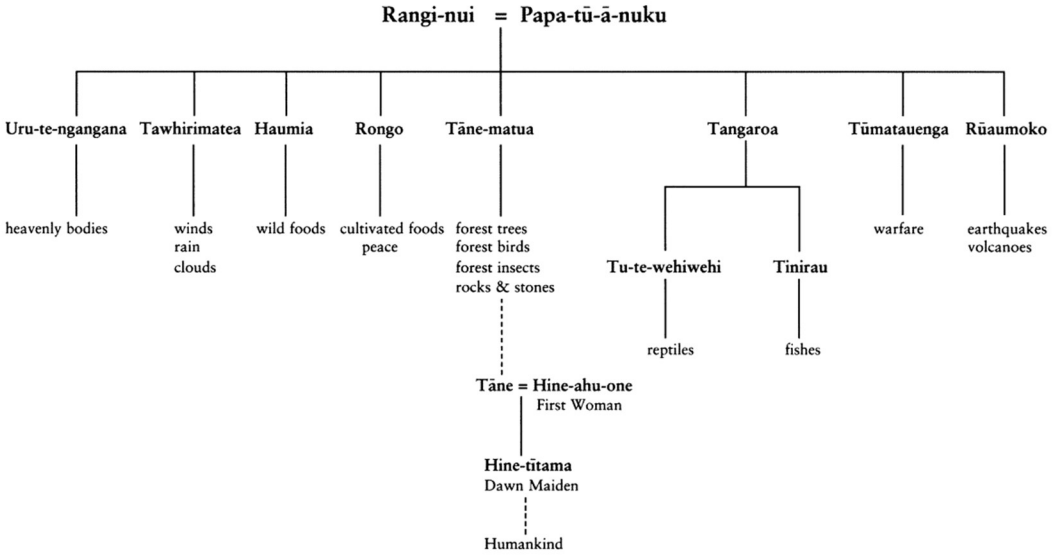

FIGURE 1. A whakapapa of the children of Rangi-nui and Papa-tū-ā-nuku.
Source: Adapted and much abbreviated from Best 1982; 1995.

Figure 4: A whakapapa of the children of Rangi-nui and Papa-tū-ā-nuku (Roberts et al 2004, p. 6).

How can thinking with composting uphold whakapapa and tend respectfully to mauri? Whakapapa has natural consequences, whether you think with these or not, the ties between the living world, humans and our actions are inextricable and ever-present. When thinking with composting, upholding whakapapa means we need to think with the origins and life cycles of the individual materials we introduce to our community, of their respective life forces, and collectively of their interconnectedness with all that is living within soils, including the atua it descends from. Where did each material come from? What kind of life force does it possess and how will this interact with other life forces present in this soil? These are just a few lines of inquiry to start with. Thinking with composting that upholds whakapapa means we are responsible for locating, sequencing and prioritising natural orders as well as the living entities bound within this process.

The natural consequences of whakapapa and composting practices are important considerations because they involve relationships with life *and* death. Composting is a process through which life cycles complete and new life springs forth. During processes of decay, life forces impel and interact inwardly, while transforming and emanating outwardly as new life forms. Thinking with composting means reconciling that composting practices are also about curating end of life journeys[14] in ways that revitalise mauri for the benefit of future generations, both human and non-human. The alternative is this energy/mauri is mis- or displaced from a natural order, such is the potential with a 'waste to energy' system for example. These recent technologies subvert the natural order of organic decomposition by not returning these materials to soil in their entirety, or in ways that promote healthy soil ecologies. Wherever we stand, when we are thinking with composting to uphold whakapapa, we are honouring where mauri has come from and how we might impact on what it will become.

With whakapapa comes responsibility to care for local environments, and this is understood as the practice of kaitiakitanga. Kaitiakitanga in the context of this study starts with respect for Mātauranga Māori, and as a Pākehā, my view is a respectful approach to careful and ethical interaction with the living world, with Te Ao Turoa, should lead with the question of 'how to care?' (Puig de la Bellcasa, 2017). Careful ethical encounters with the living world are explored in the following section of this chapter (section 3.3). In the simplest terms, upholding whakapapa and tending respectfully to mauri through composting means returning materials to soil so that their life forces can be reconstituted within a domain that is coherent with its origins. This *coherence* is

[14] I must acknowledge my brother Oliver here who has cast composters as being 'undertakers' for organic wastes. A grim and grimy task, but a dignified and necessary part of life no less.

important because it represents the theoretical potential for upholding the connectivity of whakapapa ties as they relate to soils and eco-cultural landscapes, with both their physical and spiritual states, and with both human and more-than-human communities. The current ontological form of organic waste management needs to be challenged, precisely because it explicitly lack this coherence. Thinking with composting to generate a repair-methodology could restore connectivity between communities, and restore coherent whakapapa ties between tangata and whenua.

The theoretical drive of this study is to identify the conceptual foundations for an ontological shift. This is a shift from degenerative organic waste management to thinking with composting methodologies that prioritise living systems, natural orders, and a responsibility to tend to the mauri of soils. Upholding whakapapa and tending to mauri are a relationship with organic materials based on respect and reciprocity with Te Ao Māori and atua Māori, not least Papatūānuku, Ranginui, Tangaroa, Tāne, Parawhenuamea and Hine-ahu-one – all essential characters in the stories of transformations inherent in Te Ao Turoa – as it plays out from the mountains to the sea – Ki Uta Ki Tai. We are interacting with the whakapapa of these deities when we are tending to mauri in composting methodologies. This is an obligation and a responsibility with an inextricable ethic of care that is inherent in this whakapapa. While there is much, much more to consider beyond the simple statements I am making here, the culturally, locational- and place-specific, ethical practices of different Iwi – what I understand as appropriate is known in Te Ao Māori as *tikanga* (Mead, 2016). Tikanga is one critical consideration not discussed here in this study and that is because I am not an authority on this matter. And with that omission taken as critically acknowledged, part of my understanding of the practice of kaitiakitanga is reflected in the following quote:

> "[whakapapa] emphasises to humans the fact that their environment and its resources are both ancestors and kin… therefore, rather than a relationship of unrestrained exploitation of one's tuakana (senior) kin, a relationship based on respect and reciprocity is obligatory" (Roberts et al 2004, p. 5).

The quote above from Roberts et al (2004) speaks to the appropriate kind of relationships with organic materials that are required when we are thinking with composting. In the context of this study, we can ask the question of how organic waste management systems are involved in these natural cycles, and what this relationship looks like in practice. Is this organic waste system a management practice that is reciprocating with soil, is it respectful to Hine-ahu-one?

In my experience, commercial and industrial composting practices – the status quo for organic waste management systems in Aotearoa – are typically commissioned, managed and regulated

on how well they *isolate* natural processes from the living world. This is structured around avoiding, mitigating and remedying *adverse* environmental effects, and stipulated through policy and legislation such as the *Resource Management Act 1991* (New Zealand Government, 1991, Williams 2004). It is primarily done for the purpose of maximising financial and economic benefits for governments and private corporations that do not prioritise reciprocity and respect with Indigenous knowledge and eco-cultural systems. I argue that this type of relationship not only dishonours the life forces that organic materials contain, including their immaterial emanations, it also displaces and disconnects the mauri of organic resources from their inherent natural orders. And in doing so, this effectively becomes a negation of kaitiakitanga, of the responsibility for organics system managers to uphold whakapapa and tend to mauri through composting, through reciprocity with soil as a living system.

> "One cannot understand how to contribute to healthy soils without understanding the connections to wider ecological, social and cultural systems" (Hutchings and Smith 2020, p. 22).

As a coherent, eco-culturally appropriate practice, organic waste management would otherwise tend to the mauri of soils, to enhance their vitality, to revitalise Hine-ahu-one. I argue this ethic – contributing to healthy soils in connection to wider eco-cultural systems – is no longer the understanding reflected in priorities leading Ōtautahi's organics system today, and that this is contributing to an *incoherent* disconnect between organic waste management systems and the responsibility to tend to the mauri of soils. Thinking with composting through Te Ao Māori concepts prioritises respect and reciprocity towards soil and its liveliness, and it prefigures an alternative to the status quo, a revitalised ontological position (Wakkary 2021) on the design of organic waste management systems.

Thinking with composting is therefore not simply a metaphor or a method – it is a commitment to a worldview in which layered, multispecies relationships are central to ethical action. In the context of Aotearoa and this study, it is a way of working that attends to whakapapa and mauri as more than abstract principles, but as living, breathing dimensions of place, responsibility, and interconnection. To uphold the whakapapa of composting is to acknowledge the genealogical ties that bind humans to whenua, to atua, and to the ongoing cycles of decay and renewal that sustain life. It is also to honour the practice of kaitiakitanga as an embodied, relational ethic – grounded in the everyday acts of tending, caring, interacting with and listening to the more-than-human world. In the context of colonised and rifted landscapes such as those found in Ōtautahi, these commitments require a careful, situated, and reparative approach. The next section considers what it means to enact this care – in practice and in place – through what I describe as careful

encounters: grounded, attentive, and ethically entangled engagements with soil, community, and whenua.

3.2. Care Ethics in Composting Practice

In this next section, I explore thinking with composting with respect to care ethics in our encounters with the living world. All throughout Aotearoa, human collectives are enlisting non-human collectives of microorganisms to do the work of composting. This collaboration is typically built on a conscious and collective taking of responsibility, to do composting work, that enacts care for dead and decaying material within the living world. Taking responsibility as collectives sits well with the key cultural concepts from Te Ao Māori considered above. Indigenous academic researchers identify our interactions that entangle us with the living worlds through whole cosmologies that narrate these connections as a 'woven universe' (Marsden, 2003). Collaboration with the 'more-than-human' world is an established, grounded theoretical standpoint, and a sensible place to plant some of the thinking driving this study. By acknowledging and uplifting all partners to this project, including the non-human, the work can better explore the question of what the possibilities are for composting as a repair-methodology in specific cultural contexts. Wakkary frames this more-than-human turn in design as a commitment "to seek possibilities that are sustaining and accountable… a relational ontology" (Wakkary, 2021, p. 4), drawing on Barad and Haraway, and on Puig de la Bellacasa's articulation of Haraway's relationality as "thinking with". In this thesis, "thinking with composting" connects with a practice of designing-with – designing with humans and nonhumans in ways that are fundamentally expansive and relational (Wakkary, 2021). Care ethics in this project is therefore more than a theoretical overlay; it is an operational requirement for collaborating with microbial life as the executors of decomposition.

Academic researchers have long theorised that material worlds participate in shaping human worlds (e.g., Bennett, 2004; Whatmore, 2006), and this has since been sharpened in more-than-human design research that explicitly asks what it means to design-with nonhumans as co-constitutive participants (Wakkary, 2021; Helms, 2024; Wun & Wakkary, 2025). Just as other researchers have recognised the pre-dominance of micro-organisms such as non-human bacteria that constitute significant proportions of our human bodies (section 2.2.1), researchers in multiple fields have considered what it means to be *thinking* with non-humans and thinking about our entanglements with more-than-human beings (Tsing, 2015). Wakkary describes constituencies as "the assembly of humans and nonhumans from which designers of things are gathered to go on to design things and form biographies" (2021, p. 201). This is useful for my

project because composting can be read as a constituency-forming practice: each compost heap assembles humans, microbes, tools, materials, norms, and site conditions around shared matters of concern (odour, contamination, food safety, labour, learning, whenua vitality). It also clarifies why autobiography matters here: if biography is the configuration of life forces that inscribes itself through what is designed and what is left behind (Wakkary, 2021), then my own situated practice – and the institutional and political contexts it enters – becomes part of the accountability of this work.

These researchers have also created a field where our entanglements with the more-than-human are studied as relationships (Krzywoszynska, 2019; Krzywoszynska & Marchesi, 2020; Puig de la Bellacasa, 2014). These approaches to research have theorised how encounters with more-than-human worlds help us learn to be affected and embody more caring relationships *with* non-human beings (Puig de la Bellacasa, 2014, 2017, 2019).

> "Feminist visions of how to transform capitalism, how to think ecologically (about economics), demand an analytical and political project that connects particular sites of practice and resistance that acknowledges care work" (Harcourt & Bauhardt, 2019, p. 13)

This is directly relevant to composting-as-method in this study because care work here is not ancillary labour; it is the practice through which ecological and institutional relationships are tested, negotiated, and potentially re-patterned. These fields of research show us more than the possibilities of new thinking, they support politically engaged and responsive work by human and non-human-collectives (Dombroski, 2018; Gibson et al., 2015; Harcourt & Bauhardt, 2019, Wakkary 2021). This shift in perspective further pushes care beyond sentiment and theoretical critique, and positions it as a materially enacted relationship that teaches humans how to be affected by more-than-human worlds (Puig de la Bellacasa, 2014, 2017, 2019; Krzywoszynska, 2019; Krzywoszynska & Marchesi, 2020). In composting, the ethics of care becomes legible through what the heap permits and what it refuses – through heat, smell, moisture, texture, and the consequences of contamination – making relational accountability practically unavoidable.

I work with composting organisms as non-human counterparts, nurturing soils as a foundation for food sovereignty (La Via Campesina, 2021). I am not alone in doing this (Puig de la Bellacasa 2013, Zhou et al 2024). Recent work in more-than-human design and HCI has highlighted both the promise and limitations of designing with living systems. Zhou et al. (2024, p.3) note that despite a long-standing recognition that living media can foster empathy, shared vitality, and motivations of care, there remains "a lack of longitudinal studies involving living

artefacts," largely due to the technical and practical challenges of sustaining biological systems over time.

> "[We] recognize the imperative to confront the complexities inherent in caring for living artefacts within real-life contexts" (Zhou et al. 2024, p. 18).

My research directly engages this gap by positioning composting as an ongoing, field-based, and autobiographical practice, where microbial life is not prototyped or exhibited but lived-with across seasons, sites, and institutional contexts. In doing so, this project aligns with, yet diverges from, prevailing MtH trajectories by treating duration, maintenance, and failure as core methodological conditions rather than constraints on regenerative organic design.

Longitudinal first-person HCI methods provide a direct methodological defence for this kind of work, including how to define study boundaries (time, place, role), handle role multiplicity (designer/practitioner/participant), and support rigour through reflective documentation and retrospective sense-making (Lucero, Desjardins, & Neustaedter, 2021). In that sense, this study "designs from within," where sustained self-usage steers imagination, making, and reflection rather than being treated as anecdotal (Desjardins et al., 2021, pp. 4-5). This approach aligns with first-person and autobiographical design research, where the researcher's own sustained, embodied engagement is treated as a legitimate site of knowledge production rather than a source of bias to be minimised (Desjardins et al., 2021; Neustaedter & Sengers, 2012). First-person methods explicitly acknowledge subjectivity, emotionality, and reflexivity as integral to rigour, often combining lived experience with documentation, reflective writing, and material traces over time (Desjardins et al., 2021). In this study, composting functioned as a "use-it-yourself" practice, where designing, maintaining, and adapting systems through everyday use enabled learning that could not be accessed through short-term trials or detached observation.

These efforts are what Puig de la Bellacasa (2017) calls "matters of care" embodied by people practicing these actions on an everyday basis throughout the world. More-than-human design scholarship makes a compatible claim: designing-with requires humility and the willingness to "make space for new forms of knowledge to arise" (Wun & Wakkary, 2025, p. 257), including knowledge expressed through nonhuman effects rather than human language. This expands what counts as participation in a composting practice, because "nonhumans" includes not only microbes and worms but also tools, materials, and processes that mediate care and responsibility (Wun & Wakkary, 2025). Dombroski (2018) theorises collaboration with more-than-human communities in terms of 'careful encounters'. In this study, I encounter care ethics as they are practiced in a specific Māori context, and I entangle my own Pākehā care ethics with Te Ao Māori

concepts and practices of care. My own experience of careful, politically engaged and responsive encounters with Māori communities of practice are underpinned by years of previous inspiration drawn from indigenous food sovereignty scholars (Shiva, 2005, 2006), Māori agroecological praxis and Māori practitioners (Hutchings et al., 2012, 2018, 2020; Hutchings & Smith, 2020; Te Pūtahitanga o Te Wai Pounamu, 2022). These are studies and people that have affected my practice, albeit from a distance. Prior to this project, my working experience with Māori communities and practitioners had been limited. I had a desire to work more with Māori communities but for whatever reason had not made this a priority.

My own careful encounters with soil and composting life can be referred to as what researchers' term 'embodied knowledge', an understanding and new knowledge gained through lived experiences and ethnographic research activities (McKinnon & Dombroski, 2019). McKinnon and Dombroski say: "*being there*, in the 'flesh' is really what matters" (ibid, p. 12) when doing ethnographic research. In his ethnography based at an urban farm in Christchurch, New Zealand, Goburdhone, p. (2021, p. 50) refers to understanding the importance of embodiment as "feeling the space... to enlighten the significance of the work. One cannot learn farming by intellect alone. We must feel it. Embodiment, then, was the beginnings of being able to think-with, being open to other thoughts that were not just cognition". Puig de la Bellacasa (2017, pp. 201-203) also refers to the practice of 'thoughtful and protracted observation' as an ethic of soil care practice, of attuning to land and its processes before acting: "...observing cycles and processes here is not only about becoming aware of them but about a requirement to tune in to these rhythms". Embodied knowledge and taking time to develop ecological awareness are preconditions for a more carefully ethical awareness when thinking with composting.

These Pākehā perspectives on embodiment, ethnographic research and ethics of care for the land are consistent with the Kaupapa Māori perspectives of Linda Tuhiwai Smith on doing respectful community research. These perspectives only become ethically usable in this project because they are subordinated to, and checked against, Kaupapa Māori and decolonising methodological principles articulated by Linda Tuhiwai Smith (1999). In her seminal text *Decolonising Methodologies*, when referencing sound ethical principles for research in Māori communities, *being there* is understood in the Māori language as "kanohi kitea – the seen face, ... present yourself to people face to face", ... and, "titiro, whakarongo,... kōrero", meaning to 'look, listen, ... then speak' (Smith 1999, p. 136-137). Importantly, *Decolonising Methodologies* (Smith, 1999) was a primary driver of the research design rather than a post-hoc ethical commentary. It informed how I defined my role (as contributor through mahi rather than extractor of knowledge),

how access was earned and maintained (kanohi kitea over time), and what forms of evidence were legitimate to carry forward into an academic text (documentation of practice, publicly accountable records, and consented operational materials, rather than elicited cultural knowledge). I hear and see the words of Puig de la Bellacasa and Goburdhone from the paragraph above mirrored in these principles from Linda Tuhiwai Smith. My 'seen face' at Te Pā was established by consistently turning up on a regular basis to make compost with the students and staff of Te Pā – reflected further in chapters five and six that follow and in the Companion Flipbook. This presence enabled privileged access to the community and an opportunity to practice respectfully observing and interacting with mātauranga and tikanga that was unique to Te Pā. That privilege and access is not promised to anyone and can only be gained with time, being present, looking and listening. My embodied knowledge of composting and corresponding presence in the community of Te Pā became an ethically acceptable standpoint for this project. This 'making with' (Haraway, 2016) opened a time-space for thinking with composting with Te Pā as a community, enhancing soil vitality, and building relationships that support the more widely transformative aims of Te Pā. This aligns with Wakkary's claim that the designer is "radically situated" within the assemblages that make a thing and is not separable from the lifeworld that is being cohabited and reworked through practice (Wakkary, 2021). Each composting cycle functioned as a co-designed intervention: decisions about inputs, recipe, labour, and responses to odour or contamination were negotiated with Te Pā participants and partner site actors rather than imposed as a researcher protocol. Knowledge was therefore produced through shared doing – iteratively shaping practice and institutional interfaces over time in ways consistent with decolonising methodology's emphasis on accountable contribution over extraction (Smith, 1999).

Preconditions for a more widely transformative soil care collaboration were already present and in practice at Te Pā. These preconditions take the form of place-based knowledges, and the ethics are encoded in whakapapa-inspired pedagogies, evidenced in Te Pā's curriculum, *Tūwhakarōria* (Te Pā o Rākaihautū, 2014). My project could readily engage in this context of active learning because co-designed action research enabled composting to be treated as an intervention across three inseparable scales: material practice (composting trials), collective arrangement (shared roles, tikanga-aligned participation, and learning), and institutional interface (compliance, correspondence, and governance constraints). The "more targeted interaction" refers to deliberately shaping each composting cycle to address a specific rift condition (e.g., food scraps becoming "waste," whānau-whenua disconnection, or institutional barriers to community-scale organics). Methodologically, rift-repair was pursued through iterative trialing and reflective

documentation that tracked how technical adjustments and relational commitments co-produced viable practice over time.

In *Matters of Care*, Puig de la Bellacasa (2017) talks about “intensifying attentiveness within already existing relations of interdependency and mutual involvement” (p. 204). Intensifying attentiveness in the context of this project was a focus on making compost to build soil fertility, to produce more food and sustain our interdependent relations with soil dwelling organisms. The existing relations, interdependency and mutual involvement could be likened to Te Pā and me collaborating with more-than-human communities to make compost. In this thesis, that intensification is inseparable from decolonising method: it is the practical discipline of remaining accountable to the people and place one is with, and of slowing down interpretive authority until participation has been earned through relationship and responsibility (Smith, 1999). The linkage between thinking with composting and reciprocating with Te Pā was easy to collectively imagine and the will to act in this direction was already well engaged. I needed a research partner and Te Pā needed an experienced practitioner to support the community to restore its soil care, composting and develop its māra kai practices. A platform of mutual respect and natural reciprocity meant that my partnership with Te Pā matured into a full-blown collaboration on multiple levels, as if this study was the catalytic planting of much more than a study on composting. And through it all, nurturing soils by thinking and working collaborative with composting has remained a constant priority.

Making, designing and thinking with compost are moments to witness the mauri inherent in organic materials – food scraps – and in the soil of a place to see the inherent liveliness and ‘hear' with all our senses the responses that composting lifeforms will ‘speak’ to us with (Wakkary 2021, Keune 2021). Foregrounding Tuhiwai Smith’s (1999) codes for ethical research with Māori communities, thinking with composting, making compost, is attentively looking and listening for the ethics of responsibly including nonhumans as living and part of the community (Puig de la Bellcasa 2017, Wakkary 2021). These ethics are stated by nonhuman composting beings with their biological languages and signatures, telling us about their necessary preconditions for wellness. We are interdependent as multispecies communities in these moments and care ethics are encoded into our bodies through what Puig de la Bellacasa (2017, p. 204) calls "doings of care that make the everyday substrate of life”.

> "The open question ‘How to care?’ grounds ethics in situation... a politics of speculative thinking also is a commitment to seek what others worlds could be in the making through caring while staying with the trouble of our own complicities and implications... feminist visions of care emphasize the ethico-political significance of doings of care that make the

> substrate of everyday life, not as a separate cozy realm where "nice" relations can thrive..." (p. 204, emphasis added in bolded text).

In this project, the everyday substrate of life that unfolded over time was composting enacted in the wild edges that present the technical and practical challenges of more-than-human temporalities and their biographical languages of their terms, rather than within experimental encounters bounded by designers (Zhou et al., 2024).

This inclusion of the more-than-human also reframes “speaking”: compost’s constituencies do not primarily “speak” through language, but through effects – bio-signatures and thresholds that require humans to respond if care is to remain “as well as possible” in practice (Wakkary, 2021, p. 213; citing Puig de la Bellacasa, 2017, p. 6). With careful ethics for encountering human and more-than-human communities intact, I observed an ethic of my own reflected in the culture at Te Pā: respect for those who show up and do the mahi, who genuinely reciprocate beyond the “cosy realm of nice relations”, who participate in the everyday “mundane” tasks of caring, such as the return food scraps to soil (Puig de la Bellacasa 2017, pp. 199-204). Respect is built, in part, on reciprocity and being a participant in this substrate of everyday life. In that way, theoretical drive for this project was built on a culturally appropriate common ground, one compost heap at a time, forming a cultural substrate[15] for co-designing of a more widespread transformation. It was safe to speculate that the pre-conditions were present for thinking with composting and cultural substrates to produce a rift-repair methodology relevant to the context of this study. Composting organisms are interacting with and supporting the regenerative functions of ecosystems at scales that vary from microscopic to landscape dimensions. Can thinking with composting that upholds whakapapa, and tends to mauri, support a conceptual basis for transforming the organics system of an entire bioregion?

The same material bond to the more than human world of soil and composting organisms also occurs with places at a landscape scale. Thinking with composting to practice care with landscape-sized entities in Aotearoa is not reflected in the academic literature, yet organic waste infrastructures and systems are having an impact here on a landscape-sized scale. Bioregionalism (Fanfani & Ruiz, 2020) and elements of bioregional definition, such as freshwater catchments, are structured into how statutory responsibilities for natural resource management are defined in Aotearoa New Zealand (Jenkins, 2018; Rennie & Lomax, 2010). Landscape

[15] I must acknowledge the kōrero of Anake Goodall and Huia Lambie in forming this term, *cultural substrate,* while I reflected with them about the kaupapa of 20:20 Compost in concert with broader purposes; over good food and coffee of course.

ecology and restoration ecology are whole branches of ‘life science’ that apply care on a landscape scale, but these fields are subject to critiques showing that cultural landscapes are under-represented in determining how restoration is enacted, commonly focusing on ecological aspects and overlooking historical and cultural factors (Aronson et al., 2017), leaving room for improvement in stakeholder engagement (Toma & Buisson, 2022).

Thinking with composting to practice care with landscape-sized entities in Aotearoa is not reflected in the academic literature in any sustained, practice-based way. While there is growing scholarship on care ethics and more-than-human design, these studies rarely address how care is *operationalised over time* through infrastructural practices such as composting, particularly within Indigenous-led contexts. This absence opens a methodological opportunity to study care as an enacted, negotiated, and materially demanding practice – one that must respond simultaneously to microbial processes, human labour, tikanga, and institutional constraints across extended temporal and spatial scales. Unsurprisingly, care for *cultural* landscapes is front and centre throughout Iwi Māori strategic and statutory planning frameworks for environmental management in Ōtautahi (Bennett et al., 2021; Jolly & Lambert, 2019; Matunga, 2016; Matunga et al., 2020; Pauling & Harmsworth, 2018; Te Ngāi Tūāhuriri Rūnanga et al., 2013; Yates & Bennett, 2021). These statutory documents are the first port of call for entering a study that involves engagement with land and Iwi in terms of environmental management (Kaiser & Saunders, 2021). The stories of these landscape-scale entities are essential reading to build understanding about the culturally determined responsibilities, priorities, and the natural order in which living systems are interacting with composting organisms in these places. Any conceptual support for thinking with composting at the scale of an entire bioregion would need to be consistent with the storying of cultural landscapes by Ngāi Tahu.

Soils, water bodies and vegetation patterns are all large characters in these stories. In the sense of geological scale – of landscapes, and layers of cultural history articulated in the landscape – and geological time, the formative processes and defining characteristics of entire landscapes are shaped over timescales that Māori culture have witnessed and remembered with whakapapa. Large water bodies and movements of water across landscapes over geological scales in time are leading characters in these stories. Maps of native soils (see Figure 5) show large drifts that occur across whole regions. Vegetation above ground follows patterns that correlate to the underlying soils (see Figure 6).

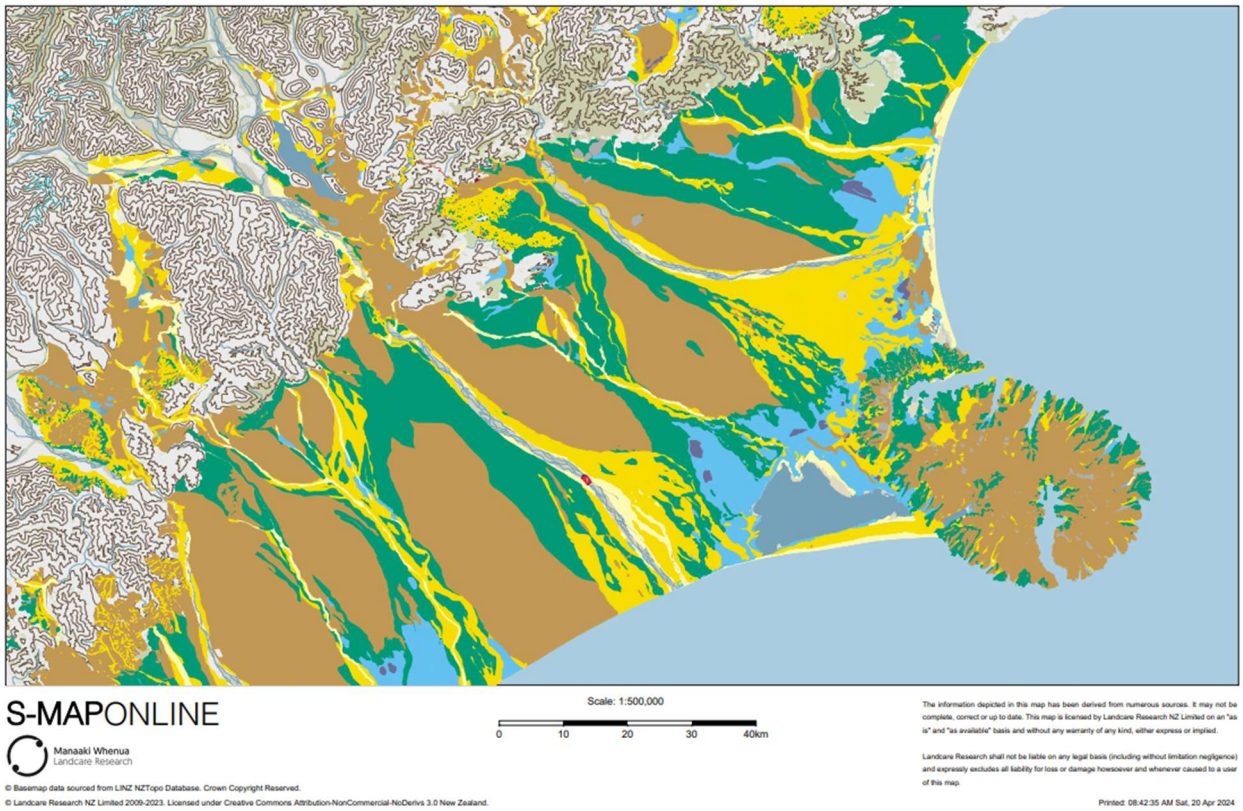

Figure 5: Soil Maps in the wider region where the study is located. Manaaki Whenua Landcare Research (2024), retrieved 23 May 2025 from: https://smap.landcareresearch.co.nz/.

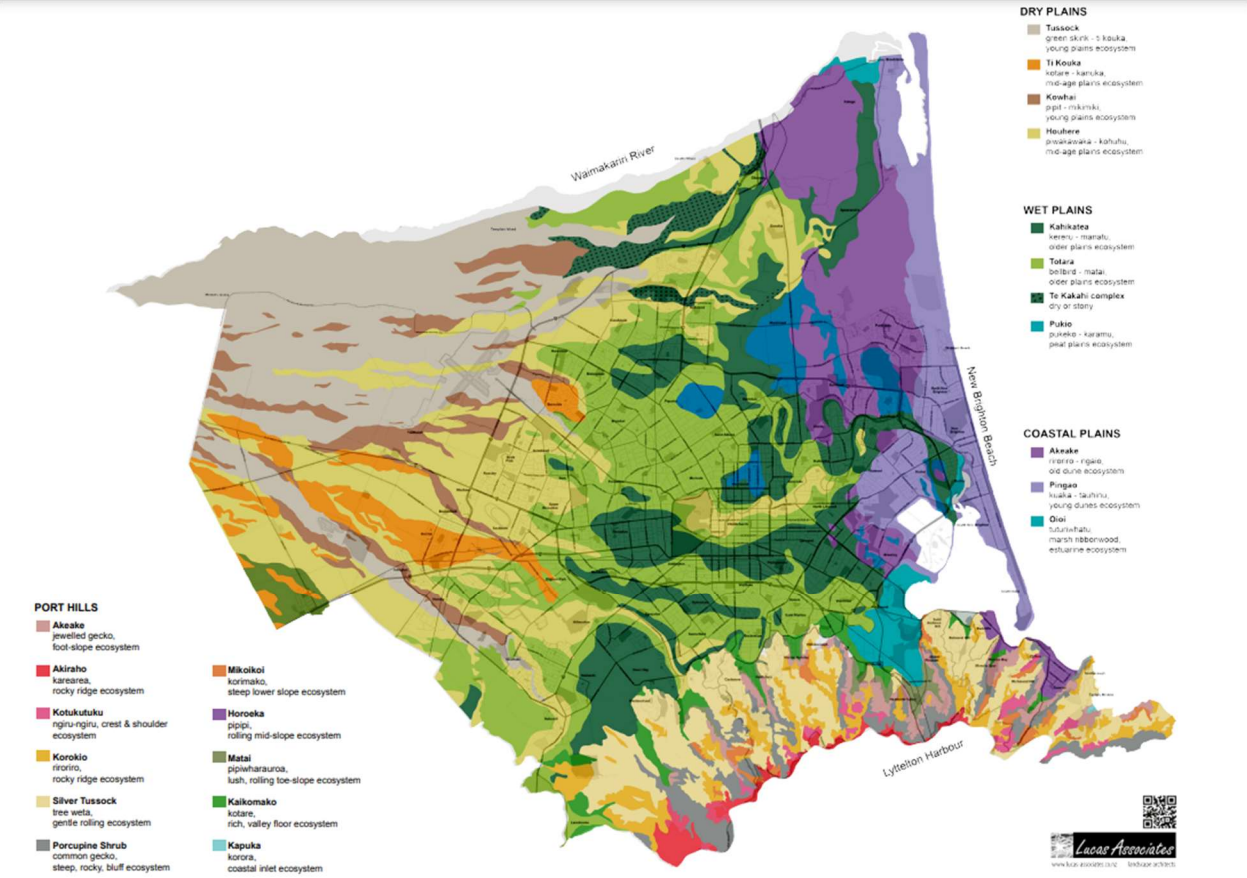

Figure 6: Christchurch Ecosystems Map. Lucas Associates (2023). Retrieved 23 May 2025 from: https://www.lucas-associates.co.nz/christchurch-banks-peninsula/ecosystem-map/.

The geological features of the Canterbury landscape are imbued with whakapapa and liveliness, embodied in entities such as Aoraki (Waaka, 1999), Kā Pākihi Whakatekateka a Waitaha (Te Rūnanga o Ngāi Tahu, 2012), Te Pātaka o Rākaihautū, Te Kete Ika a Rākaihautū (Te Rūnanga o Ngāi Tahu, 2025; Te Taumutu Rūnanga, 2019), and Te Ihutai (Pauling et al., 2007; Te Ngāi Tūāhuriri Rūnanga et al., 2013). These are not mere physical landmarks but cultural landscapes (Lenihan, 2014), woven into the fabric of Ngāi Tahu identity through layers of history, connection, and meaning. They are vital to this study, serving as anchors for understanding the interplay between people and place. As Reid et al. (2025) articulate:

> "The Ngāi Tūāhuriri worldview, informed by their rich understanding of the interdependencies between humans and ecosystems, forms the foundation of their strategies for climate adaptation and addressing land use change and environmental degradation. The concept of mauri, central to this worldview, is seen as the vitality or life-generating capacity of various 'bodies', including ecosystems and communities, while the

> concept of whakapapa informs the relationships and interdependencies between them. Furthermore, the philosophy of 'ki uta ki tai' (the connection from the mountain to the sea) encourages whole-of-catchment adaptation responses to hydro-meteorological risks based on ecosystem interconnectivity" (pp. 1–2).

This perspective underscores the liveliness of these entities, where mauri and whakapapa breathe life into the land, guiding practices that sustain it. In this project, collaborating with the more-than-human – through composting and engaging with these cultural landscapes – has meant deepening familiarity with the stories and practices that manaaki (uplift the mana of) these places, enriching our connection to their enduring narratives.

Thinking with composting at a landscape scale illuminates soils in connection with cultural landscapes, revealing their inherent vitality, and where they are currently alienated within organic waste management systems. Puig de la Bellacasa (2013) frames soil as 'bioinfrastructure,' a living foundation supporting the world, emphasising the need to listen to its invisible workers – mostly non-humans, the true processors of decay. As she notes, "Soil is revealed as the habitat of respectable beings that take care of its health: worms, fungi, nematodes and microbes" (Puig de la Bellacasa, 2013, p. 35). She further argues:

> "New affective entanglements with invisible workers of the soil can be fostered... [and] can contribute to an 'infrastructural inversion' where the backstage elements of work practice are brought to the forefront: among these are not only the ecologies of taking care of excess waste, but also those of our relations [with the] invisible, non-human, workers of soil that make this possible" (Puig de la Bellacasa, 2013, p. 35).

This perspective not only makes soils visible but also highlights how, as eco-cultural systems and bioinfrastructure, they are being forgotten, silenced, or erased in the design of organic waste management systems (Puig de la Bellacasa, 2013). By thinking with composting rooted in cultural landscapes, we decentre the figuratively sterile 'organics processing plants' in favour of vibrant, living systems. In the context of this study's cultural landscape – what once thrived as coastal wetland forest and a deltaic Indigenous culture (Reid et al., 2025) – the current planning and operation of organic waste management arguably fails to embody a regenerative approach that is coherent with this place or respectful of its communities. This dominant mode of composting has drifted from the archetypal abundance, prolific digestive functions, and liveliness of flourishing coastal wetland and lowland forest ecosystems. It has severed the practice of kaitiakitanga for organics from Māori communities, undermining their ability to exercise kai motuhake – self-determination in culturally appropriate food provisioning. This disconnection signals a broader 'metabolic rift' which will explored in the following Section 3.3.

3.3. Metabolic Rift

While more-than-human design and HCI scholarship provides valuable language for decentring the human and attending to relational agency, this project diverges from many MtH trajectories in what it is answerable to and where it is situated. Rather than operating primarily through bounded artefacts, short field trials, or speculative engagements, composting here is treated as an infrastructural practice embedded in treaty-bound governance landscapes and Indigenous-led partnership obligations – where participation, authority, and legitimacy are constrained and enabled by land histories, tikanga, regulation, contracts, and institutional power. In this setting, "designing-with" cannot be reduced to an ethics of interspecies attentiveness alone; it must also confront how colonial and capitalist infrastructures structure who can care, what forms of care are authorised, and which metabolic relations are permitted to persist. This is why the study pairs MtH orientation with decolonising methodology and metabolic rift analysis: to name and intervene in the systemic conditions that configure composting as a site of both ecological care and political struggle.

The disconnection highlighted in current organic waste management – where soils, cultural landscapes, and mahinga kai practices are alienated from their ecological and cultural roots – points to a deeper fracture that the theory of *metabolic rift* can help us understand. In the context of Te Ao Māori and living systems, metabolic rift offers a conceptual foundation for thinking with composting as a rift-repair methodology, illuminating how separation has occurred and why it matters. Marx originally located this separation in the treatment of soil, writing that "capitalist production… develops technology, and the combining together of various processes into a social whole, only by sapping the original sources of all wealth – the soil and the labourer" (Marx, 1867/1887, p. 329). Here, soil is not metaphor but material foundation: an original source of wealth exhausted through extractive agricultural and industrial systems. Te Pā, Mana Whenua, our city's organics systems, and the landscapes of this research context are downstream of metabolic rupturing.

Emerging from Marx's critique of capitalist agriculture, the metabolic rift concept has been extended by scholars such as Foster (2013), Goburdhone (2021), and Friedman (2018) to trace how capitalist modes of production systematically sever the cyclical exchanges between human and more-than-human worlds. These scholars show how industrial, urbanised societies – underpinned by extractive logics – disrupt the cascading, recycling metabolism of the living world, privileging throughput, accumulation, and separation over regeneration, relationality, and care.

As Read & Habib (2023, p. 1901) assert, "'Metabolic Rift' describes how capitalism redirects the material exchanges between society and nature to support increased material throughput rather than life." In colonised contexts like Aotearoa, this redirection is starkly evident in the erosion of Indigenous relationships with land and mātauranga, particularly in the transformation of coastal wetlands and lowland forests from sites of mahinga kai to zones of extraction or neglect.

In this sense, a decentralised, decolonising, Kaupapa Māori-aligned composting system can be read as a practical intervention aimed at regenerating both original sources of wealth – soil and those whose labour restores it – within place-based ecological and cultural cycles. By naming these patterns as a metabolic rift, we gain a way to see beyond generic diagnoses and begin to trace the root causes of cultural and ecological harm, right down to the decisions that shape our everyday systems of disposal and disconnection. A decolonising methodological stance matters here because it changes what counts as the "problem": not merely technical inefficiency or mismanagement, but the continuation of colonial relations through infrastructure, policy, and subject matter expertise. Decolonising methodologies require analysis that stays answerable to Indigenous priorities rather than treating them as optional values (Smith, 1999).

Further research has elaborated the concept of metabolic rift to trace the ruptures in nutrient cycles between urban and rural systems, as well as the wider disconnection of people from food-growing and ecological rhythms (Goburdhone & Dombroski, 2023; Schneider & McMichael, 2010). This disconnection is not only material but cultural, with consequences that extend across generations. A growing body of literature links metabolic rift theory with colonialism, situating the degradation of ecosystems alongside the disruption of Indigenous socio-ecological relationships (Leeuwenkamp, 2023a; Manglou et al., 2022; Read & Habib, 2023; Romero-Toledo, 2023; Slater & Flaherty, 2023; Wittman, 2009). These works highlight how colonial systems not only extracted resources but restructured landscapes and societies in ways that continue to produce eco-cultural harm, population decline, and economic marginalisation.

Slater and Flaherty (2023), for example, extend Marx's concept of metabolic rift through a study of Ireland under British colonial rule. They argue that colonial agricultural systems degraded ecological fertility while simultaneously undermining the physical and social reproduction of the Irish population, setting the stage for persistent economic underdevelopment. Similarly, Romero-Toledo (2023) explores how colonial landscape transformation in Chile displaced Indigenous communities, altering their political-territorial organisation and creating a new colonial "production of nature" that fundamentally reshaped ecological, cultural, and economic life. In Aotearoa, Goburdhone and Dombroski (2023) introduce metabolic rift in relation to urban farming – in a

setting that I led the development of before I was aware of metabolic rift theory – yet the theory has not been applied to the analysis of urban organic waste systems or in the context of a decolonial ecology. Given the well-documented separation of Māori from ancestral lands, the decline in biodiversity, and the erosion of eco-cultural systems health, there is a critical need to explore how metabolic rift theory might help diagnose and intervene in these ongoing, colonising dynamics. This study takes up that challenge by applying the concept to current waste infrastructures and their entanglement with the legacies of colonisation and dispossession in Ōtautahi.

Colonisation has created a metabolic rift between Māori communities and their cultural landscapes. Traditional places of communal settlement – pā and kainga nohoanga – are interdependent with food gathering areas, but both of these (settlements and food gathering areas) have been actively planned out of cities (Hanna & Wallace, 2022; Tau, 2016) in Aotearoa, disconnecting communities from their places of sustenance, wellbeing and identity. Further alienation from land deepened this disconnect through time across multiple generations, resulting in severe social, economic and cultural damages for many Iwi Māori, and specifically for Ngāi Tahu as a people (Reid et al., 2017), and as stewards of ecosystems, guardians of taonga species, and carriers of knowledge associated with the practice of kaitiakitanga. Metabolic rift is central to eco-cultural degradation (ecosystem and population decline) and is consequential (multi-generational economic underdevelopment). Colonially-driven rifting for Māori was removal from land and drastic reduction in access to lands that would have fed and sustained a population. Population decline and underdevelopment has occurred as a result (Moewaka Barnes & McCreanor, 2019).

> "The influx of settlers led to a demand for land, and from the 1840s Māori were under great pressure to sell their ancestral territories. Loss of Māori land – through confiscation following the 1860s wars, Crown purchase and the Native Land Court – led to the displacement of large numbers of Māori. Deprived of their land, tribes were in many instances reduced to poverty, with no option but to live in overcrowded and unhygienic conditions. Losing land, they also lost access to traditional food sources. Lack of resources, overcrowding and poor diet helped disease to take hold and spread" (Pool, 2019).

A central argument of this study is that the logics determining the governance of organic waste management systems in Aotearoa is incoherent in Indigenous eco-cultural terms. There are two key differences between organic waste management by local authorities and Māori conceptual and regulatory frameworks that relate to organics systems. Arguably these differences highlight where there are layers of coherence and interconnectedness that remain intact as foundations for rift-repair on other levels. Firstly, Māori have resisted becoming separate from the natural world

at any conceptual level, which I have established through a basic outline of whakapapa, mauri and kaitiakitanga above. Secondly, Te Ao Māori concepts such as the above are included in key statutory resource management documents as they relate to waste management and Te Ihutai (Pauling and Ataria 2010; Te Ngāi Tūāhuriri Rūnanga et al, 2013). This means there are legal and ontological grounds (Reid et al., 2025) to give effect to repair strategies that can overcome metabolic rift.

The theory of metabolic rift is useful for identifying the problems evident in the design of organic waste management systems in Aotearoa. The metabolic rift of organic waste management is a re-ordering of natural priorities to service capital instead of soil, whakapapa and whānau. Like the quote above from Read and Habib (2023), increased material throughput of organic waste is prioritised over the life and connectivity this material supports in eco-cultural systems. The role of composting in organic waste management has become a tool of industrial food systems that has co-opted the language of circular bioeconomies (Diprose et al., 2023) to win large public waste management contracts. By now, these are intergenerational arrangements that form multi-layered rifts in Ōtautahi alone. At least two of Aotearoa's largest cities – Auckland and Christchurch – are moving to systems that no longer return some or even any of this material to soils. In Ōtautahi for example, composting will be substituted for a different technology and a system that by design has the function of separating people from the responsibility of cycling nutrients within their appropriate domain. Thinking with composting has been overruled with the convenience, commercial viability, and large volumes of a single industrial-capitalist solution. This represents a conceptual shift (away from composting) that uses the regulatory frameworks of waste management to maintain an unjust model of human-soil relations.

The alienation of Māori communities from their settlements, food sources and identities as peoples of the land – tangata whenua – is a metabolic rift between tangata and whenua. Urbanisation has not been a welcoming opportunity for many Māori, who were left with little choice but to leave traditional settlements, too small to support subsistence living and disconnected from traditional places of sustenance and move into cities to find survive in the prevailing conditions of Colonial Western capitalism (Durie, 2012; Moewaka Barnes & McCreanor, 2019; Rameka, 2018). These cities were monocultures for industrial capitalism and offered little by way of recognition of cultural identity for Māori – worse, it was further displaced by assimilation policies designed to delete Māori language and traditions in places like schools and towns that bore English names, colonial designs and foreign objects of trade. These are complex matters that are put here simply in a few sentences, but in terms of separation – they represent breaches of Te Tiriti o Waitangi

(Te Tiriti), a rupturing of trust and obfuscation of the underlying principles and the rights of Māori that Te Tiriti was supposed to protect.

> "The Ngāi Tahu Deed of Settlement included an apology which acknowledged that the Crown had acted 'unconscionably' and had 'failed to allow reasonable access to traditional sources of food'" (Reid et al., 2025, p. 3).

Authentic claims of Treaty breaches now span centuries and numerous claims remain unresolved or intergenerational sore points to this day, including the cultural landscapes of Te Ihutai (Lenihan, 2014; Mahaanui Kurataiao Limited, 2022).

The historical background of the rifts caused by colonisation loom large in the context of this study. Composting here is a small-scale attempt to heal eco-cultural rifts. In Aotearoa, metabolic rift theory has yet to be fully mobilised to account for the cultural and ecological harm wrought through the forced disconnection of Māori from whenua, food systems, and the life-sustaining ecologies of their places. This thesis takes up that challenge, reframing composting as a form of rift-repair that is both metabolic and metaphysical – restoring not just soil fertility but relational integrity. It advances the notion that acts of reconnection must attend not only to nutrient cycles and carbon flows but to whakapapa, mauri, and the obligations of tangata whenua to land, ancestors, and generations yet to come. From this standpoint, the problem is not just waste, but severed relationships. As such, a reimagining of organic systems cannot rely solely on policy or infrastructure, but must also draw from cosmologies and ontologies that remember how to live in mutuality. To deepen this relational approach, the next section turns to mycelial life – both as ecological actor and theoretical guide – to explore how networks of decomposition and connectivity can inform a kaupapa of regeneration.

3.4. Mycelial Life

Mycelial life offers a living foundation for conceptualising a rift-repair methodology – one that reconnects what has been severed across cultural and ecological landscapes. This section explores the role of fungi, especially mycelium, as both a material presence and a guiding metaphor for reconnection, healing, and renewal. It highlights some of the many roles of mycelial life as a way of understanding connection, repair, and renewal across cultural and ecological landscapes. Starting with Anna Tsing's ethnographical work on the Matsutake mushroom (2015), it introduces mycelium as an active, interconnected force – a living matrix that decomposes, recycles, and maintains life within damaged systems. It then looks at the biology of fungal networks, especially decomposers and mycorrhizal fungi, and how they are being used in real-world myco-remediation efforts. These examples help show both the potential and limits of fungi

for repairing landscapes. From there, the section turns to metaphor – exploring how mycelium can help us think about eco-cultural reconnections, especially through the Māori concept of *whanaungatanga*, where hidden yet vital relationships bind and strengthen community resilience and wellbeing. The discussion then weaves together myco-remediation with Kaupapa Māori approaches to cultural revitalisation, showing how both work to break down what is harmful – whether ecological or colonial – and make space for healing. Finally, it considers how aspects of Western ecological science, particularly soil science, can align with Indigenous ways of knowing, drawing on the example of Te Pā o Rākaihautū. Mycelial life, in this light, offers more than a function – it becomes a guide for restoring relational balance, enhancing *mauri*, and honouring *whakapapa*. Through this arc, mycelial life is offered as both a material strategy and a conceptual pathway for healing rifted ecosystems and cultural identities.

Tsing's text *The Mushroom at the End of the World: On the possibility of life in capitalist ruins* (2015) illuminates the agency of mycelial life as an intensively interconnected, more-than-human world. Tsing follows the Matsutake mushroom into entanglements with foraging communities, political ecologies and economies of forest management in various parts of the globe. Tsing reveals how fungal mycelium networks are powerful composting and remediating matrices. Literally, mycelium forms connections and mediates the building processes in soils, communicating with biochemical signaling known as quorum sensing. Tsing refers to quorum sensing as the natural phenomenon of "chemical sensing that creates communal effects" (p. 238). As a source of metaphoric inspiration for this project, Tsing's text highlights the connectivity and interconnectedness of mycelial life, prefiguring the possibilities for rift-repair methodologies in disrupted and colonised cultural landscapes.

Mycelial life is connective. Fungal mycelium is the vegetative part of a fungus consisting of a network of fine white filaments (hyphae). Mycelial networks are powerful composting and remediating infrastructures. Mycelial networks can scale to meet the needs of wide-ranging landscape repair, a method known as myco-remediation. However, myco-remediation methods are often limited in scale beyond laboratory studies and basic field trials (Antón-Herrero et al., 2023). Myco-remediation is a central method of soil and landscape repair for the composting methodologies of this research. The type of fungal networks of greatest interest in this study can be simplified into two categories:

1. Decomposers that feed on decaying crop matter and are prevalent in composting ecologies - "As a general rule these kinds of fungi have relatively small hyphal networks.

They are important for soil fertility and soil structure, but play only a minor role in carbon storage" (Jones, 2008, p. 2);

2. Mycorrhizal fungi - "acquire their energy in a liquid form, as soluble carbon directly from actively growing plants, access and transport water - plus nutrients such as phosphorus, nitrogen and zinc - in exchange for carbon from their living host; they also have the capacity to connect individual plants below ground and can facilitate the transfer of nutrients between species; and, they can play an extremely important role in humification and soil building processes" (Jones 2008, p. 3; see also: (Allen, 2007; Leake et al., 2004).

The connectivity of mycelial life is important to this study, as a living system that can be uplifted through the material practice of composting, and as an inspiration guiding the theoretical drive of this study. That is, the transformative habits of mycelial life can offer parallels for building a rift-repair methodology that could be useful in the context of cultural revitalisation.

Mycelial worlds are the unseen realms, they are like the vital cultural substrate of whanaungatanga. Whanaungatanga emphasises kinship and the fostering of strong relationships and community ties, which are crucial for collective well-being and social cohesion (Durie, 2001; Pihama et al., 2014). These ties are like the hyphae strands of fungal mycelium in the way they support inter-relations and exchanges in the unseen realms. In a similar sense, whanaungatanga is also an unseen realm, yet a very real dimension by which connectivity is conducted in Te Ao Māori. Fungal mycelium re-open damaged soil substrates so that these can be revitalised with oxygen, water and support nutrient cycling and exchanges with the energy of liquid carbon. This increased soil function can be measured as conductivity. Mycelium, like whanaungatanga, nurtures connectivity, reciprocity and exchange between communities. If mycelial networks are the building blocks for life then whanaungatanga, the feeding of connectivity, the enhancing of conductivity, is *how* we could do rift-repair.

Mycelial networks can be scaled to meet the needs of wide-ranging cultural landscape and ecosystem repair. Mycelium plays a crucial role in ecosystems by decomposing organic matter, recycling nutrients, and forming symbiotic relationships with plants, much like how Māori cultural practices are integral to the health of wai, whenua and whānau. Myco-remediation, the use of fungi to degrade or sequester contaminants in the environment (Stamets, 2005), mirrors the process of cultural revitalisation. Just as mycelium breaks down toxins and restores ecological balance, Kaupapa Māori initiatives aim to heal and rejuvenate communities impacted by colonisation and cultural loss. Myco-remediation harnesses the natural abilities of fungi to metabolise pollutants, turning harmful substances into benign ones (Stamets, 2005). Similarly,

Māori revitalisation efforts transform the cultural landscape by reclaiming language, traditions, and knowledge systems, promoting community resilience and wellbeing (Mutu, 2010; Smith, 1999).

One notable application of myco-remediation involves the degradation of polycyclic aromatic hydrocarbons (PAHs) in contaminated soils. Studies have shown that fungi can effectively break down these persistent pollutants, demonstrating the potential of fungal networks to restore environmental health (Bhatt et al., 2002; Pointing, 2001; Sasek & Eggen, 2001). This process is analogous to process of revitalising Māori language (Te Reo) which was severely impacted by the colonising tools of policy and legislation (Smith 1999). Arguably, to this day, and among other tools, these colonising tools have been a 'persistent pollutant' of Māori wellbeing and cultural identity. An example of this is the Native Schools Act of 1867, a piece of Crown legislation that established English as the primary medium of instruction in schools, leading to the marginalisation and decline of Māori language use among younger generations (May & Hill, 2005; Simon & Smith, 2001). This policy aimed to assimilate Māori children into European ways of life, significantly disrupting the transmission of the Māori language and culture within communities (Jenkins & Ka'ai, 1994). In other words, the conductivity of Māori communities and livelihoods had been critically disabled, and with it, the expression of Māori indigeneity that is deeply rooted in and inextricably connected with the health of soils and ecosystems.

Quorum sensing offers a compelling and pragmatic metaphor for understanding the life ways of healthy soils and their parallels with Māori cultural revitalisation. In quorum sensing, bacteria communicate through signaling molecules called autoinducers, coordinating behaviours like biofilm formation or virulence once a critical population density is reached (Waters & Bassler, 2005). This collective action enables bacterial communities to adapt and thrive in diverse environments, mirroring how Māori cultural initiatives harness community unity to rejuvenate customary practices, language, and identity. Just as quorum sensing empowers bacteria to achieve complex tasks beyond the capacity of individual cells, Māori revitalisation relies on shared values and coordinated effort to rebuild cultural well-being, as seen in community-led efforts like the establishment of kura kaupapa Māori (Pihama et al., 2014). This comparison underscores a universal principle: unity and cooperation drive large-scale positive change, whether in microbial ecosystems or human societies (Kidd et al., 2020). Strengthening this point, Kidd et al. (2020) highlight how collective Māori and Tauiwi (non-Māori) efforts to address health inequities exemplify the power of unified action. However, as Reid et al. (2024) argue,

> “Western science is likely to focus on Nature-based Solutions (NbS) that restore ecosystems to the minimum viable function required to deliver sought-after ecosystem services, whereas Ngāi Tūāhuriri is more likely to focus on Nature-based Solutions that reestablish positive relationality – a standard that may exceed minimum viable function and be informed by mātauranga Māori” (p. 12).

This distinction reveals why merely emulating mycelial composting to restore landscapes falls short. A truly transformative approach requires an Indigenous ontology that embeds humans and more-than-humans in interdependent relationships, enhancing mauri (life force) and upholding whakapapa (genealogy), rather than settling for improved environmental functionality alone (Reid et al., 2025).

Building on the metaphoric and material practice of mycelium, the main purpose of thinking with composting and fungal life is to support the re-establishment of positive relationality between people and more-than-human worlds. Mycelium's ability to form symbiotic relationships with plant roots enhances nutrient exchange and plant health, like how Māori values such as whanaungatanga (kinship) and kotahitanga (unity / togetherness) strengthen cultural identity and wellbeing (Durie, 2001). These relationships enable both the fungi and their plant partners to thrive, a parallel for how cultural revitalisation initiatives empower Māori communities to flourish by fostering a shared sense of purpose and identity (Pihama et al., 2014; Thompson-Fawcett et al., 2017). The mycelial network of Te Pā o Rākaihautū exemplifies interconnectedness, whānaungatanga and community support. Te Pā is “the school that whānau built” (Parata Takurua, 2023), despite the persistent pollution of non-Māori educational institutions and the severing of whakapapa ties to whenua that have impacted Ngāi Tahu communities so heavily. Te Pā is more than a story about Māori educational success, it is a story of transformation, cultural revitalisation and reclaiming of Indigenous knowledge systems and practice. The point is that quorum sensing can model living processes by which a critical mass of participation, listening and learning can be achieved: intensifying attentiveness to a regenerative and decolonial practice of composting. Arguably, Te Pā is a cultural substrate that already supports a working model of rift-repair methodology – specifically in the context of Ngāi Tahu takiwā (tribally-defined geographies) like the catchment of Te Ihutai.

Ecological connectivity between Ngāi Tahu communities has been profoundly disrupted by urbanisation, fracturing the "ki uta ki tai" continuum – from mountains to sea – that once sustained tangata (people) and whenua (land). This fragmentation has confined Māori to isolated patches, insufficient to support the critical mass of interconnected ecosystems that historically nurtured their population. Forced to endure a colonial settler landscape inherently hostile to Māori

indigeneity, Ngāi Tahu face a legacy of severed flows – ecological, cultural, and spiritual. Yet, as O'Regan (1989) asserts, cited in Reid et al. (2025), "the maintenance of mahinga kai and Ngāi Tahu culture are interdependent" (pp. 3-4), underscoring that cultural vitality hinges on ecological wholeness. Composting emerges as a rift-repair mechanism, with wairākau – the fluid essence of decay and renewal – acting as a bridge, channelling conductivity from above-ground wai to the unseen underground realms of soil, and the substrates of cultural landscapes. This flow reconnects ecosystem types, mirroring the interdependence that Ngāi Tūāhuriri harness in their climate adaptation strategies:

> "informed by their rich understanding of the interdependencies between humans and ecosystems, [these strategies] serve as a testament to the potential of indigenous knowledge… [offering] cultural revitalisation and decolonisation through the regeneration of mahinga kai" (Reid et al., 2025, p. 15).

The cultural substrate of Te Pā o Rākaihautū, rooted in Mana Whenua and its pan-Hapū, pan-Iwi constitution, exemplifies this vision, restoring connectivity across sites to rebuild a critical mass – perhaps of biodiversity, community, or mauri itself. This landscape-scale flow counters urbanisation's distortions, aligning with the regenerative power of wairākau. The theoretical drive of this study suggests that connectivity – like mycelial networks – can enhance mauri, supporting Ngāi Tahu eco-cultural restoration efforts through rift-repair methodologies that attend to the interwoven legacies of colonisation, urbanisation, and ecological disruption. The following chapter takes this further, exploring how rift-repair methodologies can operate across scales to re-weave disrupted landscapes and rebuild collective vitality.

3.5. Conclusion

The more-than-human relationships and entanglements explored in this chapter set a conceptual but also deeply pragmatic ground for this composting research. The research moves between the braided rivers of Mātauranga Māori and Pākehā ecological knowledge (Macfarlane & Macfarlane, 2019a), as it relates to community-based composting practices. It is reasonable to expect this will be a fruitful space to test the possibilities of rift-repair methodologies, interacting with cultural landscapes, people and places that know and remember the possibilities for abundance in healthy living systems (Moewaka Barnes & McCreanor, 2019; Parata-Goodall, 2019). This diverse, cultural substrate of entanglements is a rich soil for this research project.

Thinking with composting as care work, and as a repair-methodology, is about being an architect of regenerative forms. Architectural design in this context is about understanding the regenerative functions of composting that are akin with the digestive, transformative processes of

whenua. Whenua relies on its soil microbiome and the many complex, living and cascading layers of soil ecologies, to perform digestive processes that continuously cycle nutrients and organic materials. If soils and ecosystems cannot perform these functions effectively then the respective landscapes cannot not be well, *we* as human communities cannot be well either. The Ngāi Tahu whakataukī, shared in this doctorate's acknowledgments, "Toitū te marae o Tāne, toitū te marae o Tangaroa, toitū te iwi" (When the domains of Tāne and Tangaroa are sustained, the people prosper), underscores this interdependence: if soils and ecosystems cannot perform these vital functions, landscapes and human communities alike falter in wellness. This Māori insight resonates with Western feminist geography, notably Maria Puig de la Bellacasa's (2013) question, "Does the affective shift that would make us care more for the soil need to occur through the acknowledgement that *we* are soil, that *we are our residues*?" (Puig de la Bellacasa 2013, pp. 34-35). Bellacasa is urging a re-embodiment of human and more-than-human connection and relationality.

In this study, composting is a tool for healing – repairing degraded soils and ecologies at a landscape scale, while confronting the deep cultural wounds left by colonisation (Reid et al., 2017). These challenges are intertwined, both emerging from a disconnection between composting and *Te Ao Tūroa* – the natural world and its rhythms (Hutchings et al., 2012) – and from the erosion of tikanga Māori as a living, embodied ethic of care. Industrial systems have disrupted this relational order, reducing composting to a waste process rather than a regenerative practice. To respond, we must relearn composting as an act of care for soil, for place, and for eco-cultural systems. How, then, might we think with compost to shape methodologies of repair—ones that restore the conditions for life to thrive, before rushing to plant new possibilities? This call to transformation and reconnection, across communities and landscapes, guides the following enquiry into this project's methodology.

CHAPTER 4: METHODOLOGY

Building on the previous chapter's exploration of *Te Ao Māori* concepts, care ethics, metabolic rift, mycelial life, and composting as a regenerative practice grounded in interdependence, this chapter outlines the research methodology. Action research and co-design approaches are deployed to support this inquiry, guided by a shift in thinking with composting – from a by-product of extractive, industrialised organics systems to a relational mindset rooted in holistic worldviews. Composting, while the subject of this study, also operates as a methodological metaphor: a practice of layering diverse materials – ideas, voices, and methods – to create the conditions for transformation.

In this chapter, I weave together a range of methodological frameworks to support the practical application of methods that activate these critical conditions. The intent is multi-layered: to enhance regenerative practices at the intersection of composting and decolonising methodologies; to decentre harmful ontologies of separation – such as those embedded in corporatised organics systems – and to uphold Māori leadership by aligning Pākehā-dominated spaces with *Te Ao Māori* perspectives on living systems in Aotearoa. This regenerative layering, like the work of mycelium in damaged soils, prepares the ground for a composting approach that values collaboration, experimentation, and emergent possibility – elements explored in the discussion ahead.

4.0 Some Preparatory Thinking on my Methodological Approach to this Project

Before I begin the methodological layering that follows, I need to reflect on my initial engagements with academia and academic literature relating to community-based action research. These engagements led to decisions about where I planted my own time, energy and cares with this project for it to work in the ways I imagined. My project represents a departure from conventional social research tools and methodologies, driven by an acute awareness of their limitations in building sustained, reciprocal relationships with communities. My growing discomfort with extractive research practices – especially those that impose academic timelines and protocols onto already-caring communities – precipitated what felt like a departure from academic conventions.

In this project, my position differs fundamentally from the conventional research narrative in which an academic forms a "risky attachment" (Gibson et al., 2015, pp. ii–iii) with a community. Rather

than stepping into a new relationship as a researcher, I was already present as a community member – as a composter, collaborator, and participant in the daily life and aspirations of Te Pā o Rākaihautū. The research relationship was not initiated through formal recruitment or outreach but cultivated through existing commitments and sustained engagement. In this sense, my role as a researcher was not an entry point, but a layer added to a relationship already in place. Informed consent for the research emerged not through procedural ethics alone, but through culturally grounded processes of whakawhanaungatanga, shared purpose, and ongoing kōrero with whānau and kaiārahi. I was not asking the community to enter an academic project – I was offering my research as something that could be metabolised into a shared kaupapa.

This position required me to resist the extractive logics that often accompany research timelines and protocols. Using traditional social research tools risked undermining the trust I had built within the community and the values expressed by Te Pā whānau around how research should be conducted. As Puig de la Bellacasa (2017, p. 133) reminds us, it is "through impure entanglements rather than enlightened distance" that critical interventions become possible. Inspired by this, I chose to reconfigure my methodological stance, prioritising presence, relational accountability, and co-development within Te Pā o Rākaihautū. This reorientation aligned closely with my own soil care ethics, which had long entailed working with more-than-humans, and demanded a method that could *perform* care extensively, not just describe or theorise it. Working reflexively with compost as more than metaphor – as practice, as infrastructure, and as a community economy – has made visible new forms of engagement that sit beyond the scope of traditional research paradigms (Cameron & Gibson, 2020; Dombroski, 2020; Dombroski et al., 2018a).

Feminist Political Ecology and Ecofeminist Science and Technology Studies have provided compelling conceptual tools for thinking through this shift to something more than traditional social research. Much of this literature is primarily conceptual, and does not always engage the long-duration responsibilities of sustained community work. Scholars highlight the "performativity of research" and its potential to be world-making (Cameron & Hicks, 2014; Dombroski et al., 2018a; Dombroski et al., 2018), but I am not convinced that co-theorising change through short-term engagements is sufficient for building durable alternatives – particularly in the face of urgent needs like localised food sovereignty or soil regeneration. These are not short term projects.

My shift to a practice-based doctoral programme was not just logistical but methodological and ultimately ontological; it enabled me to embed deeper into the care infrastructures already operating in the community and to engage in a form of research with 'skin in the game'. At least, I felt this was a more authentic version of myself that I was bringing to Te Pā. It meant that I was

practicing-with, making with, in place, over time, and that this co-creative making *was the research*. It meant that I could perform a wider, more enjoyable and genuinely useful range of duties in that context as well. While many of the kaiārahi (learning guides) I worked alongside at Te Pā may not identify as researchers, much of their iterative, place-responsive work constituted a powerful form of reflexive practice.

The decision to pivot away from traditional Western research methods benefitted from several defining moments earlier in my undergraduate student and practicing years prior to embarking on this project. These moments prefigured my own discomfort and distrust towards agents of academic research and governmental policy institutions. Not long into my time there, I had observed extractive and colonising approaches to research playing out at Te Pā. I moved to protect my own relationships and be connected primarily as a composter and supporter of the community. I did not want to be mistaken for an archetype of the 'researcher' persona that was not impacting well let alone sticking around to reciprocate from *within* the community. I was comfortable then when the suggestion came to shift my project to a practice-based programme. This move enabled me to form and develop composting and co-designed action into something of my own as a research methodology. This decision represents a definitive shift to a process that favoured being more deeply present, engaged and committed with the community of Te Pā o Rākaihautū.

I have chosen still to work through an action research approach, which is often community-based and collaborative, where participants bring existing strengths together to learn 'on the go' (Cameron et al., 2014). This project aligns with established traditions of community-based action research, feminist political ecology, and design-led participatory research that situate knowledge production within ongoing practice rather than discrete interventions (Cameron & Gibson, 2020; Dombroski et al., 2018a; Manzini, 2015). In these approaches, research is understood as performative and relational, emerging through sustained engagement with people, place, and material conditions; and, resisting extractive or time-bound process. My work sits alongside these traditions, while differing in its longitudinal embedding within an Indigenous-led educational community and its explicit engagement with more-than-human participants as active constituents in the research process. Rather than treating action research as a facilitative method applied to a predefined problem, this study enacts action research as an ongoing mode of working with composting infrastructures, collectives, and governance contexts as they unfold over time. In this sense, action research operates here as a rift-repair orientation – one that supports cultural and

ecological revitalisation through iterative, practice-based engagement across community, material, and institutional scales.

This approach suited my practice-oriented style of working, reflecting the dynamic, hands-on process of composting itself – layering, adapting, and nurturing transformation in real time, and also allowing of time for deeper change processes to play out. Drawing further from Wakkary (2021, p. 178) in emphasising respect for time in the use of composting to produce design research knowledge, “a biography does not simply appear but is formed and reformed historically as an ongoing process”. Complex, collaborative, and practice-based research is also “always-in-process” (Tsing, 2015, p. ix), much like mycelial networks that continuously weave connections across shifting landscapes. As such, it demands reflexive skills to remain open-minded and engage effectively with an entangled, emergent research context – one shaped by the metabolic rifts this study was seeking to mend. Rather than over-defining how this ‘practice-oriented’ project is positioned, in this chapter I aim to articulate the work I wanted the research to do, what effects I hoped to see in the world, and how actively thinking with composting might shift ways of knowing. This shift mirrors the regenerative ethos of composting, fostering conditions for ecological and cultural repair, and paving the way for co-design methodologies that build on collaborative strengths.

Co-design research approaches, common in design projects (Sanders & Stappers, 2008), intertwine research and practice, allowing creative *praxis* to emerge through experimentation, co-creation, and collaboration (Blomkamp, 2018; Manzini, 2015; Zamenopoulos & Alexiou, 2018), as diverse stakeholders layer ideas and test possibilities in dynamic, participatory settings. This ethic of co-design, collaboration, and partnership is prevalent in Aotearoa, reflecting a commitment to bilingualism and co-governance that weaves Kaupapa Māori practices into participatory planning and design processes (Dionisio & Macfarlane, 2021). Composting itself is a form of co-design research, making space for diverse inputs to intermingle and transform, just like the capacity of mycelial life to repair and maintain ruptured ecologies.

The methodology that follows emerged during the preparation of my research proposal, coinciding with readings recommended by supervisors and peers (Yates et al., 2023; Yates, 2021), which blend co-design with participatory practices to address socio-ecological challenges. This period also overlapped with COVID-19 lockdowns, sharp rises in food insecurity, and local failures in wastewater treatment and organic waste management facilities, directly shaping this project’s formative features. These disruptions prompted a shift from the School of Earth and Environment at the University of Canterbury to the practice-oriented doctoral programme in the School of

Future Environments at Auckland University of Technology (AUT), reinforcing my commitment to composting as a regenerative design response to metabolic rift. Together, action research and co-design offer a framework to layer up methodologies that not only repair but also reimagine human and more-than-human interdependence in Aotearoa.

4.1 What I Want the Research to do

The first section of this chapter develops composting as a methodological frame for action that is led by the practice of decolonising methodologies – organising how I enter relationships, how knowledge is produced, and how ethical accountability is maintained through presence, reciprocity, and whānau-led purpose. It centres decolonising methodologies (Smith, 1999) to discuss what I want the research to do (respectful community research, small steps to self determination), what effects I aim to see in the world from the project (growing Māori leadership, overcoming metabolic rift, pushing limits), and how actively thinking with composting *and* decolonising methodologies might shift ways of forming practical knowing (embodying an eco-culturally unifying rift-repair praxis). The second section introduces Urban Political Agro-Ecological Praxis as a tool to guide thinking with composting in ways that are better suited to a decolonising praxis, and therefore begin embodying a rift-repairing form of composting methodology. The third section outlines the reflexive layering of methods chosen for this project – composting, writing, listening and photography. I cover how these reiterated the methodological framing of the project, and how they worked as the research tools of this project.

Composting is a diverse methodological frame for action that can choose to centre decolonising methodologies in practices. Composting and Decolonising Methodologies are regenerative by design, and as a unifying practice, it is a form of co-design research. It is "a way of inquiring, a way of producing knowing and knowledge" in a design context (Downton, 2003, pp. 1–2). Composting is such an inquiry and production of knowing and knowledge if only through working with the material qualities of the process. For example, the archetypal structure of a hot compost pile must consider the moisture, carbon and nitrogen content of materials used in the build, and how these support a condition of porosity for sufficient flow of air within a pile. There are no definitive measures for these factors in any given composting situation, only guidelines and embodied experience. Design research is itself an undefined and trans-disciplinary initiative (Cross, 2006; Koskinen et al., 2011) and the positioning of composting as a form of design research extends the porosity of this condition.

Globally, design researchers advocate for co-creation and collaboration in design-led methodologies, although these terms are recognised as being very broad (Sanders and Stappers 2008). In practice, design process invariably involves a 'creative leap', the articulation of a concept that serves to 'bridge gaps' between problems and solutions (Cross 2006, p. 57). Composting and the formation of compost piles are the material expressions of this creative leap, a co-creation of materials working with collectives of non-human and human collaborators. Composting makes room for experimentation, working with materials while also working with a reliable ethical structure in the sense that composting inevitably leads to transformation of materials (as a solution) for the benefit of interconnected and interdependent living systems. The quality of that transformation and its impact in the living world, *through an organics system,* is the focus of this practice-oriented research inquiry.

Before detailing the methodologies chosen for this project, I want to introduce a key thinking tool: the practice of building bridges between living systems worldviews and regenerative design. Stuart Cowan of the Buckminster Fuller Institute[16], speaking on a *Ma Earth Media*[17] podcast, emphasises the importance of co-design between Western and Indigenous approaches:

> "My intuition is that at this moment, the kind of co-design proposed by the Indigenous Knowledge Systems Lab... is crucial. There are many examples of working across indigenous and non-indigenous divides... This is important work of bridging and connecting without ignoring those identities, but rather exploring what happens when we try to create a future together... These co-design bridging processes will accelerate regeneration place by place."

Cowan and the Indigenous Knowledge Systems Lab[18] advocate for Indigenous design leadership in the face of modern sustainability challenges, highlighting co-design as a tool for connection – honouring difference while building shared futures. This echoes what Donna Haraway (2015) refers to as *making-with*, and what Robin Wall Kimmerer (2015), in *Braiding Sweetgrass*, achieves through the weaving of Indigenous wisdom and scientific knowledge to cultivate reciprocity with living systems.

In Aotearoa, He Awa Whiria (Macfarlane & Macfarlane, 2019) offers a locally grounded model for braiding Indigenous and Western knowledge systems without forcing synthesis (Cram et al.,

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[16] "Buckminster Fuller developed the new discipline of Comprehensive Anticipatory Design Science to support a whole systems approach to [modern sustainability challenges for humanity]" – Retrieved 09 March 2025 from https://www.bfi.org/

[17] https://maearth.com/episodes/stuart-cowan-buckminster-fuller-institute

[18] https://ikslab.deakin.edu.au/

2018; Macfarlane et al., 2024); I return to this framework in Section 4.1.1 as a key reference for respectful community research in a Kaupapa Māori environment. Within this bridging work, Wakkary (2021) clarifies a further methodological demand: that design practice must become capable of translating across more-than-human participation as well as the institutional logics that shape what can be done. As he puts it, “Designers are translators…” (Wakkary, 2021, p. 225). In this study, composting becomes a practical site of such translation – between microbial signals and community needs, and between community-led practice and the policy and planning architectures that condition organics management in Ōtautahi.

Within this bridging work, Wakkary (2021) clarifies a further methodological demand: that design practice must become capable of translating across human and more-than-human participation as well as across the institutional logics that shape what can be done. As he puts it, “Designers are translators who translate the benefits, harms, and unexplored potential of nonhumans. Designers also translate policies, standards, guidelines, and new technologies. They create experiments, tools, and methods to divine the mediating effects of nonhumans on user tastes, satisfaction, productivity, sustainability, behaviors, sociality, injustices, postcolonialism, empowerment, and so on” (Wakkary, 2021, p. 225). Read alongside He Awa Whiria, this frames translation not as neutral interpretation but as a careful practice of mediation: making space for non-speaking subjects and materially expressed signals (such as compost heat, odour, moisture, breakdown, and contamination) to inform decisions, while also working explicitly with the policy and planning architectures that condition organics management in Ōtautahi.

This bridging is critical in my own context, where I carry *Te Ao Pākehā* environmentalist traditions into a *Kaupapa Māori* community whose praxis of care differs significantly from mainstream Western models. Composting becomes one of the braids running through this research – a method and metaphor for dismantling colonial systems and dominant flows of governance and finance that have fractured living systems. Transformation is the shared purpose across many practice-based movements responding to our current crises of disconnection and decay under militarised, corporatised systems. These are the dead and dying logics – systems in need of both literal and figurative composting. Through this project, I aim to prefigure the conditions for alternative, life-affirming futures to emerge, grounded in place and practice, with composting as both method and metaphor.

I begin framing the project methodology with two key concerns:

1. how to steward a **respectful community research** *process* from my position as a Pākehā working in a predominantly Kaupapa Māori environment.
2. that each composting action and its corresponding dialogue represents a **small step towards a self-determining community food system**.

Each of these two concerns are explored further in the following section. These discussions, a dialogue between composting and decolonising methodologies, guide the broader aims of the methodological approach to this project.

4.1.1 Respectful Community Research

Pākehā researchers performing community-based studies in Aotearoa with Māori must engage with Te Ao Māori perspectives on ethical research with Indigenous communities (Waitoa & Dombroski, 2020). Researchers working in a Kaupapa Māori environment must also be aware of the risks posed by Pākehā researchers and research methodologies which can be problematic and cause damage (Smith, 1999). This project is *not* claiming to be Kaupapa Māori research, which "is about *Māori* control... [whereby] *Māori* design, plan, gather data, analyse, and write up the research" (Walker et al., 2006, p. 333). As a co-designer of a practice-oriented project, I have exercised agency within a Kaupapa Māori community with the intention of prioritising beneficial outcomes for that Māori community. Core principles of Kaupapa Māori research (Quigan et al., 2021) might be recognisable in this project, but I am not Māori and therefore this project should not be considered as Kaupapa Māori research.

A guiding light in the literature on decolonising methodologies is that of Distinguished Professor Linda Tuhiwai-Smith, a globally recognised Indigenous Research scholar, and particularly her text *Decolonising Methodologies: Research and Indigenous Peoples*.

> "[Community research] *processes* are expected to be respectful, to enable people, to heal and to educate. They are expected to lead one small step further towards self-determination" (1999, p. 149).

This statement has been key to my research process – formulating my methodology and methods – and especially important for increasing my awareness of any colonising behaviours that I could bring into Māori communities. One assumption I have worked with in the past is that urban agriculture and community composting was an undeniably good thing to do, and that promoting this was going to make it more accessible to more people. Reading *Decolonising Methodologies* and encountering the literature on the critical geographies of urban agriculture has challenged this assumption. While acknowledging the potential for urban agriculture to be positively

transformative, Tornaghi (2017, p. 782) has identified “multiple forms of injustice” embedded in urban agriculture practice. Realising some of my entanglements with these injustices has been uncomfortable and difficult to navigate from within the various communities of practice I belong to that are concerned with social and environmental issues. I see predominantly Pākehā-led agendas continuing to dominate discursive spaces for collective action that are claiming to possess a potential for transformation.

This dynamic also resonates with Wakkary’s (2021) notion of forming constituencies in more-than-human design. A constituency is not merely a collection of stakeholders, but a gathering of actors – human and nonhuman – whose concerns become legible through practice. In many environmental and urban agriculture forums I entered, I became increasingly aware of the absence of iwi subjects in shaping the discourse, even where transformation was being claimed. The “speaking subjects” in those spaces were predominantly Pākehā. A more expansive and inclusive kōrero would sound different, it would carry a distinct Te Ao Māori presence, shaped by different genealogies of responsibility and relationality. Recognising this absence sharpened my responsibility not to speak over, but to work toward conditions in which Māori leadership could determine what was spoken, how, and by whom.

This highlights the importance of making respectful research process a high priority to keep all people (including myself) safe throughout this project. I discuss this further below in terms of reflective practice and the ways that reflexivity was necessitated throughout this project. From a methodological standpoint however, the metaphor of He Awa Whiria / Braided Rivers is a powerful and poignant reference for this project (Quigan et al 2021, p. 290, citing Macfarlane et al. (2015):

> “He Awa Whiria/The Braided Rivers is a framework developed by MacFarlane and colleagues (2015) to weave both Indigenous and western knowledge systems. He Awa Whiria uses the metaphor of the iconic braided rivers of Waitaha/Canterbury. Macfarlane et al. (2015) proposed that western knowledge and theory are culturally bound and, therefore, cannot be directly transferred into another culture (i.e. te ao Māori). The differences between Māori and Pākehā are nuanced and layered... He Awa Whiria makes the case to not force the blending or intentionally minimise either knowledge system. Each stream is allowed to flow on its own mana. ... For a kaupapa to stand on its own mana, an element of stewardship, or kaitiakitanga, is required to provide protective space for expansion without dilution. Any action can enhance the mana of a person or object, or trample on it. He Awa Whiria allows vastly different worldviews to contribute to a kaupapa, while simultaneously holding their own mana (Quigan et al 2021, p. 290).”

This metaphor and concept highlights that while community composting and urban agriculture hold transformative potential in Pākehā communities, this does not necessarily mean it is universally true when deployed in Māori communities. Therefore, in this project, I had to re-

examine my assumptions about the limitations of community composting I had experienced to date and could have continued to design with as core assumptions for scaling up a community-based food system initiative. I had to step-back from an individualistic approach to design and open space for co-design to determine *how* community composting from my Te Ao Pākehā experiences could work best in alignment with the aspirations and specific cultural context of Te Pā o Rākaihautū. I had to work iteratively and collectively – takings small steps together – to identify barriers and limitations to the practice of composting methodologies, *as they emerged within a Māori community and context.* With critical educational, urban agricultural and decolonising methodologies in my back pocket so to speak, I could be a learner and a facilitator nurturing the flow of a culturally appropriate practice of composting methodologies with Te Pā.

4.1.2 Small Steps Towards a Self-determining Community Food System

In this project I committed to being more present 'in the field' – specifically, prioritising engaging in composting practices with Māori communities. Through a co-design process, I steadily built relationships with Te Pā o Rākaihautū as a community over the course of multiple years. Early conversations with leaders of this community helped to form a mandate for my research persona: restoring connections between whānau and the natural world while sharing my composting and food growing skills; and, attempting to do this at a scale large enough to feed the pā. By consistently showing up and living the composting practice within the community, I built mutual respect and reciprocity. This allowed me to grow an embodied understanding of decolonising practice – going beyond what I could learn from reading or theory alone. Embodying my knowledge of composting practice was my primary and most important methodology for enabling me to respectfully work with more-than-human beings, to do composting effectively, in a specifically Māori cultural context. I built relationships around the core activity of making compost with Te Pā as a community, a simple and sophisticated collective act of healing. It is reasonable to think that each composting exercise and its corresponding dialogue represents a small step towards a self-determining community food system. It is possible that both composting and decolonising methodologies are a model for healing metabolic rifts, and that this constitutes a respectful and worthwhile praxis for me to stand by.

4.2 What Effects I Aim to See in the World from the Project

4.2.1 Overcoming Metabolic Rift

In this study, overcoming metabolic rift is part of taking small steps towards a self-determining community food system. McClintock (2010) talks about how urban agriculture attempts to overcome metabolic rift and unpacks the term into three different categories (see Figure 7). There are two arguments for how to overcome rifts that stood strong throughout this study: 1) by considering the systems which create and maintain unjust human-soil relational practices (Krzywoszynska & Marchesi, 2020), and; 2) with shifts in regulatory and conceptual frameworks (Dehaene et al., 2016).

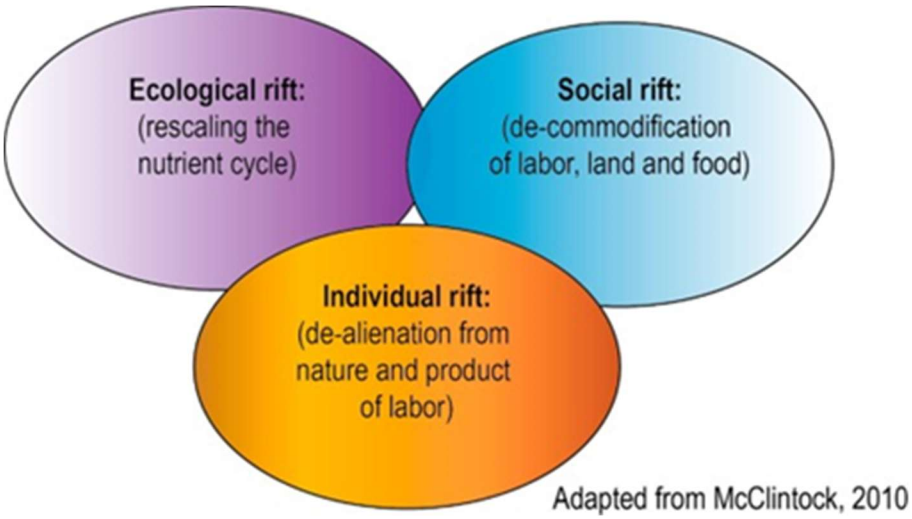

Figure 7: Categories of Metabolic Rift. (Bahers & Giacchè, 2019).

Overcoming metabolic rift in the context of this study required more from mainstream environmentalist and social change movements, including urban agriculture, community composting, and urban food systems change initiatives in Ōtautahi Christchurch. Authors acknowledge there is potential for these initiatives to achieve widespread transformation (Alkon & Agyeman, 2011; Horst et al., 2017; Pothukuchi, 2015), but critical analysis of alternatives to large, centralised food systems and organics suggests need to go deeper yet to find more robust foundations if repair methodologies are going to be both enduring and coherent with Indigenous eco-cultural systems.

> "While urban agriculture gradually finds its way into the fabric of the city, often through grassroots-led initiatives, and starts to transform urban metabolism (through modifying the diet of community food growers, recycling kitchen waste or realising the agricultural potential of urban green spaces), many of these initiatives remain isolated and residual.

> Even when economically viable and thriving, they do not necessarily impact on the issues of justice, health, resourcefulness or progressive development" (Dehaene et al., 2016, p. 176).

Further to this thread in the literature on overcoming metabolic rift – multiple authors (Ferdinand, 2021; Leeuwenkamp, 2023b) discuss the critical importance of "a combined decolonial and ecological approach ... to fully understand the complex ways in which historical injustices affect today's unequally distributed vulnerabilities to climate catastrophes, health and social crises, … is also necessary because it urges critical theory to look beyond its own tradition for more fruitful ways of thinking about nature." (Leeuwenkamp 2023, p. 131).

> "Different environmental movements have paid as little attention to antiracist struggles as they have to anticolonial struggles. To hold antislavery, anticolonialism, and environmentalism together, to get rid of the shadow of the Anthropocene's hold, that is the task of a decolonial ecology." (Ferdinand, 2021, pp. 123–128).

Forming a combined decolonial and ecological approach required careful attention to who could legitimately speak within dominant political discourse. Wakkary (2021) reminds us that designers often become translators and, in doing so, risk becoming the speaking subject on behalf of others. Throughout this project, I became acutely aware of the limited presence of iwi voices in policy forums concerned with organics governance. I raised my concerns with Te Upoko o Ngāi Tūāhuriri, Dr. Te Maire Tau, who signalled through email a willingness to engage in this discourse (Appendix P). Further engagement did not materialise within the timeframe of this project, although Te Pā certainly has ongoing and significant whakapapa, relational ties, to Te Ngāi Tūāhuriri.

This absence must be understood within the broader context of iwi leadership operating under the cumulative pressures of colonial governance systems that continually demand labour, representation, and negotiation across multiple fronts. We never got to speak on the subject in the lifetime of this project, but the point is that in my research context, my speaking in certain forums was relationally mediated – supported by elders in a chain of dialogue who signalled what was appropriate for me to raise, how to raise it, and where silence and patience were required. I added to this my own sense of when to push the limits with what I said and to who, trusting I had gained enough perspective to do so respectfully. This did not grant me authority to speak on any matter on behalf of Iwi Māori, or any Tangata Whenua (all Māori people in Aotearoa) for that matter. I had an obligation to speak carefully, as one should regardless of context, within the boundaries of trust, and always in service of growing Māori leadership rather than substituting for it.

My research project focuses on strengthening a praxis for community-based food systems initiatives, and in particular, localised organics systems and composting methodologies, to realise more of their potential to be widely transformative as opposed to being 'isolated and residual' and even limiting of promising alternatives to the dominant paradigm. In this next section I suggest that to enact a culturally appropriate set of conditions for transformation, repair methodologies must combine decolonising approaches to urban, political agroecological approaches, which includes localised composting.

4.2.2 Pushing limits

A hypothesis driving this work is that a city's entire organics system can be managed through a robust network of community-led composting sites, pushing the limits of what is considered feasible and, if achieved, unlocking transformative societal change rooted in communities reclaiming sovereignty, connectivity, and liveliness in their food systems. One heap at a time, collectives can confront these boundaries, test innovative approaches, and iterate toward unprecedented levels of self-determination. The limitations are also like a compost in that they are multi-layered, yet I know breakthroughs are possible beyond what is typically deemed a 'community scale' for composting – I did it before with Cultivate Christchurch. While authorities overseeing organics systems in New Zealand's larger cities mostly persist in sidelining community-based solutions, I argue that composting can exceed both their expectations and even the ambitions communities hold for themselves. Proving this demands not just composting, but thinking expansively with composting and communities, redefining what is possible for collective resilience and inter-dependability. This study does not claim that a fully community-led citywide organics system is immediately achievable under current governance, land tenure, labour capacity, and compliance settings in Ōtautahi. Rather, it demonstrates that community composting can operate at meaningful volume and reliability, while making visible the limiting conditions – odour risk, contamination control, neighbourhood tolerance, consenting pathways, insurance and liability, and institutional protection of incumbents – that must be navigated if such a network is to scale.

This vision of pushing limits through composting hinges on grounding it in a culturally critical context. Alternative organics systems need to work in a critical context whereby cultural concerns for sovereignty and self-determination can be supported. And this is because any research in Aotearoa done by Pākehā, especially where this concerns the health of the environment, must uphold responsibilities to Whenua, Tangata Whenua, and Te Tiriti o Waitangi. This meant building a meaningful partnership with a Māori community, which, through my unique positionality in

Ōtautahi, I was able to do relatively quickly. The privilege of the PhD scholarship afforded me the time to invest in people and place, all the while enhancing the practice – such was the fortuitous circumstance that came about by enacting a partnership between the 20:20 Compost Collective and Te Pā o Rākaihautū. Through this collaboration, the project became more about supporting a Māori community to reconnect with the practice of composting, and in doing so, repairing rifts caused by the colonisation of an Indigenous people, and the colonisation of Te Ao Turoa through industrial practices. This partnership became a testing ground for stretching composting as a repair-practice.

I also wanted this research project to have the effect of pushing the limits of community composting in the direction of achieving the food sovereignty aspirations of Te Pā. That is a relatively large-scale task considering this would mean feeding over a thousand people per day on a regular basis. While feasibly achieving this was unlikely within the limited timespan of this PhD project, with Te Pā, at least I was working with a community already performing transformative actions. I wanted the course of the research to establish something that would continue without me – and following Tuhiwai Smith – would respectfully enable people, be educational, and promote healing, leading to small steps toward self-determination, or more specifically, kai motuhake.

The work of this research was not oriented toward the recruitment of participants, but toward the gradual formation of collectives through shared practice. These collectives did not emerge through formal organisational design, but through repeated, situated acts of composting, learning, maintenance, and problem-solving carried out over time. In this sense, collectivity was not an outcome measured at the end of the project, but a methodological condition cultivated through presence, reciprocity, and embodied contribution. Several overlapping collectives took shape through this process. At Te Pā o Rākaihautū, composting became a focal activity through which whānau, kaiārahi, tamariki, and non-human composting organisms gathered around shared concerns for whenua, kai motuhake, and care. Beyond the pā, operational collectives formed around the practical requirements of sustaining composting at scale, including relationships with neighbouring landholders, community growers, organics suppliers, and collaborators involved in transport, monitoring, and site stewardship. A further collective emerged at the institutional interface, where engagement with council officers, regulators, and policy documents required coordinated action, shared authorship, and collective negotiation.

These collectives were not discrete or bounded; they overlapped, dissolved, and re-formed in response to shifting material, social, and institutional conditions. What held them together was

not a fixed identity or governance structure, but a shared commitment to working with composting as a means of repairing fractured relationships between people, soils, and systems. From a methodological perspective, the formation of collectives was therefore both the means and the evidence of rift-repair in practice: a way of testing whether sustained, community-led composting could convene durable forms of cooperation capable of operating across ecological, cultural, and governance scales.

Establishing collectives required a sustained commitment to presence and reciprocity, amplifying the potential to push boundaries further. From the outset of the research-based relationship with Te Pā, I verbally committed to people at Te Pā that being a PhD candidate would support at least three years dedicated to the kaupapa of Te Pā's kai motuhake aspirations. Because of my positionality, and because of my choice to prioritise being present at Te Pā, I garnered a respect that meant I was invited into privileged spaces in the community. This presented me with unique opportunities to listen and learn of the work that Te Pā wanted to do – and importantly, to witness first hand at times the challenges being faced – not just in the space of realising kai motuhake, but for realising mana motuhake as a *Kura-a-Iwi* (tribally-connected Māori place-based learning). It became apparent early in the journey of the project that there was much I could contribute, and that the aspirations of Te Pā would require much more work than just I could do through the research, but in any case, to maintain a respectful presence required me to continue to make compost with Te Pā whānau on a regular basis. As an avid composter and gardener (all day, any day!) in a privileged position within a Māori community, learning generous amounts in return – Te Reo Māori, Mātauranga Māori – this position was very clearly safe and fertile grounds to push limits through a respectful action research collaboration.

4.2.3 Growing Māori Leadership

The theoretical drive of the project initially stemmed from my own questions about scaling community composting, but as I learned to embody decolonising practices, I recognised I was imposing a Pākehā lens on what success should look like in a partnership. I arrived with a monocultural concept of transformative composting, stepping into a Māori space that, while aligned with the vision of food sovereignty, held distinct aspirations and pathways rooted in Te Ao Māori. Rather than fixating on composting's technical success – I shifted to interpreting composting methodologies within the Kaupapa Māori context of Te Pā. This required prioritising listening and observing over asserting my own transformative vision, and affirming Te Pā's perspectives to guide how kai motuhake could take shape in this specific cultural and community context.

This shift presented a challenge: Te Pā whānau quickly elevated me into roles where I was urged to speak first, sharing composting knowledge in front of children and teachers. Instead of leading with words, I leaned into action, guiding us all into the hands-on practice of composting – a rapid, embodied way to share knowledge that transcends mere observation or instruction. Composting, a craft learned through direct engagement with soil, tools, and living organisms, became a bridge for mutual learning. By stepping back from my (Pākehā) personally-driven narrative and centring this experiential process, I supported the growth of Māori leadership, enabling Te Pā's community to reclaim and adapt composting within their tikanga, fostering growth together in the doing.

Beyond the act of composting, I found other ways to contribute to Māori leadership. One key role for me as a Pākehā ally was to speak up about colonial injustices impacting Māori – issues like the industrial colonisation of organic waste management – supporting Māori communities with the constant labour of naming these harms. Guided by increasingly trusting connections with Māori through Te Pā, I learned when and how to call out these injustices effectively in other forums, amplifying Māori wisdom in spaces where it is often drowned out by dominant, disrespectful politics. This advocacy, especially in political arenas, can elevate Indigenous leadership, a task growing ever more vital as *re-indigenising* methodologies gain traction in public discourse. Through composting and allyship, I aimed to create space for Māori voices to lead, ensuring the project bolstered their mana and self-determination.

4.3 How Thinking with Composting and Decolonising Methodologies Can Shift (Praxis) Ways of Knowing

Throughout much of this study, I found inspiration in Tornaghi and Dehaene's (2020) critique of Urban Agriculture (UA), which they reframe as an *urban political agroecological praxis* – a transformative approach to shift ways of knowing under urban capitalism. They identify three disruptive mechanisms driving this shift: i) interrupting logics of substitution, ii) embodying an ecology of care and more-than-human solidarities, and iii) building resourceful communities through empowering infrastructure (Tornaghi & Dehaene, 2020, p. 605). Dehaene et al. (2016) extend this, proposing an "alternative urbanism" that repairs metabolic rifts by connecting across groups and engaging politically for widespread healing (see Table 1). Table 1 contrasts UA's limitations – hyper-local, isolated, and minimally transformative – with an agroecological praxis that reimagines scale, dismantles unjust systems, and pursues a radical agenda for change. Tornaghi and Dehaene (2020, p. 599-601) describe this praxis as "a rich framework and constellation of virtuous practices… to bring forward a paradigmatic change… [and] actively

dismantle disempowering and oppressive processes," citing activist case studies that "reimagine the scale at which closed loops of agroecological farmers operate in an urban context" (ibid, p. 603).

Urban Agriculture (UA)	Urban (Political) Agroecological Praxis
Hyper-local	Reframe "urban" by reimagining scale
Isolated and residual	Actively dismantle unjust systems
Limited transformation	Radical agenda for transformation

Table 1. A tabulation of Tornaghi and Dehaene's (2020) differentiation of urban agriculture and urban (political) agroecological praxis.

Thinking with composting through this lens shifted my understanding of praxis in Ōtautahi Christchurch, where decolonising methodologies intertwined with organic waste management to challenge colonial and industrial knowledge systems. These were the unjust systems I sought to disrupt, using composting as a decolonising tool to reimagine scale – not just technically, but culturally – grounded within Te Pā o Rākaihautū's eco-cultural substrates. While Tornaghi and Dehaene's framework suggests an 'alternative urbanism' with broader healing potential, my focus narrowed to composting's role in restoring Māori-led ways of knowing. The specifics of this mātauranga remain unpublished here to honour Te Pā whānau ownership. This work revealed that dismantling unjust systems, particularly at an institutional level, demands an intergenerational approach – a lesson in patience and humility that composting itself mirrors, as it slowly turns waste into fertile ground.

4.4 Reflexive co-design of methodologies and methods as practical research orientations

Reflexive practice, grounded in Donald Schön's (1983) conception of the reflective practitioner, provided a critical lens through which to interrogate my own positionality as a Pākehā urban farmer entering a Kaupapa Māori space. Reflexivity became a necessary orientation – not as an abstract ideal but as a lived methodological imperative – anchoring the ethical demands of this research within relational accountability and situated presence. This reflexive turn was catalysed by tensions explored in earlier chapters: the dual effects of urban farming as both a site of localised resilience and as a space shaped by whiteness and unjust settler logics (Roman-Alcalá, 2015; Tornaghi & Dehaene, 2020).

In light of these tensions, I reframed my methodological approach around composting – not simply as a technical process or ecological intervention, but as a living systems practice aligned with regenerative and decolonising aims. Composting, as discussed in Chapter 2, became both a metaphor and an enacted practice of rift-repair: a way of working across ecological, cultural, and epistemic divides through repeated, material engagement. Within this framework, I drew on Linda Tuhiwai Smith's (1999) decolonising methodologies to recognise and resist the risk of extractive research patterns, particularly in participatory action research led by a non-Indigenous researcher within a Kaupapa Māori context. I also drew on support from scholars in More-than-Human design research who understand risk as an expression of generosity, sharing of oneself, and being open to unanticipated outcomes, approaching research with practical orientation of "humility, vulnerability, uncertainty, and unknowingness" (Helms 2024, p. 4) towards all participants, human and nonhuman.

Rather than defaulting to dominant Pākehā research instruments, I turned to the tools of composting – garden forks, thermometers, time, presence – as both literal and figurative methods for iterating practice, embodying care, and yielding to processes of co-design. For example, a single compost build often involved multiple layers of method: material work (building and monitoring the pile), relational work (working alongside whānau and tamariki), reflective work (field diary entries and photographs), and institutional engagement (documenting compliance requirements or responding to council inquiries). These tools operated within a broader logic of layering: a way to continually rework the boundaries between knowledge and relationship, between intention and emergence. Layering functioned as a discipline of return: re-entering the same sites and relationships with new information, recalibrating practice, and keeping methodological decisions traceable across time. Composting allowed me to move beyond individual cognition into an embodied, ecological mode of knowing-with (Haraway, 2015), as in alongside. This move also aligned with Robin Wall Kimmerer's (2015) invitation to braid Indigenous wisdom and scientific inquiry through the ethic of reciprocity.

Through co-designed composting trials with Te Pā o Rākaihautū, this research transitioned from methodology to relationship. Reflexive co-design was not a fixed phase but a continuous mode of research-in-practice, unfolding through whanaungatanga and guided by care-full attention to kaupapa such as Te Pā's whakapapa (e.g. Kura-a-Iwi), Te Pā-style manaakitanga (e.g. wharekai, māra kai), and kaitiakitanga (e.g. Mātaiao kaupapa performed by Te Pā). Listening to the lived realities of Te Pā whānau required unlearning many of my assumptions – particularly the idea that composting alone, as a material intervention, could deliver transformation. What emerged

instead was a deeper understanding that composting needed to be embedded within the cultural narratives and aspirations of the community: the pursuit of mana motuhake, kai sovereignty, and the restoration of relationships between tangata, whenua and atua.

Committing to this relational mode of praxis meant investing in time, presence, and finding shared rhythms. Over four years, my consistent contribution to composting work became a relational bridge into the everyday life of the pā. Being there – building heaps, planting and weeding māra kai, cleaning up, guiding Tamariki – created opportunities to move from researcher to co-contributor, building trust not through words alone but through action. Reflexive practice demanded that I not only reflect on my actions, but allow my actions to be shaped by the collective's values and insights. In this way, composting evolved into a shared space of meaning-making, supporting both tangible systems change and the cultural shifts that underpin it.

Composting thus emerged as a relational methodology, a bridge between worldviews, and part of a pedagogy situated deep in whakapapa ties to whenua. The co-design process that unfolded was shaped as much by pūrākau, karakia and waiata as by temperature records and carbon-to-nitrogen ratios. Whānau engagement was not framed as participation, but as building of self-determination. These shared actions – layering the greens (nitrogen rich material) and browns (carbon-rich material), watching the pile transform, returning food scraps to whenua – embodied the living systems worldview outlined in earlier chapters. They represented small acts of rift-repair within the broader ruptures of colonial environmental management, and helped prefigure a more just and reciprocal food system attuned to the tikanga and rhythms of place, of taiao.

4.5 Methods

4.5.1 Composting

Composting is my key method, a practical and transformative tool to power repair functions in cultural landscapes and restore eco-cultural system health in Ōtautahi Christchurch. To clarify how composting operates methodologically in this research, I draw on Wakkary's concept of constituencies to articulate how humans and non-humans are convened through shared matters of concern. Wakkary describes constituencies as the assemblies of humans and non-humans that gather through ongoing commitments of care, attention, and participation, forming the conditions from which design activity and responsibility emerge (Wakkary, 2021). Constituencies are not predefined user groups or stakeholders, but living collectives that take shape through practice and endure through time.

In this study, composting functioned as a constituency-forming practice. Each composting site assembled human participants (whānau, kaiārahi, collaborators), non-human participants (microorganisms, fungi, soils, plants), material artefacts (tools, organic residues, infrastructure), and institutional conditions (regulations, policies, land tenure). These elements were bound together not by abstraction, but by practical obligations: managing odour, responding to heat, correcting contamination, ensuring food safety, and maintaining trust with neighbours and authorities. Through these shared concerns, composting convened a constituency capable of acting collectively across ecological, cultural, and governance domains.

Understanding composting through constituencies helps clarify rift-repair as a methodological orientation rather than a technical solution. Rift-repair did not occur through composting alone, but through the capacity of composting practices to gather and sustain constituencies that could remain attentive, responsive, and accountable over time. These constituencies enabled the research to move across scales – from soil metabolism, to community food systems, to institutional engagement – without collapsing difference or erasing Indigenous leadership. In this way, composting became a means of designing-with living systems, where repair emerged through sustained participation in shared material and relational conditions.

This active thinking and making with composting shifts ways of knowing, revealing both its potential and its limits within dominant systems, such as the regulatory hurdles of ‘resource consent,’ which I explore further in the two exegetical chapters that follow. By targeting a replacement organics system, one heap at a time, the collectives in this study co-designed, iterated, and experimented with a rift-repair methodology that unleashed composting’s transformative capabilities. This method’s strength lies in its mundane yet profound capacity to sustain engagement and care, as Puig de la Bellacasa (2017) inspires:

> "a vision that embeds care relations in mundane doings of maintenance and repair that sustain everyday life… an aspiration to engage speculatively with imperceptible tendencies… transforming everyday soil care… [and] ‘making time’ to get involved with a diversity of timelines (such as the ones involved with living soil) that make the web of more than human agencies" (pp. 170-171).

Composting, then, was never just about organics diversion – it became a methodological pivot. In practice, it revealed a capacity to transform not only matter, but also the researcher, the relationships, and the rhythms of engagement. What emerged, particularly within the relational fabric of Te Pā, was a deeper attunement to *whanaungatanga* – a cultural force too often dismissed as mundane or procedural, yet which forms a resilient, enduring substrate for transformation. Respectfully entering into this relational field required time, humility, and practice

– and composting together offered a way to do this, not as a metaphor, but as an enacted commitment.

At Te Pā o Rākaihautū, composting became a connective agent – community engagement, decolonising praxis, and regenerative practice rolled into one – sustaining a critical questioning of its possibilities. What scale can be achieved by a community-based operation? Can we sustain this as a reliable alternative for commercial operators to plug into? How do we reconcile the priority of repairing rifts with the machinations of the dominant system? Those questions will not explicitly be answered here in subsequent sections. For now, what is important is that through each compost build, it bridged human and non-human worlds, fostered greater food sovereignty and conducted repair of cultural and ecological rifts in a time-space of iterative, hands-on transformation.

Across the course of this study, each compost build operated as a situated site of rift-repair, where human and more-than-human worlds were brought into relation through hands-on, iterative practice. For example, at Te Pā o Rākaihautū, early composting sessions with tamariki and kaiārahi centred on returning daily food scraps from the wharekai to soil through small-scale hot compost piles. These builds foregrounded learning-through-doing: monitoring heat with hands and thermometers, adjusting moisture through observation rather than measurement alone, and responding collectively when piles failed to activate. Here, composting fostered eco-cultural reconnection by making soil processes visible and participatory, grounding food sovereignty aspirations in lived experience rather than abstraction.

As the work extended beyond Te Pā into larger soil remediation contexts, compost builds took on different configurations and responsibilities. At sites receiving commercial food scraps and green waste, composting became a negotiation between microbial processes, regulatory expectations, and community accountability. Odour management, contamination control, and neighbour relationships became matters of shared concern that required continual adjustment of practice. Each build demanded responsiveness to non-human signals – excessive heat, anaerobic conditions, or pest attraction – while simultaneously navigating institutional scrutiny. These composting events thus bridged human and non-human worlds not symbolically, but operationally, as failures and successes directly shaped both soil outcomes and social trust.

Across sites, composting repeatedly enacted repair through its temporal demands. Each pile unfolded over weeks and months, requiring return visits, care, and recalibration. This slow, iterative rhythm enabled relationships to deepen: between whānau and whenua, between

practitioners and microbial life, and between community initiatives and governance frameworks. Rather than producing discrete outputs, composting generated a time-space of transformation where cultural, ecological, and institutional rifts could be encountered, negotiated, and partially repaired through sustained, collective engagement.

I return to these propositions more fully in my concluding reflections, where I consider composting as a practical determinant capable of tending to mauri and activating culturally specific energies toward systems repair and the realisation of Te Tiriti-based futures.

4.5.2 Listening

Listening, in this study, is a vital method that extended beyond my ears to encompass all my senses, fostering connections with the living worlds of the cultural landscapes in this study, with Te Pā o Rākaihautū, and especially with their aspirations for food sovereignty. Ways of knowing that prioritise liveliness and living systems motivate me, especially within collectives where respectful and reciprocal relationships with local landscapes are paramount. At Te Pā, this priority amplified my role as a partner, where mutual respect for life – human and more-than-human – shaped our collaboration.

Embodied listening in this study was documented and analysed through a combination of field diaries, photographic records, and reflective writing undertaken in close temporal proximity to composting activities. Listening did not operate as an abstract attentiveness, but as a materially grounded practice shaped by repeated engagement with compost piles, soils, tools, and people. Sensory observations – such as heat gradients within a pile, odour shifts, moisture levels, rates of breakdown, or signs of distress in surrounding landscapes – were recorded alongside contextual notes about social interactions, governance pressures, and collective decision-making.

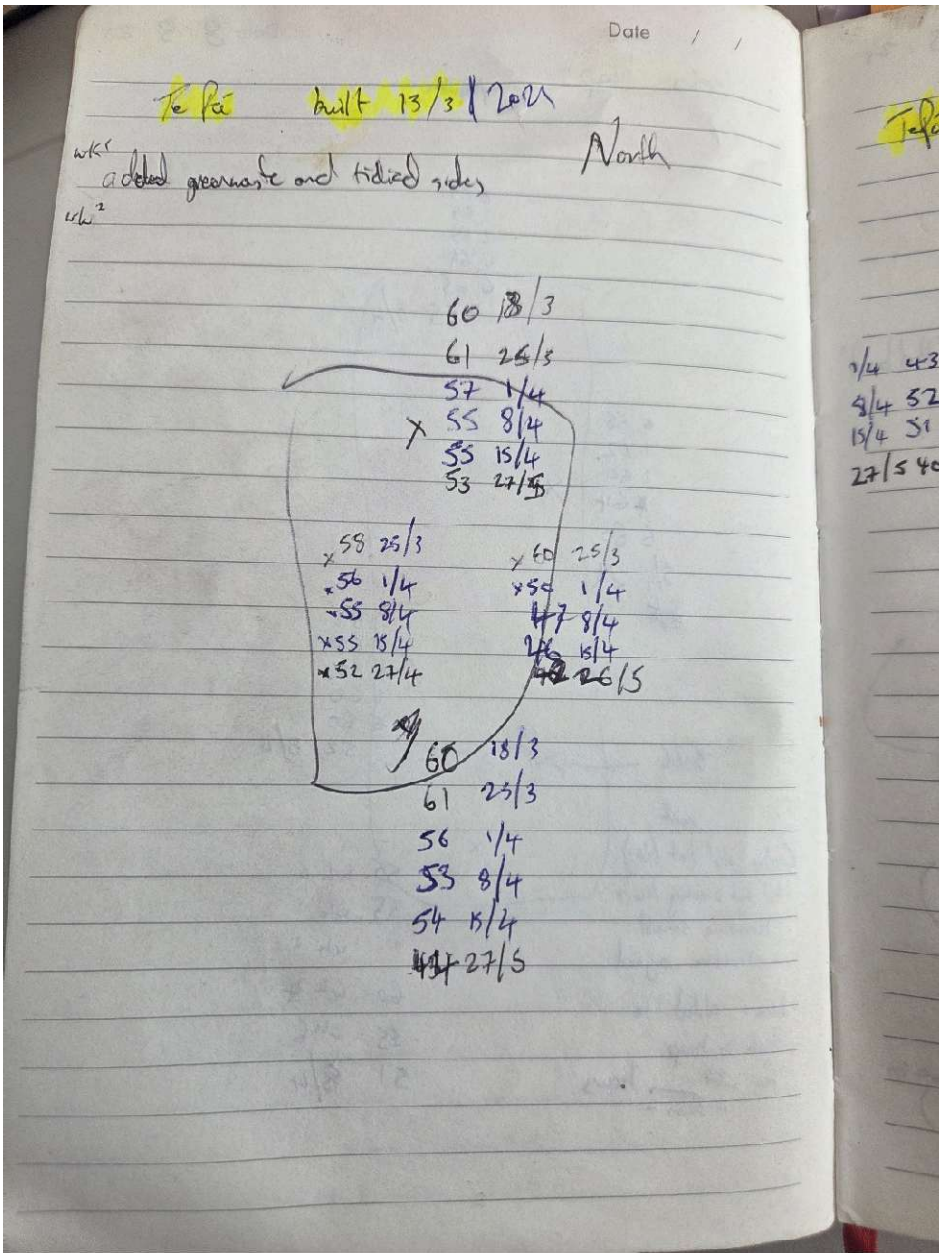

Figure 8: Excerpt from Field Diary (2021) with date and temperature readings on the 20:20 Compost trial SPICE heaps.

Analysis occurred through iterative cycles of action and reflection rather than formal coding procedures. Field diary entries were revisited over time to identify patterns across compost builds, including recurring moments of failure, adaptation, and relational negotiation. These patterns were cross-referenced with photographic sequences that visually documented change over time, enabling slow transformations to be made perceptible and comparable across sites. Reflective

writing functioned as an analytic practice in itself, allowing insights to emerge through narrative synthesis rather than abstraction from practice.

Crucially, embodied listening was also subject to relational accountability. Interpretations were tested through ongoing kōrero with whānau and collaborators at Te Pā o Rākaihautū, ensuring that observations remained grounded in shared experience rather than individual interpretation alone. In this way, listening was not only documented but continuously recalibrated through practice, dialogue, and return. This approach aligns with first-person and practice-based research traditions that treat attentiveness, reflexivity, and situated judgement as valid and necessary forms of analysis when working with living systems over extended timeframes.

Though I lack a deep knowledge of my own whakapapa to claim kinship ties to soil life as Indigenous cultures can and do, I feel materially connected to the entities and beings in this study. I sense their liveliness and respond to their needs with my body and conscious mind. Listening with my senses – feeling the heat of a compost pile, seeing its transformation, or noting distress in the landscape – grounds and charges my sense of responsibility to support these living systems. In Aotearoa, this approach also resonates with Kaupapa Māori practices of kōrero and relational accountability, where listening is inseparable from presence, contribution, and trust (Smith, 1999; Kawharu et al., 2024). While this research does not claim Kaupapa Māori methodology, these principles informed how listening was enacted and evaluated within a Māori-led educational context. These sensibilities naturally aligned my practice with Te Pā and Te Ao Māori's reverence for vibrant, interconnected worlds.

Listening and reflexive observation in this study are grounded in established traditions of practice-based, first-person, and more-than-human research. Donald Schön's (1983) conception of reflection-in-action provides a foundational reference for understanding how knowledge emerges through doing, particularly within complex and uncertain practice environments. Feminist Science and Technology Studies and Feminist Political Ecology further extend this orientation by framing attentiveness, care, and situated judgement as epistemic practices rather than subjective residue (Puig de la Bellacasa, 2017; Haraway, 2016).

Within design research, first-person and autobiographical methodologies legitimise embodied attentiveness as a site of knowledge production, particularly where systems unfold slowly and resist abstraction (Desjardins et al., 2021; Lucero et al., 2021; Neustaedter & Sengers, 2012). More-than-human design scholarship further supports listening as a relational practice that involves learning to be affected by nonhuman actors and material processes (Wakkary, 2021;

Helms, 2024). Together, these bodies of work justify listening not as passive reception, but as an active methodological stance through which responsiveness, accountability, and judgement are cultivated over time.

Listening, here, was never passive. It became a conscious relational posture – a mode of attuning and accountability – that invited me into deeper forms of connection and responsibility. In contexts too often structured by urgency, extraction, or formality, listening risks being dismissed as inefficient or inactive. But within this kaupapa, it was generative. It created space for relationships to take root on properly grounded cultural terms. Crucially, listening did not mean standing idly by. Composting became my way of being present, contributing, and remaining active within the living rhythms of the community. It offered a way to reciprocate – to be useful and engaged – rather than expecting others to do the cultural labour of bridging to me while I waited for answers to my questions. Hands-on involvement built trust through action, and ensured my listening was not extractive, but situated within shared purpose and collective effort.

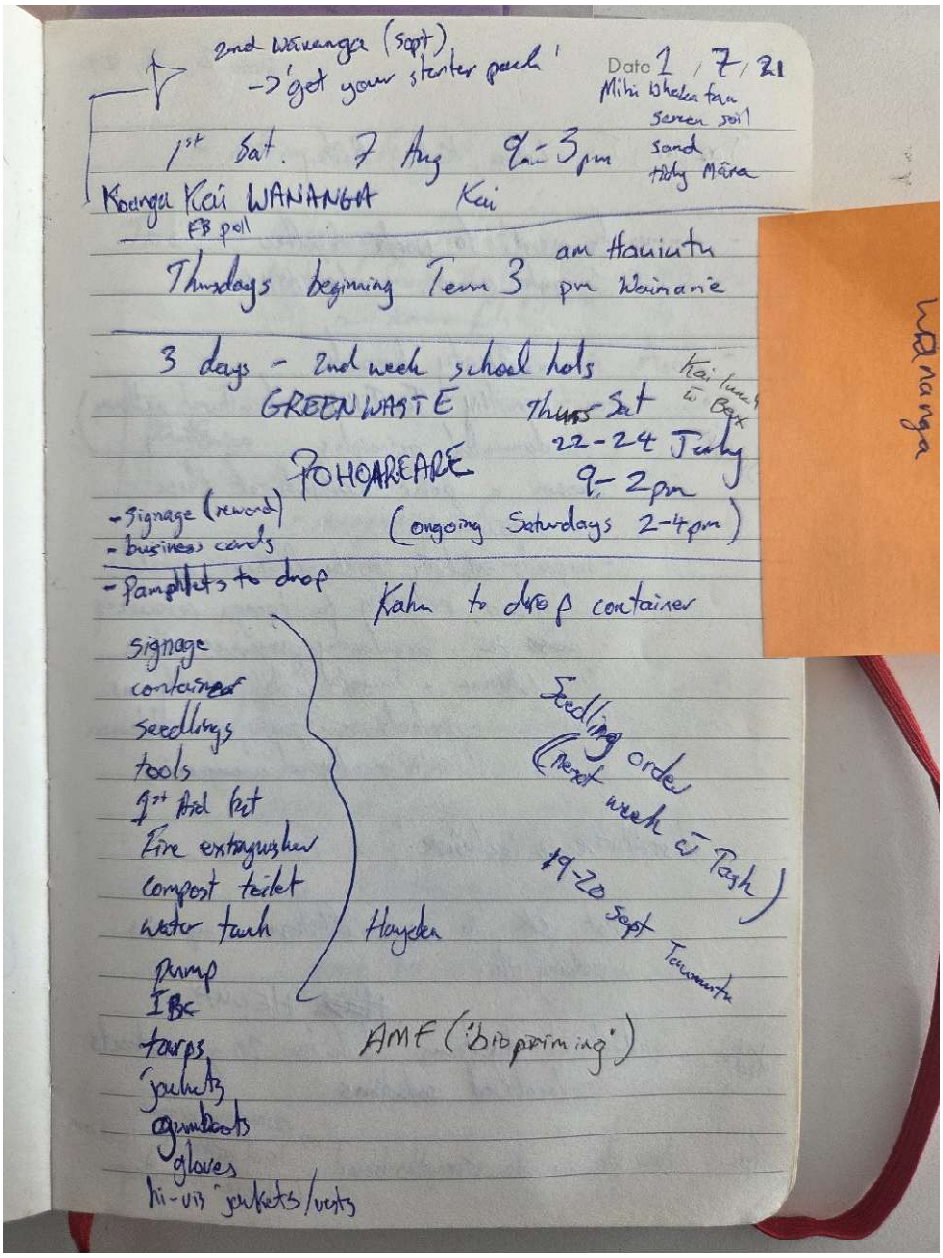

Figure 9: Excerpt from Field Diary (2021) – planning a wānanga; listing equipment needed for upholding health and safety on-site at Te Ōraka; a calendar ahead for regular curriculum engagement (e.g. Hauaitū and Waimarie and two learning clusters / pools or 'puna' within Te Pā o Rākaihautū).

This embodied listening transcended my researcher persona, enabling me to participate authentically in Te Pā's community. By openly sharing my privileges and being present – first as a partner, then as a guide – I joined tamariki and whānau in daily tasks, hearing their stories and aspirations through kōrero, a conversational practice rooted in Kaupapa Māori contexts (Kawharu

et al., 2024). While I do not claim to know Kaupapa Māori research methods as a Pākehā, I drew inspiration from kōrero to better align Western approaches to research with concerted listening, co-designing composting and community engagement. My intent was to honour the fact the research context was a predominantly Kaupapa Māori environment and to honour the guidance from Te Pā's leadership to reconnect the kids and whānau with natural cycles and whenua.

This approach has enabled me to build a respectful presence, weaving me into the fold of the many, varying genealogical layers of human and more-than-human whanaunga at Te Pā, and within its wider community. These are enduring communities held together across generations. Through listening, I supported Te Pā's leadership in reviving connections with composting, amplifying these ways of knowing living worlds in concert with my own. It is in this way that listening operated not just as a method, but as a form of relational infrastructure — one that animated and grounded this research within living systems of care and cultural strength.

4.5.3 Writing

Writing emerged as a powerful method in this study, functioning as a political contribution to collective action by re-positioning composting away from industrial-commercial models and toward community-led alternatives. Following listening and reflexive observation, I wielded writing to test these alternatives against Ōtautahi Christchurch's regulatory frameworks, intertwining hands-on composting with advocacy. This strategy involved document analysis and writing functioned as both a reflective and analytic method throughout this project. Beyond formal academic drafting, I engaged in ongoing annotated writing practices that included margin notes on policy documents, planning frameworks, consent correspondence, technical guidance, and funding applications related to organics management in Ōtautahi Christchurch. These annotations recorded immediate reflections, questions, tensions, and emerging insights as they arose through practice.

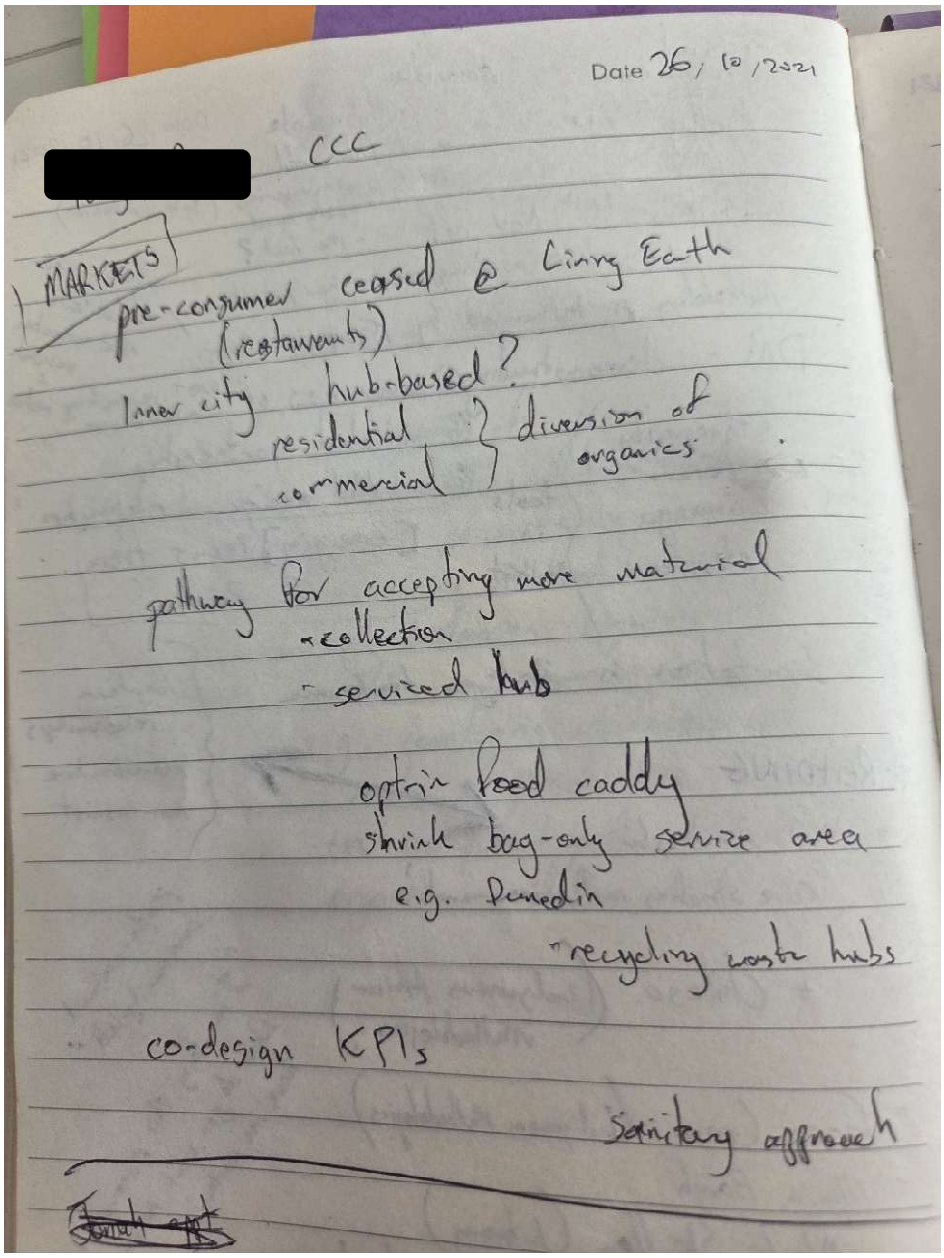

Figure 10: Excerpt from Field Diary (2021) – notes on correspondence with local government officials arising from September 2021 deputation (see Appendix B).

This form of writing enabled real-time sense-making in response to institutional encounters, allowing me to trace how regulatory logics, governance constraints, and dominant waste-management paradigms interacted with on-the-ground composting practice. Annotated documents were revisited longitudinally, enabling comparison across time as policy positions shifted, relationships evolved, or composting trials generated new evidence. In parallel, reflective writing in field notebooks and digital logs supported retrospective analysis. These writings

captured moments of uncertainty, adaptation, and learning that were not always visible in formal outputs, and provided a means to synthesise material, social, and institutional dynamics without abstracting away from practice. Writing, in this sense, operated as a method for holding together action and reflection, allowing rift-repair to be traced as an evolving orientation rather than a fixed outcome.

Document analysis was also about tracking other people's writing and kōrero especially as it informed decision-making on organics infrastructure. My writing was also proactive, such as co-authored health and safety plans, operations manuals, adaptive management plans, and pre-applications for resource consent with Te Pā and 20:20 Compost collaborators. These documents safeguarded the practice from compliance pressures, protecting participants and the non-human landscapes implicated in our composting, while asserting its place in the city's replacement organics system. Meetings and formal correspondence relating to these documents also brought traditionally non-speaking constituents into conversation, in-person, with dominant, incumbent institutional speakers, further highlighting ways these research methods enacted rift-repair by becoming more expansive and inclusionary. Beyond advocacy, I wrote into field diaries to record composting trials and technical tasks like odour and litter monitoring, grounding my observations in the material realities of each heap and refining our approach through iterative reflection.

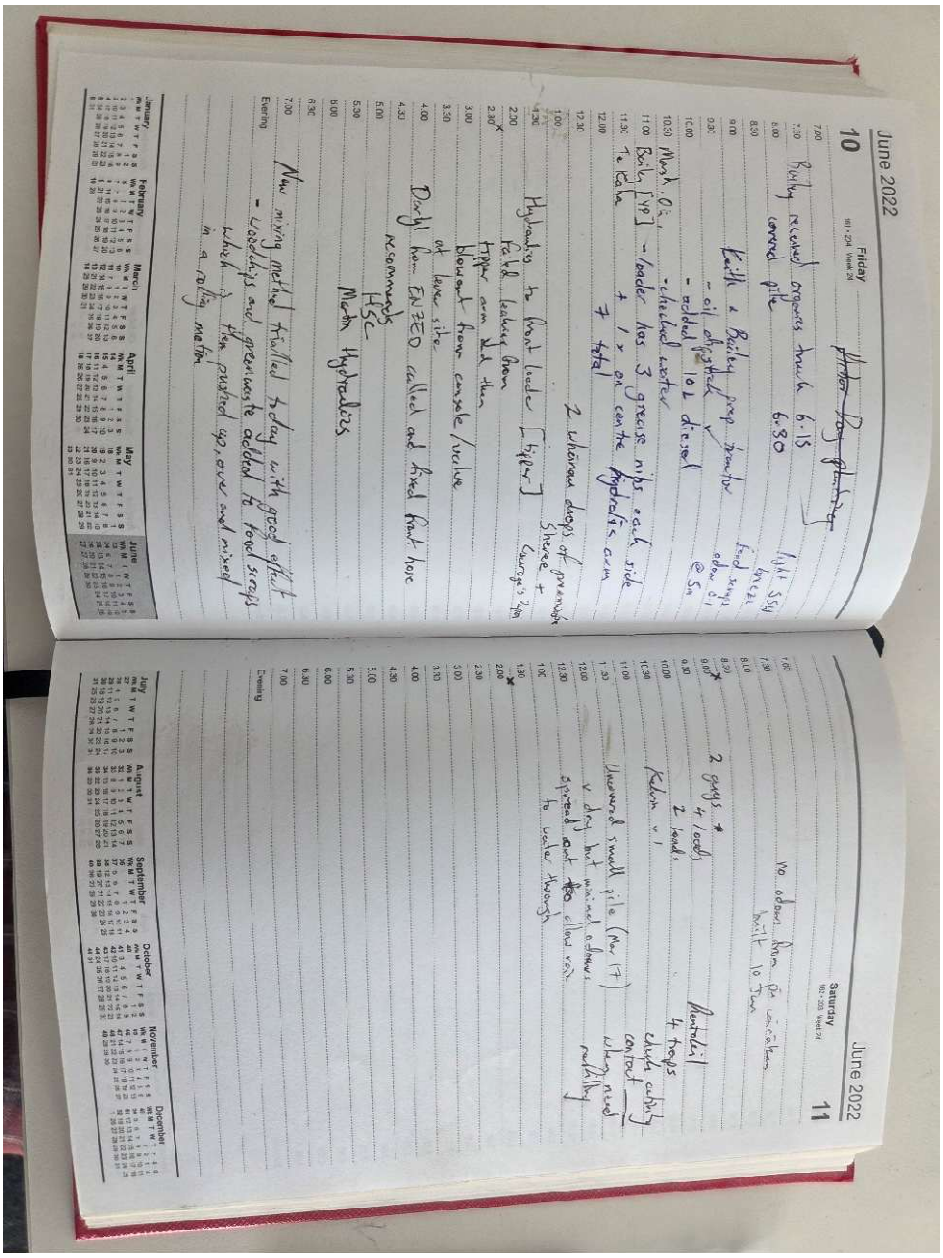

Figure 11: Excerpt from Field Diary (2022) – two days of activity, reflections on methods, repairs required, basic materials and labour records, odour monitoring, etcetera.

Field diaries were maintained across multiple years and sites, recording composting trials, site conditions, technical decisions, and daily maintenance work. Entries often included practical data – such as temperature readings, moisture levels, and odour observations – integrated with narrative accounts of decision-making and relational context. Rather than functioning as raw data awaiting coding, field diaries supported longitudinal pattern recognition. They served like running minutes and a record of actions or otherwise. Revisiting entries over time enabled me to identify

recurring challenges, adaptations, and thresholds – both material (e.g., limits of processing scale, labour capacity, or site constraints) and relational (e.g., mandate, contributions, institutional resistance). These patterns informed subsequent compost builds, adjustments to practice, and strategic engagement with regulatory actors.

Field diaries also operated as an accountability mechanism, because many aspects of the work – such as public deputations, site permissions, or organisational commitments – were externally visible or documented elsewhere. Diary entries functioned as a cross-check between the everyday experience and public record of the practice. In this way, the diaries supported rigor through traceability and consistency for the practice, aligned to where it was living, rather than the limited narratives that surface in institutional accounts. Together with photography and annotated writing, field diaries enabled a slow, practice-attentive form of analysis suited to living systems and community-based work. They allowed composting to be studied as an unfolding methodology embedded within ecological, cultural, and institutional timeframes.

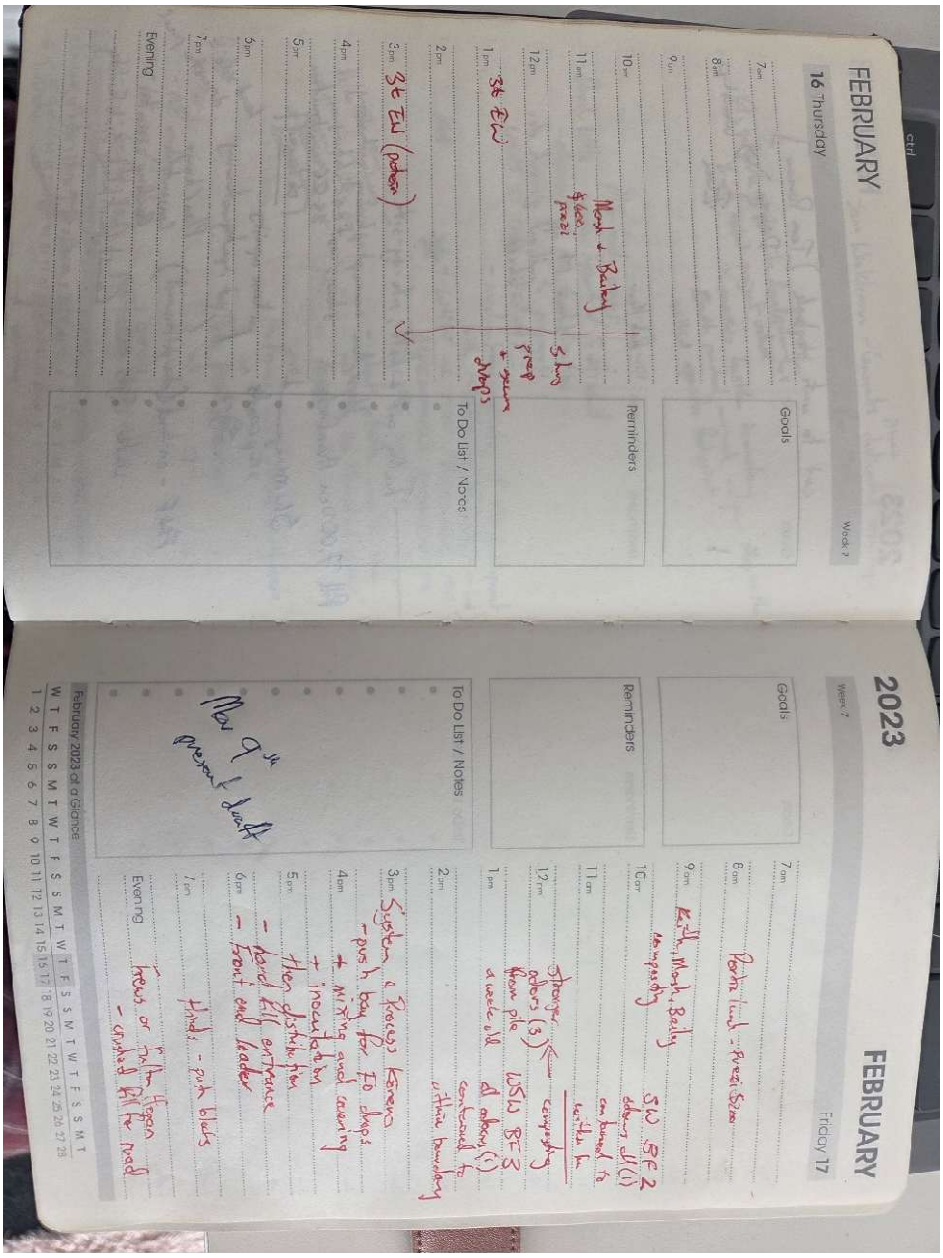

Figure 12: Excerpt from Field Diary (2023) – noting typical people, materials and environmental monitoring for composting days; this example shows capture of key notes about iterating our systems.

The power of writing, as Tuhiwai-Smith (1999) underscores in her critique of colonial research, has origins as a tool of colonisation – crafting policy and legislation that sever Māori and non-Māori from equitable ties to whenua, particularly in organics infrastructure. I turned this tool toward decolonisation, using document analysis to uncover colonising methodologies in existing frameworks and identify openings for interventionist writing, while field diaries captured the

humble yet lived practice of composting as a counter-narrative to industrial dominance. Funding applications and preparatory texts became acts of resistance, challenging unjust Pākehā governance models that limit alternatives capable of revitalising eco-cultural landscapes and repairing rifts from colonial waste practices. Through writing – whether strategic documents or daily field notes – I recorded and advocated for composting as a rift-repair praxis, co-constructed with Te Pā to amplify their aspirations and shift systemic ways of knowing organics management.

4.5.4 Photography

Photography served as an essential method in this study, capturing the physical forms of composting to document the journey and support reflections on praxis over time. Far from an artistic pursuit, it recorded progress – each heap, trial, and transformation – while also preserving the mundane, as Puig de la Bellacasa (2017) evokes with "mundane doings of maintenance and repair that sustain everyday life" (p. 170). A photo of my numerous keys, symbols of responsibility for managing care across multiple sites, illustrates this care work alongside the creative practice of composting with Te Pā o Rākaihautū. Blevis (2016, p. 983) supports photo-visual methods as "a methodologically sound manner of creating and recording design knowledge". Liu et al (2018, p. 778) use photography "as a mode of constructive inquiry to investigate current modes of human-nature interaction" and to inform greater sensitivity towards the dependency between human and nature. They emphasise how, particularly in urban spaces, "nature is often tamed", highlighting how photography can capture the "unexpected and wild". For example, I include images and short videos in the Companion Flipbook that show food scraps being tipped out into an urban park setting – an abrupt and raw disruption from its previous appearance where mown grass is perceived as a well-maintained space. Visual documentation with basic photography was an important tool to capture this change and represent it to the reader of this project.

These photographic records complemented writing and listening, grounding my observations in tangible evidence of eco-cultural repair and enabling iterative co-design by visually tracking shifts in the living systems we nurtured. Images became a shared language – circulated in discussions, embedded in presentations – offering accessible cues for reflection and recalibration. In this way, photography supported co-design not just retrospectively, but in real time, as a mode of collective sense-making.

I deliberately avoided photographing children or staff at Te Pā – with rare exceptions for those frequently working alongside me in the composting sites – in order to steer clear of the ethical complexities that arise when people become entangled in academic research as visible subjects.

My intent was to remain focused on the work itself and avoid introducing consent processes that might risk instrumentalising participation or inhibiting the everyday ease of engagement with the kaupapa. This decision helped uphold the relational ethic that underpinned the study, allowing photography to serve as a companion to the work rather than a means of extracting or exposing it. Through this lens, photography chronicled the collective efforts to reimagine organics management in Ōtautahi Christchurch. These photos are compiled as a Companion Flipbook to this text, helping the reader to visualise the work of composting methodologies as a rift-repairing practice.

4.6 Conclusion

As I composted alongside Te Pā, fostering alliance and thinking with living systems, my methods – composting, listening, writing and photography – interwove to pursue a bolder task: transforming Ōtautahi Waitaha's organics system. This journey composted my own intent, reshaping me more than the city's infrastructure, while subtly supporting Te Pā's food sovereignty aspirations. Staying true to our partnership, I co-designed these methods to honour Te Pā's whānau and collective vision.

In this way, methodology became more than a scaffold for inquiry – it became a living practice of relationships, reciprocity, and responsibility. Each method carried its own logic and rhythm, yet all shared an ethic of attentiveness to the life within and around the work. The chapters that follow trace this journey chronologically and compost-like, revealing how these practices yielded a photographic and written record of composting as a methodology for rift-repair – one shaped through cycles of action and reflection, and rooted in place, people, and the possibility of renewal.

CHAPTER 5: COMPOSTING AS EXPLORATORY PRAXIS

5.0 Hands on Trials, Community Engagement and Emergent Methodologies

This chapter focuses on the exploratory dimensions of composting practice – the processes, trials, and co-designed methods that unfolded through hands-on engagement with Te Pā o Rākaihautū. These tests were not just technical, but relational: acts of mutual care, repair, and listening with the whenua and whānau. They reveal how composting was used not only to build soil but to build trust, collective wisdom, relationality, and a method for eco-cultural rift repair. They evidence how we used “the body as an ideation and validation tool” (Desjardins et al 2021, p. 4) – documented through my first-person methods. This chapter begins with a reflection on formative composting experiences and the development of core composting methods prior to this doctoral study. It then tracks the evolution of those methods through community practice and co-design at Te Pā, gradually revealing a layered composting methodology responsive to social, cultural, and ecological relationships.

5.1 Composting and Community Engagement Methodologies

In this section I outline the main composting methods practiced in this study. First, I position myself alongside compost heaps and reflect on my earliest experiences of living and unseen worlds. I then describe the simple composting practices developed through home and community-based trials, particularly at Te Pā o Rākaihautū, which formed a foundation for embedding myself and composting as a methodology within the kaupapa of Te Pā. As these engagements evolved, more complex, larger-scale composting systems were co-designed – again primarily with Te Pā – in response to the systemic limitations and practical barriers to growing a locally grounded food system.

Some basic quantitative data and analysis is also presented later in the chapter to highlight key scientific and economic information relevant for demonstrating the systems-level insights gained through the composting methodologies explored here. In describing these practices, I also represent the people, non-human collaborators, and diverse communities involved. I reflect on my core strategies and objectives as well as those of the key collectives central to the research

context – specifically the 20:20 Compost Collective and Te Pā o Rākaihautū – along with other supporting entities. Photographs taken throughout the composting practices are used as evidence to help visualise the activities and their relational context.

5.1.1 My Earliest Experiences of Composting and Living Worlds

I have been making compost since I was a child. I had planted various vegetable seedlings at home with family before – lettuces and tomatoes mainly – but especially as a pre-teen I remember standing at our backyard compost bays. On numerous occasions, I spent hours pruning smaller twigs and shoots from tree branches into the compost bay. I never really thought of it as composting – it was just another chore – but I knew it mattered because we used the compost in our vegetable gardens, and things grew year after year, even in otherwise sandy soils.

The larger branches were set aside to be cut as firewood – also a job for me and my brothers. I remember working with saws over a sawhorse until my shoulders ached. I trained both arms to distribute the tiredness and stay with the task longer. Sometimes the pile was too big to finish in one go, and we had to come back to it another day. All of this was part of life. My Mum and my Grandparents were ‘makers’ as well, so I learned various practices and techniques in using tools and materials. Dad was firm and reasonable about getting the work done, and I learned practical skills and a certain ethic: finish what you start. Work was sustenance, and we always had homegrown food on the table.

During these same years, I also learned about the fragility of life. My mother passed away suddenly when I was eight. I remember Dad telling me, “Your Mum must have been needed elsewhere." From that moment I understood death as real, but not final. My Mum lives on in a place I can’t see but can feel. These memories and sensations sit in my body differently from the work I did with Dad. The feeling of being close to her is something I still experience when doing community work. Mum was a clinical psychologist, a specialist in family therapy. Her ethic of care lives in me alongside the ethic of homework instilled by my father.

As painful as that loss was, Mum’s death also became a bridge to my awareness of unseen energies in the living world. I came to understand life forces, death, and decay – the cycles of matter and spirit, and the animacy of the more-than-human world. These are all crucial to composting, which honours life by returning the dead and dying to soil, where unseen yet familiar forces transform and generate new life.

It was through Mum's profession that I also had my first experiences of Te Ao Māori and community. A Māori reverend presided over her burial in the sandy soils of Bromley – Te Ihutai, east of Ōtautahi. My family has recalled how many Māori colleagues of hers attended her funeral. The new therapy practice she had co-founded was opened with karakia and blessings. It was envisioned as "a place of te rangi mārie (peace), a centre based on aroha (love), a centre based on respect for difference" (Smart, 1995). In the same text, Smart (1995) articulates the responsibilities that Pākehā carry when working with Māori, especially in the context of the Treaty of Waitangi. This ethic was instilled early for me: that Māori ways of being, knowing, and relating were to be respected deeply.

A seed of appreciation for Te Ao Māori and tikanga Māori was planted in me through my mother. This is relevant to this study because it later guided how I came to form meaningful relationships with Māori communities – most recently with Te Pā o Rākaihautū.

5.1.2 The Core Composting Methods – My Composting Experiences Leading into This Study

Composting methods vary widely, producing diverse piles and products shaped by numerous factors. Regardless of the approach, decomposition adheres to universal material and energetic laws, driven by key variables: oxygen, water, organic matter, and microbes. These elements interact dynamically within a compost pile, shifting as microbes digest organic matter, oxygen, and water, while new layers of organic compounds and more-than-human communities emerge. When effectively balanced during the pile's formation, these elements trigger rapid transformation, often evident overnight. Composters learn to interpret these changes - non-human languages - through sensory engagement: observing shifts in colour from raw materials to dark earth, feeling heat radiating from the pile, and smelling the initial odours unique to the mix.

Before this study, my experiences at Cultivate Christchurch taught me to distinguish between merely making compost and using composting methodologies to integrate organic materials into a regenerative living system. At Cultivate, we collected food scraps from nearby cafés and restaurants, trenching them into a base layer of woodchips delivered by arborists. This method arose from necessity: the site's 'soil' was compacted rubble capped with a 10-20 cm layer of imported 'cleanfill' – too thin to sustain an urban farm. We covered the trenched rows with finished compost from commercial producers, then planted fast-growing, shallow-rooted, short-season crops typical of urban farming systems. These crops, grown for quick returns, absorbed excess nutrients leaching into the woodchips while rooting into the underground transformation of raw

materials – a digestive system of soil always becoming anew. Listening to this process, I noted worms proliferating, a soil substrate forming beneath, and high-quality vegetables emerging above ground. These experiences foreshadowed the reflexive co-design methods that later shaped this study; meaning specifically, I was aware going into this project that a seemingly simple intent to make compost to build food gardens involved substantially more nuance that I could anticipate through previous experience, and share that knowledge for the benefit of Te Pā.

As Cultivate's trenching space dwindled and material volumes grew, we shifted to an above-ground system, building bays from wooden pallet crates and turning every two weeks to speed up the processing time. After several 12-week cycles, our team observed that woodchips remained undecomposed, their dense carbon content outlasting the nitrogen-rich, water-heavy food scraps. Screening out these 'uncomposted' remnants before applying compost to growing beds would have yielded a more mature product, but labour and time constraints made this unfeasible. After a few seasons, this partially mature compost disrupted the soil nutrient balance – yellowing leaves, stunted growth, pest pressure, and poor-tasting crops signalled the imbalance. Compost science explains this through carbon-to-nitrogen ratios and other mineral balancing complexities. Listening to these visible cues honed my sensory engagement with composting's limits, a skill I carried into this study.

Cultivate's system processed organic materials into our soils but rarely yielded true compost – a challenge not inherent to the design, but persistent due to resource limitations and my own burnout. Instead of refining the system further, I became preoccupied with the financial sustainability of the organisation – a separate story – and eventually left in April 2020. My departure marked a resolve to build soil differently, rooted in these formative pre-study experiences. Listening to the system's constraints revealed possibilities – iterations to test, and potential for simple composting to nourish soil and diverse communities, human and non-human alike. These lessons propelled me into the genesis of 20:20 Compost and this doctoral study, where composting, listening, writing, and photography became tools to further explore regenerative systems.

5.1.3 The Genesis of 20:20 Compost

The composting methodologies explored by 20:20 Compost in this study stem from Gerry Gillespie, a seasoned advocate and practitioner of zero-waste initiatives in Aotearoa and Australia. In his book *The Waste Between Our Ears: Rethinking waste to create a global solution for our environmental crisis* (2020), Gerry outlines approaches that inspired our work. In June 2020, the

20:20 Compost collective connected with him via video call, seeking low-tech solutions to address challenges I had encountered in community composting, particularly from my pre-study tenure at Cultivate Christchurch. Erin Crampton, a 20:20 collaborator, captured the essence of this approach in a slide (see Figure 13):

> "Large-scale commercial composting technology exists but comes at a steep financial cost. With prices in the hundreds of thousands of dollars and uncertain tech support, many councils hesitate to adopt it. Successful commercial facilities remain limited in the materials they can process. Commercial composting machinery offers a tech solution to a management/education problem. This pilot project will demonstrate the management solution of SPICE composting and vermicompost in a decentralised urban setting, making the education readily available through the white paper" (Crampton, 2020).

This perspective shifted our focus from costly infrastructure to scalable, community-driven methods.

Figure 13: Going big doesn't capture all the opportunities. Erin Crampton (2020).

The large-scale equipment in Erin's slide mirrors a unit I sought to fund in my final months at Cultivate, a $500,000 machine that promised to multiply our capacity. Yet, without owned land or an affordable lease, Cultivate lacked the tenure security to attract impact investors or meet basic bank lending criteria. Local authorities, despite supporting Cultivate's mission, had prior negative experiences with this machinery's performance and declined to back it. Gerry's work sparked our interest precisely because it sidestepped such barriers. In New South Wales, Australia, he

achieved municipal-scale organics processing using the SPICE method – Static Pile Inoculated Compost Extension, also termed 'Fermentative Composting'[19]. This no-turn, low-infrastructure approach contrasted sharply with my Cultivate struggles, offering a practical alternative that resonated with this study's aim to explore regenerative systems at a community level.

SPICE composting begins with a static pile, built and left unturned, unlike the aerated static pile (ASP) systems common in Aotearoa's commercial facilities. ASP relies on ducting and air pumps to force oxygen into piles, maintaining aerobic conditions without turning – a setup requiring concrete pads, energy supplies, and effluent management, pushing it toward large-scale operations. SPICE, however, eliminates forced aeration and turning, manual or mechanised, regardless of scale. Its 'inoculated compost extension' leverages facultative microbes – organisms thriving in low-oxygen, fermentative conditions – to drive decomposition. These microbes, introduced via a simple inoculum made from household ingredients per Gerry's open-source guidance, reduce labour and equipment needs. In Christchurch, a commercial alternative, EM (Effective Microorganisms) from Japan, offers a similar agricultural-grade product. At Cultivate, we supplied restaurants with EM-infused sawdust to control odours and kickstart fermentation in food scrap collection bins. Christchurch's Organics Processing Plant later adopted EM to curb odours, underscoring its relevance. SPICE trials in this study tested both homemade and EMNZ inoculum.

The 'extension' in SPICE refers to expanding a base population of facultative microbes with locally sourced, native microbiological diversity, tailored to the agroecological context. Gerry emphasised capturing this diversity to fuel the biochemical and biocultural exchanges in an active compost pile – a complex eruption of energy and life. EM's documentation notes:

> "The diversity of microorganisms contained in EM and the metabolites they produce will increase the number and diversity of microorganisms in the soil. When microorganisms are activated, protozoans and larger organisms such as worms will increase in number and a healthier ecosystem will result" (EM Research Organization, 2016).

Organisms feed on each other and their by-products – metabolites – dying off as conditions shift, enabling new life to thrive. This cycle limits gas escape as odours, a key focus of this study, by fostering organisms that consume these emissions, enhancing soil health through beneficial metabolites. SPICE aims for an odourless process and product, effective within metres of the pile – a hypothesis tested in our trials and contrasted with the Organics Processing Plant's failures to

[19] www.gerrygillespie.net

control odours. It retains more water, reducing inputs, due to efficient use of raw material moisture and silage tarpaulins that trap gases and humidity. Pile shape influences this recycling of moisture and gases, a detail explored in later sections. SPICE also preserves biomass by converting exchanges into stable organic compounds rather than losing gases, particulates, and steam to the atmosphere. Tarpaulins shield piles from rain erosion, saturation, drying, and animal intrusion – critical for our open-access trials reflected below. These features, rooted in Gerry's methods and refined through Cultivate's lessons, underpin 20:20 Compost's genesis, driving this study's exploration of composting as a regenerative, community-led practice.

5.1.4 Preparing the 20:20 Compost Trials

Since April 2020, 20:20 Compost convened weekly via one-hour video calls, leaning into existing relationships to complete follow-up tasks during a time of significant disruption from COVID-19. Lockdowns began in late March 2020, with restrictions on public movement persisting until May, confining much activity to homes and heightening food insecurity across Ōtautahi Christchurch. As practitioners in food systems innovation, we recognised a widespread motivation to tackle this challenge. Our collective dialogue and shared interests spurred us to build from the ground up. Once restrictions eased in June 2020, I sourced basic ingredients to craft the SPICE compost inoculum, preparing for pilot trials. By October, I had visited sites and engaged prospective community partners in person, securing seven locations with signed Land Use Agreements, including 11 hectares across two sites in the Ōtākaro Avon River Corridor Regeneration Area (ŌARC). These early steps laid the foundation for the composting trials central to this study.

Huia Lambie, a Food Systems Innovator at Healthy Families Ōtautahi Christchurch, played a pivotal role in rallying support and activating connections for the 20:20 Compost pilot. She coined the name - 20:20 Compost - envisioning 20 weeks and 20 square metres to process 20 cubic metres of organics. Before the first trials, Huia secured: partnership with Seed the Change | He Kākano Hāpai Charitable Trust as an umbrella organisation, avoiding legal and financial overheads; support from Te Marino Lenihan, Director of Māori Achievement at ARA Institute of Canterbury, providing Seven Oaks land and $200 in food vouchers for participants; a letter from Arapata Reuben, then Chairperson of Te Ngāi Tūāhuriri Rūnanga, the manawhenua of our tākiwa, who later visited us at Sevenoaks; and $2,980 from her senior manager at Healthy Families. Beyond logistics, Huia urged us to prioritise Māori communities, connecting me with Te Pā o Rākaihautū and challenging my colonising tendencies - particularly my instinct to test activities first as a safety measure, which inadvertently positioned me as a gatekeeper, limiting others'

agency. She reframed safety as trust in shared growth, which became very influential in shaping this study's relational approach.

The full 20:20 Compost team – Erin Crampton, Gavin Sole, Huia, and I – met in person for the first time in October 2020, reflecting on our preparations. We had gained temporary access to over 15 hectares across seven locations, engaging 10 community entities, two commercial operators, and collecting 4.7 tonnes of organics. Our connection with Te Pā catalysed their system into a 2-tonne-per-term composting cycle, integrated with teaching for up to 60 children and staff weekly. Prioritising a deeper relationship with Te Pā, we invited whānau to be involved in the Seven Oaks trial. A commercial partner helped craft a robust Health and Safety document with monitoring protocols, targeting no odour, litter, or complaints – proof that composting methodologies engage communities effectively with minimal financial outlay. Like gathering materials for a pile, this preparation took time, a gift from our core team.

From June to November 2020, I spearheaded preliminary trial activity from my Woolston home, alongside the first site activation at Seven Oaks, Waltham, with my brother Oliver (Oli). At home, I had already converted a concrete double-garage pad into a composting station to revitalise soils in my backyard. We used diverse materials: juice pulp from a friend's organic juicery, swapped for near-expiry stock; coffee grounds from Riverside Market; arborist woodchips; kitchen scraps; garden clippings; and invasive weeds pulped in rainwater barrels (important because of chlorination of Christchurch water supply). Neighbours contributed greenwaste, and we gathered park clippings, repurposing Council green bins to feed our station and nurture worms. Maintaining this took six hours weekly and the system could hold up to 10 cubic metres. This setup reflects my personal and professional commitment to composting methodologies, a prelude to the study's broader trials detailed later.

With funds secured, I purchased materials for the SPICE inoculum, following Gerry Gillespie's straightforward recipe scaled for 20 cubic metres. Rice fermented in chlorine-free rainwater produced lactobacillus bacteria (LAB); after straining, the liquid fed on milk and formed a LAB serum that separated from a cheese-like culture that was composted or fed to chickens. Stabilised with molasses, this serum stored for months, while the extension process yielded 100 litres – enough for 50 x 20-cubic metre composting trials. Gerry validated its burnt-orange hue and fungal bloom via a video call, reinforcing my prior experience with EM products. Testing it at home, I noted changes in nature of temperature spikes in the first 24-72 hours compared to non-inoculated piles. Colleagues in Wellington, using BAM (another EM variant), shared similar observations. While this study could have veered into biological science, my focus – aligned with

Hutchings and Smith's (2020) rejection of 'singular economic productivity' (pp. 21-22) – shifted to systemic revitalisation with Te Pā o Rākaihautū, dedicating my doctoral capacity to their soil, food security, and community wellbeing.

5.1.5 Initiating Composting Methodologies with Te Pā o Rākaihautū

I first learned of Te Pā o Rākaihautū from Anake Goodall, who spoke of his role in the pā wānanga – a 21st-century indigenous learning village. The concept resonated deeply with my belief in village community living and place-based education, sparking admiration that grew over time. On 11 May 2020, I emailed Rangimarie Parata-Takurua, leading to a video call that day. Rangimarie shared the Te Pā o Rākaihautū Education Brief 2019 and a site assessment for Te Oranga Pā in the Ōtākaro Avon River Corridor, a place of profound cultural, ecological, and historical significance to Ngāi Tahu. I read and was inspired by these documents. I visited Te Pā in late June 2020, meeting Rangimarie and Matua Keith Murphy in person. Our initial kōrero revealed a shared understanding: Te Pā and many Ngāi Tahu elders recalled a time when they 'once were gardeners,' a connection disrupted by colonisation's impact on kai motuhake and mana motuhake, including māra kai and mahinga kai practices. Rangimarie valued my experience with urban farming and social enterprise, and Huia's introduction had already positioned composting as a priority. Te Pā needed larger gardens and more composting to feed hundreds of tamariki and whānau daily – a mission to renew these practices and reconnect whānau with Te Ao Turoa and the whenua. The early establishment of this collaboration was documented through correspondence confirming the intent to develop composting practices within Te Pā's transitional land context (Appendix M). These first pieces of correspondence are a record of the relational and practical foundations upon which this research proceeded – where the conditions for rift-repair were first being formulated within Te Pā.

The next week, in July 2020, I began coordinating with Matua Keith to revive composting at Te Pā. We had crossed paths years earlier when he visited my Cultivate site on Peterborough Street, curious about our food scrap processing methods – a fleeting encounter that foreshadowed this collaboration. Te Pā, designed with sustainability at its core, had a garden in the sunniest spot and a wharekai serving 250 meals daily. Food scraps were collected and taken to a composting station behind the Mahutoka classroom block, but the pile's condition was far from functional. With a PhD scholarship on the horizon, I saw a rare privilege in being welcomed here, envisioning years of research practice with this community. Together, Matua Keith, Oli and I set out to transform the station, leveraging the study's composting trials to support Te Pā's goals. The existing setup – scraps, garden, and intent – offered a foundation, and my role was to help it thrive,

guided by the iterative possibilities unfolding through this work. The initiation of composting at Te Pā was not an informal or incidental engagement. Early correspondence and coordination between myself and Te Pā leadership formally established the intent to develop composting within the transitional land context and māra kai aspirations of the kura (Appendix M). They record the practical and relational foundations of the collaboration – including expectations for reciprocity, site access, and collective stewardship of organic materials.

These early encounters hinted at a connectivity and coherence at Te Pā that countered the separatist, extractivist organics systems dominant in Ōtautahi and Aotearoa. Beyond composting, I experienced whanaungatanga – the layering of togetherness and cohesion – woven into Te Pā's daily life, often through the sharing of kai. Joining the wharekai at lunchtime, I connected with tamariki, staff, and whānau over meals, gaining insight into the community's rhythm and composting's place within it. This felt natural, echoing my own longing to belong among a whānau so at ease together. The composting trials became a vehicle for a broader movement – supporting Te Pā's leadership in whānau transformation, rooted in their cultural context. Each session deepened this coherence, composting not just materials but relationships, aligning the study's iterations with Te Pa's vision for healing and self-determination.

On the main field, we ventured into the unknown together, learning by doing. I stood amid a lively chaos of 50 tamariki, aged eight to ten, and their teachers, guiding them to gather and layer materials – greens for nitrogen, browns for carbon, balanced with water and air. This, I explained, fed the soil's worms, insects, fungi, and microscopic life, transforming 'waste' into compost to nourish us in return. Initially, they relied on their senses and my guidance to awaken to this liveliness. My comfort with these non-human composting collectives bolstered their trust, soon validated by tangible signs – heat from microbial activity, shifting colours and smells, food scraps darkening into soil. Predictions based on our interventions built confidence in the process itself, reducing their dependence on me. Reflecting on Roman-Alcalá's (2015) suggestions for ways Pākehā can reduce their dominance in urban farming, I chose to step back, supporting others to lead. Week by week, I retreated further, reinforcing their actions gently, until composting became a collective act of becoming-together – a healing cycle empowering tamariki and whānau toward traditional food ways.

My field journal data captures this rhythm – with references to Anna Tsing's (2015) metaphorical expansion on the reproductive habits of mycelial fungi and mushroom spores:

> Thursdays, 12pm–4pm, processing 60 litres of food scraps daily (c. 0.8kg/litre), totalling 240kg weekly across five days, or roughly 3 tonnes per term over five terms (10.5 weeks each). With 300 meals served daily, the scale was clear.
>
> On 13 November 2020, I noted: “At Te Pā, we’ve established a patch for community composting to grow, though it needs time to bear fruit – a refined, replicable model. Perhaps it already has, with ‘spores’ drifting to Seven Oaks, poised to yield training and new commercial-community composting action.”

These trials iterated the study’s focus, rooting it in Te Pā’s literal soil, in line with daily curricula activities and its aspirations, a living process unfolding beyond my initial presence at the centre.

5.1.6 20:20 Compost, Trial One – SevenOaks

The next step in this study pushed composting beyond Te Pā’s 60 kilograms daily, trialling a leap to 6,000kg in a single two-day exercise at Seven Oaks – a tenfold scale-up unprecedented in our community efforts. At Cultivate, years earlier, we peaked at 2,500kg weekly, processed by hand over two days; here, 20:20 Compost aimed higher, collaborating with two commercial providers to divert their collections to trial sites where communities could co-create compost. The goal was to test the SPICE method’s promise: safe, no-turn decomposition without odours or litter, acceptable to the public. The introduction of SPICE composting trials was coordinated through direct technical correspondence with external practitioners, documenting the adaptation of microbial inoculation methods to local materials and climatic conditions (see Appendix N). These communications record early experimentation with temperature management, odour control, and accelerated decomposition – issues that would later become central to scaling composting within sensitive urban contexts.

In December 2020, eight people spent six hours each over two days, working with hand tools, blending food scraps and shredded paper from these collections with chipped green waste from the site, all sprayed with SPICE inoculum, forming a windrow larger than any prior attempt. The process united us, and the pile took shape successfully, yet the physical toll was steep – such was the impact of “using the body as an ideation and validation tool” (Desjardins et al, 2021, p. 4) – unsustainable if it were to be repeated often. This successfully tested but strained the business model under trial: charging for food scraps generated revenue, however shredded paper proved a poor carbon source, and sourcing chipped green waste incurred unbudgeted time and cost. Balancing nitrogen-rich food scraps with reliable carbon became a persistent hurdle, unresolved for years as income failed to offset expenses. We sought a system independent of traditional, scarce community funding, but this trial exposed gaps. Odours emerged from unexpectedly high meat content, challenging SPICE’s no-turn claim. After 14 days, strong smells lingered downwind,

detectable beyond a few metres yet contained within Seven Oaks' boundaries. This is important in the context of odour management within the regulatory frameworks of the Resource Management Act which requires the effects of organic composting to be controlled within the boundary of the site they are being performed. The site's mature vegetation and buildings buffered neighbours 100 metres away, sheltering us through this first iteration.

The pile demanded turning to curb odours and hasten decomposition, revealing flaws in our inputs. Shredded paper clumped, restricting oxygen, while high meat content and plastic contaminants – remnants of office shredding with binders – impacted the quality of decomposition. After 10–14 days, oxygen and moisture levels dipped below critical thresholds, stalling progress. 20:20 Compost rented small machinery used to reform the pile, a pragmatic shift that opened our thinking to mechanisation within a community ethos. Operating safely alongside people using hand tools and adding inoculum (with a 4-metre buffer following our own safety guidelines), this adjustment balanced effort and efficacy. Experience later showed that reducing meat and excluding paper mitigated odours, insights that shaped the next phase.

5.1.7 Phase Two Trials with Te Pā o Rākaihautū

For the second trial, we negotiated with our commercial partner to drop shredded paper and separate out meat scraps from the collections. In return we agreed to continue accepting compostable packaging. The second trial was done in Te Pā o Rākaihautū's māra kai for further iteration. Lessons from Seven Oaks guided phase two trials at Te Pā in March 2022, where we shifted to greenwaste as the primary carbon source, reducing reliance on shredded paper. Te Pā's recycling programme already separated paper and cardboard – manageable volumes in balance with food scraps and greenwaste from school grounds or whānau gardens, and far less than commercial truckloads. This allowed better control over plastic contaminants, often sifted out in classrooms and staffrooms. As caretaker driving waste minimisation at Te Pā, Matua Keith aimed to repurpose this paper and cardboard material onsite, cutting the need to send material off-site and even offshore for recycling. With seven participants, we built two compost piles a fortnight apart, testing our capacity to sustain multiple activations in one space – a precursor to expanding into Te Ōraka's red zone lands. The school setting, less sheltered than Seven Oaks or my backyard, demanded the same standards: safe, no-turn compost free of odours, litter, or public nuisance. Both piles met these goals, proving the SPICE method's adaptability in a dynamic environment.

5.1.8 Preparing for Phase Three of Trials

Soon after the phase two trials in March, a combination of events led to new funding and new land becoming an opportunity for Te Pā. Once again, Huia Lambie was instrumental in the forming of this support – whakawhanaungatanga – a conscious process of building shared purpose inherent in the mycelium, the cultural substrate of Te Ao Māori. The new funding opportunity was called Kōanga Kai, to which Huia was an advisor, created by Te Pūtahitanga o Te Waipounamu, the Whānau Ora commissioning agency for the South Island:

> "The Kōanga Kai initiative is grounded in Te Ao Māori, and places the new possibility of self-determined kai production in the hands of whānau. Kōanga Kai is about self-determination and sustainability – producing kai that is sustainable; enabling whānau to be in charge of creating healthy lifestyles that will sustain generations of whānau." (Personal Communication, Te Pūtahitanga o Te Waipounamu, 2021).

I was able to put time into co-authoring the funding application to Kōanga Kai with Rangimarie. Alongside this, the community partner signed to the transitional land use agreement in the ŌARC, He Waka Tapu, had to step back from that arrangement, agreeing for Te Pā to take on this land use itself. I adapted some of 20:20 Compost's documentation to fit the requirements for Transitional Land Use (TLU) agreements in the Ōtākaro Avon River Corridor with Land Information New Zealand (LINZ) – the interim governing entity for the land before its transfer to Christchurch City Council ownership. With my support through this study and the ongoing input from 20:20 Compost and its partners, Te Pā was starting to emerge more as the locus of go-forward energy for the composting methodologies at the core of this study.

With the patch at Te Pā's temporary Linwood site well established and roots extending deeper into that substrate, composting methodologies began reconnecting with a much larger patch of whenua at Te Ōraka. The site was blessed in June 2021, with the full Pā bused in; despite my efforts to stay at the back, I was called forward to join students and kaumatua in planting Kawakawa, Tī Kōuka, and Karamū ceremonially. While composting methodologies offered a way to access land through the Transitional Land Use (TLU) framework, Te Pā's return to this location exercised a deeper entanglement of historical connections. By this stage, I knew of Te Pā's multi-year struggle to secure a permanent home – the most recent site, explored with the Ministry of Education, lay just 400 metres north across the road from the TLU now in their hands. That TLU, limited to a 12-month term, reflected the limits of the certainty LINZ could provide as the interim steward of land procured under extraordinary circumstances by the New Zealand Government. Gaining access to the whenua marked a step toward permanence. In 2022, Te Pā's TLU arrangements were renewed and operational expectations were reframed in writing, including

provisions that supported feasibility assessment activity aligned with He Pā Wānanga aspirations. This renewal clarifies that composting and land-based soil work were not peripheral to Te Pā's educational trajectory; they were entangled with tenure strategy, future site planning, and the practical question of how whenua could be re-entered, cared for, and made ready under constrained and temporary permissions. The mapped area and correspondence also make explicit the spatial boundary conditions within which composting practice – and its effects – had to be contained (see Appendix K). This time, its purposes included provisions for Te Pā to assess the site's feasibility for He Pā Wānanga – a 21st-century learning village.[20]

Composting methodologies iterated through layers of tenure – albeit tenuous – connecting whānau and whenua. It is not my place to unravel the entanglements between mana whenua Ngāi Tūāhuriri, the whānau of Te Pā o Rākaihautū (many of whom whakapapa to Ngāi Tūāhuriri), and the whenua at Te Ōraka itself. Yet, this study must note that 20:20 Compost's methodologies engaged a cultural substrate of this whenua at a depth I had never encountered before. I believe that by pursuing a meaningful relationship with Te Pā and sharing my knowledge of land access, these composting methodologies contributed to restoring a connection between whenua and whānau – a bond deeply fractured by Pākehā colonisation in the 1800s. That story of reconnection continues to unfold as I write – and so do the colonising behaviours. No enduring governance entity exists for the Ōtākaro Avon River Corridor (ŌARC), and Nōku Te Ao, Te Pā, and the composting methodologies – now related to globally as Te Puku Māra – remain vulnerable to re-alienation by Christchurch City Council's middle management. I will reflect further on Te Puku Māra's emergence below, but first, I must consider how the initial 20:20 Compost trials shaped our new relationship with Te Ōraka.

The next wave of activity centred on the Transitional Land Use (TLU) area within the Ōtākaro Avon River Corridor (ŌARC), a location introduced to us as Pohoareare – a kainga nohoanga (seasonal stay) linked to Pohoareare Pā, near the Seven Oaks site by the Ōpāwaho River. Ngāi Tūāhuriri representatives later guided us to call it Te Ōraka, connecting it to Te Ōraka Pā just north of the TLU now held by Te Pā. The Transitional Land Use (TLU) licence for the ŌARC site was originally executed under He Waka Tapu in 2020, with a stated purpose enabling soil remediation research as a precursor to future productive land use (see Appendix J). This document matters methodologically because it shows composting entering the whenua not as an informal "garden practice," but as a sanctioned remediation activity within a Crown-managed post-

[20] https://christchurch.infocouncil.biz/Open/2022/05/TTKRZ_20220517_MIN_7963_AT.PDF

disaster governance framework. The licence also sets the conditions that later shaped what could be done, when, and under whose authority. The TLU application, involving Seed the Change | He Kākano Hāpai, also aimed to activate further 20:20 Compost trials. In an email to Seed the Change, I wrote, “My objective is to secure land access ahead of time should the 20:20 Compost pilot succeed, integrating this growth into a broader movement for local food security tied to the red zone opportunity” (Appendix Q). No operational activity occurred on the site until the TLU arrangements were formally transferred from the initial community partner to Nōku Te Ao Charitable Trust in May 2021 (Appendix L). That transfer is a threshold point in the methodology: it translated a conceptual pilot into a legally accountable practice with clear organisational responsibility for site access, neighbour-facing communication, and compliance with land-use conditions. In other words, the composting work became infrastructural both in volume and in governance.

After the Karakia Whakamāmā in June 2021, I joined Matua Keith and my brother Oli to open the site on weekends, receiving greenwaste from whānau and local residents. This blended community engagement with composting – a demonstrably inseparable combination. The new lease required a pamphlet drop to nearby neighbours, informing them of site changes; we completed this with the same pononga involved in Te Pā’s composting efforts. Neighbour notification requirements and communications around these obligations (see p. 48 of Companion Flipbook) further demonstrate how community acceptance and regulatory visibility were practical conditions of the composting methodology, not downstream “context”. We also sought local support, as we planned to transform the space significantly through composting methodologies. Simultaneously, we built greenwaste stockpiles to mix with food scraps, targeting a baseline of 10 cubic metres of chipped material before inviting a commercial food scraps truck with 3 tonnes of nitrogen-rich, volatile organics into the neighbourhood – a critical threshold for safety. As volumes grew across multiple sites, composting began to require logistical coordination. Moments of change, particularly through logistical barriers, marked thresholds: composting shifted from a relational garden practice to an infrastructural system requiring coordination across people, vehicles, and sites. Scaling, at this stage, was a question of who could move what, when, and under whose mandate.

Achieving that stockpile took months. During this period, I engaged more deeply in local government discussions about the Organics Processing Plant’s future. Staff and elected officials encouraged me to seek funding for a third 20:20 Compost phase, enabling us to test machinery for shredding and building SPICE compost at Te Ōraka. This phase aimed to simulate an ongoing

operation, testing our methodologies' scalability. At this point, Christchurch City Council (CCC) might have accepted my proposal that our decentralised community composting – modelled with Te Pā – could ease the Organics Processing Plant's oversupply issues, which had sparked public scrutiny over its viability. That possibility shaped our next steps. We still needed permission from the Canterbury Regional Council (ECan), the regulatory authority for organic composting, to process over 20 cubic metres onsite. I understood the regulatory framework's nuances – rules designed for industrial composters inadvertently constrained our eco-cultural, regenerative approach. Balancing carbon and nitrogen to foster decomposing microorganisms was key to managing putrescible organics safely.

While aligning our methodologies with ECan's regulatory standards, I rallied support from multiple individuals and entities for the third phase. Relationships with Te Pā proved vital; after introductions at the ECan meeting, the presiding planning officer recognised our intent to regenerate whenua – not pollute it – through education and eco-cultural restoration, not private gain. Unlike typical composting consent applications, we did not seek permission to pollute above permitted limits. ECan verbally approved us to operate provided we maintained a site diary tracking our odour management plan to avoid, remedy, or mitigate air discharges (odours, dust, litter). They cautioned that scaling up or expanding to new sites might require a resource consent, though a global consent - covering Waitaha Canterbury without per-site applications – remained possible. The officer also requested a site visit after our first Te Ōraka build to assess it in action which raised no further concerns. Our methodologies have withstood regulatory tests, public complaints, and CCC staff scrutiny, a testament to our alternative model for composting that transcends mere waste management.

In the months between restarting SPICE trials with commercial food scraps and securing initial regulatory compliance, we connected with more arborists and contractors clearing residential sites for infill housing. Finding a reliable stream of suitable material progressed slowly, but we learned that arborists, already chipping as part of their work, sent truckloads to landfill if mixed with harakeke, tī kouka, or other 'fibrous organics' rejected by the Organics Processing Plant. These materials, slow to break down and prone to tangling machinery, were also excluded from kerbside collections. Locals dropping off material were surprised that we accepted it. We first used the fibrous materials to suppress invasive, non-indigenous grasses around native plantings at Te Ōraka. My estimate suggests over 1,000 tonnes, and as much as 3,500 tonnes of this material still goes to landfill annually, a systemic waste we countered simply: return it to the whenua.

As arborists increasingly diverted material to us, it became central to our bioremediation strategy – effectively mulching the whenua on a large scale to spark natural repair below ground. This remediation's complexity exceeds this study's scope, but it evidences an iterative shift: from no greenwaste to layering 20+ cubic metres weekly at the time of writing. Through word of mouth and whakawhanaungatanga, these methodologies mend a rift – indigenous flaxes and cabbage trees, often maligned and landfilled, now return to their natural cycle. We also secured a steady flow of material for blending with food scraps, now equating to 1.4% of the CCC's organics system volume (Christchurch City Council, 2020).

5.1.9 Phase Three Trials at Te Ōraka

The third phase of trials commenced in February 2022 and was rounded out in April 2022. Despite continuing to offer greenwaste dropoffs and receive the volumes of material we needed, this still required us to spend days at a time using a hired chipper to shred the material so it was suitable for co-mingling with food scraps. This meant the flow of commercial food scraps needed to be paused so we could catch up and provide enough carbonaceous material into the system. Vehicle access to our site then became an issue as it was too wet and soft under-wheel for arborist and commercial organics trucks to make it to the drop site. By now, 20:20 Compost was having trouble discovering a non-volunteer business model to sustain the community composting model using food scraps revenue alone – which was yet to be a reliable income source. Matua Keith wanted greenwaste drops from whānau to be at no cost, and this was accepted and supported by 20:20 Compost. The tailings of the OPP process would have been ideal for our purposes, but we could not conscionably invite onto the whenua a material so badly contaminated with plastics. This became a concern with the commercial food scraps as well, highlighting issues further upstream related to how people were using the food scraps bins.

Despite these challenges, the third phase of trials managed to achieve multiple iterations of practice and compost making all the way through until July 2024 (refer to the Companion Flipbook for evidence of this). Site access conditions limited the vehicles bringing material to the site, affecting the balance of our carbon stocks on site. While we could see how to implement simple solutions to these barriers, we were not yet sustaining a model that was a viable, ongoing operation. 20:20 Compost had previously recognised and discussed this complexity in terms of the bridging worlds – highlighted by this quote from our rolling meeting minutes (dated 28 July 2021):

> “Bridging the non-reciprocal money world organisation (Envirowaste), lack facilities, have food scraps that can turn into abundant fertility WITH the reciprocal community economy of Te Pā, wanting soil fertility in abundance”.

In the regenerative agroecological sciences, these bridges are like the Liquid Carbon Pathways connecting between worlds in the root mingling zone where soils interact with plants (Jones, 2008, 2021). Fungi and bacteria form literal bonds and pathways for exchange between soil communities beneath ground, and plant-animal-human communities above ground. Although key staff and some elected officials had indicated general support for the model, I was not gaining engagement from the Christchurch City Council beyond the level of community grants for sustainability practices. These were not enduring bonds, nor did they return the value I had hoped for.

5.2 SPICE Reflections Across Three Trials

5.2.1 Initial Observations and Challenges

Reflecting on our experience with the SPICE composting method across the first three concentrated pilot trials, we initially observed promising results, particularly in maintaining a no-turn, low-intervention process. We focused on ensuring proper moisture content, applying inoculum to support microbial activity, and forming compost piles with optimal carbon-to-nitrogen ratios. However, as we progressed, several challenges arose, most notably odour management and litter contamination. Despite mitigation strategies such as the use of EM and the SPICE inoculum as deodorising agents within facultative anaerobic systems, maintaining optimal conditions proved difficult – especially in the absence of a reliable water source. These challenges, compounded by the presence of protein-rich food scraps and plastic contamination, led to a pause on composting commercial food scraps while we reassess the viability of the SPICE approach in its current form. This is not a limitation of the SPICE method itself, more a reflection of the limited capacity to execute the method, consistently, as an ongoing operation.

5.2.2 Odour Management and Bioremediation

Odour management was a primary focus, incorporating proactive measures like tarp coverage to reduce open-air exposure and ensuring rapid windrow formation within 36 hours. This odour management plan became a key component of a broader bioremediation strategy for Te Ōraka, particularly when local residents and the Council questioned our lease agreement’s purpose of soil remediation. Despite these precautions, ammonia gas emissions and other unwanted by-products still occurred, especially when piles became anaerobic.

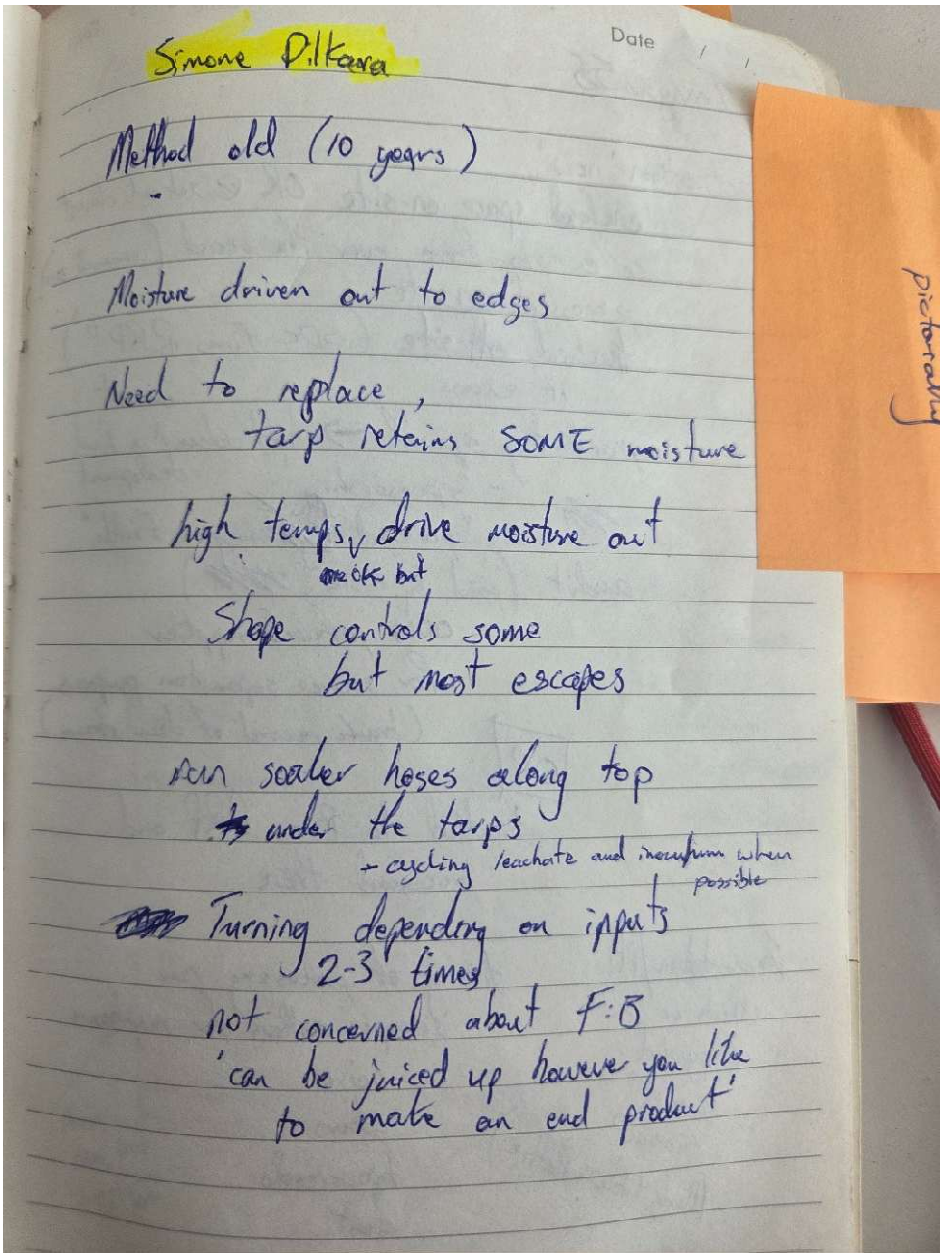

Figure 14: Excerpt from Field Diary (2021) – trouble-shooting notes from a phone call with Simone Dilkara, one of the pioneers of the SPICE method.

Troubleshooting with experts such as David Hardwick and Simone Dilkara (see Figure 14) highlighted the need for adjustments to better manage the predominant food scrap inputs. It became unfeasible for the commercial collector to separate protein-rich content in their deliveries, further complicating our processing methods.

5.2.3 Community Engagement and Local Relationships

The persistence of litter contamination, combined with increasing community concerns voiced through media and elected representatives, tested our relationship with local authorities and our surrounding community. This tension catalysed deeper conversations with Christchurch City Council about the methodologies employed by Ko Mahi Ko Ora, ultimately shaping a broader bioremediation concept that is now woven into Te Pā's practices on site. Community engagement efforts were pivotal in navigating these challenges. Through a series of in-depth community meetings, we strengthened relationships, clarified misconceptions, and ultimately garnered support from both local residents and the Council. By directly addressing the concerns of complainants, we worked towards resolving issues indefinitely. The result was a significant turning point – one that reaffirmed the importance of sustained community dialogue and transparent operational adjustments.

5.2.4 Iterations and Methodological Adjustments

Through these trials, we iterated various methods to optimise our composting efficiency. One major evolution was recognising the necessity of turning under specific conditions (e.g. wind blowing away from residential areas), highlighting the importance of working responsively with your environment. While the SPICE method emphasises a static pile approach, even moisture distribution emerged as a crucial factor, aligning with the Te Reo Māori term for composting: wairākau. The wisdom embedded in wairākau – signifying a balance of water, life, and organic matter – resonated deeply with our findings. To refine the process, we experimented with different machinery throughout each trial phase, including hand-turning with pitchforks, stand-behind Kangas, 2-tonne and 5–7-tonne pivot steer loaders, a 50hp tractor, and 3–6-tonne excavators. Additionally, we trialled various water delivery systems, such as IBCs, pressured water blasters, water tanks for inoculum application, and soaker hose irrigation.

5.2.5 Persistent Limitations and Te Puku Māra

Despite these refinements, certain limitations persisted. A reliable water source remained a critical barrier to achieving consistency, as did our ability to effectively deliver inoculum into the composting medium. Plastic contamination and the co-mingling of protein-rich meat scraps with vegetable scraps presented further difficulties, requiring facility upgrades that were beyond our capacity and the resources available to us. These infrastructure improvements would necessitate significant investment which is so far an unjustifiable commitment given our insecure site tenure. The longest period Ko Mahi Ko Ora sustained optimal operations was 18 consecutive weeks in

2024. During this time, we appeared to achieve a functional balance of material inputs, machinery, and composting methodologies. However, maintaining capacity year-round proved challenging. While incremental process adjustments initially yielded positive results, they were not consistently sustainable. Ultimately, the most sustainable and resilient composting methodology we have developed is deeply contextual, reflecting the cultural substrate of Te Pā and Te Ōraka. This approach, known as Te Puku Māra, integrates Mātauraka Māori with contemporary composting techniques in a manner unique to Te Pā o Rākaihautū, Nōku Te Ao, and Ko Mahi Ko Ora. This methodology will not be detailed in this exegesis, however it is enduring at the time of writing without the composting of commercial food scraps and the revenue associated with that.

5.3 Summary

The composting trials detailed in this chapter chronicle a transformative journey of scaling community-based organics processing in Ōtautahi, Christchurch, through the 20:20 Compost initiative, in partnership with Te Pā o Rākaihautū and other stakeholders, while achieving significant reconnection between whānau and whenua. The trials progressed through three phases: Phase One at Seven Oaks processed 6 tonnes in a single day (Dec 2020), Phase Two at Te Pā achieved two consecutive 1.5 tonne builds across different trial recipes (Mar 2021), and Phase Three at Te Ōraka diverted 147 tonnes of food scraps and greenwaste by March 2023, including 72.19 tonnes of commercial food scraps and 75.5 tonnes of residential, commercial, and fibrous organics. In 2024, operations at Te Ōraka scaled to a sustained 18-week run totaling 83 tonnes of food scraps, alongside ongoing greenwaste processing at 20+ cubic metres/week (~15-20 tonnes/week). At the time of writing in March 2025, the operation is sustained with greenwaste receipts only and equates to 1.4% of Christchurch City Council's organics system requirement (approximately 71,000 tonnes per annum).

Challenges like odour management, litter contamination, and site access were met with iterative SPICE method adjustments, community engagement, and regulatory compliance via ECan, while fostering deep engagement with Māori communities and ongoing kaumatua participation. Blessing Te Ōraka in June 2021 and ceremonial planting of Kawakawa, Tī Kōuka, and Karamū was a start towards healing of colonial rifts from the 19th century[21]. Through the 20:20 Compost trials at this site and then various permutations of more Te Pā led activity, this work culminated in culturally grounded methodologies, integrating Mātauraka Māori with contemporary practices,

[21] https://hail.to/noku-te-ao-/article/J8uTMaQ

advancing soil remediation, food sovereignty, community resilience, and a legacy of cultural restoration within the Ōtākaro Avon River Corridor. Regulatory uncertainties persist, with a pending ECan resource consent for a global composting framework and no enduring governance entity for the Ōtākaro Avon River Corridor, risking re-alienation from the whenua by Christchurch City Council (CCC). Operationally, the lack of a viable non-volunteer business model, year-round capacity challenges despite an 18-week peak in 2024, and unfeasible infrastructure investments due to insecure site tenure remain unaddressed.

5.4 Timeline of Composting Trials and Phases

- Pre-2020:
    - **Cultivate Christchurch (Pre-Study Reference)**: Sustained processing of 2.5 tonnes/week over 3+ years, establishing a baseline for community composting.
- July 2020:
    - **Initial Operations at Te Pā o Rākaihautū**: Begins with 0.048 tonnes/day (0.24 tonnes/week) from 300 meals/day, maintained at ~3 tonnes/term thereafer.
- December 2020:
    - **Phase One Trial at Seven Oaks (Hassels Lane)**: Processed 6 tonnes in a single day (6 hours, 8 people), marking the first large-scale trial with commercial food scraps.
- March 2021:
    - **Phase Two Trials at Te Pā o Rākaihautū**: Achieves two consecutive builds across trial recipes, totalling 3 tonnes, refining SPICE methods.
- June 2021:
    - **Te Ōraka Blessing**: Ceremonial planting initiating cultural reconnection and healing of colonial rifts.
- November 2021–July 2022:
    - **Phase Three Trials at Te Ōraka (Stream 1)**: Begins with limited commercial food scraps and greenwaste, including 24 greenwaste dropoff days (43 tonnes), laying groundwork for data collection and feedback.
- February 2022–April 2022:
    - **Phase Three Trials at Te Ōraka (Core Period)**: Processes initial 18-22 tonnes of food scraps, testing equipment and machinery, with site access challenges noted.
- February 2023:

    - **Phase Three Trials at Te Ōraka (Stream 2)**: Ongoing trials, diverting 40.64 tonnes of food scraps by March 2023, building on previous stream's insights.
- March 2023:
    - **Organics Diversion Milestone**: Totals - 147 tonnes diverted at Te Ōraka, including 72.19 tonnes food scraps, 43 tonnes residential greenwaste, 12.5 tonnes commercial greenwaste, and 20 tonnes fibrous organics.
- March – July 2024:
    - **Ongoing Operations at Te Ōraka**: Sustains an 18-week run, processing 83 tonnes of food scraps, with a tight 11-week peak (11 Mar-26 May) at 48 tonnes, alongside 20+ cubic metres/week greenwaste (~15-20 tonnes/week), equating to 1.4% of CCC's 71,000-tonne annual system.
- May 2025:
    - **Current State**: Operations at Te Ōraka continue with greenwaste receipts only, reflecting sustained but adapted efforts post-2024 peak.

5.5 Conclusion

This chapter's composting trials reflect the "always-in-process" ethos introduced at the outset, embodying Anna Tsing's (2015) continuous unfolding of understanding through iterative cycles of decomposition and renewal. Community-based organics processing in Ōtautahi, Christchurch has been advanced in this study, particularly by the 20:20 Compost initiative with Te Pā o Rākaihautū. Aligning with the Hua Parakore framework from Chapter 3, as Hutchings and Smith (2020) advocate, the work prioritises soil health and whakapapa, sustaining ecological, social, and cultural relationships beyond mere economically viable waste management. The trials fostered deep Māori engagement and Kaumatua participation, with the June 2021 blessing of Te Ōraka led by Te Pā marking a step toward healing colonial rifts. Yet, as Puig de la Bellacasa's (2017) ethic of care suggests, unresolved complexities persist demanding ongoing attention. Like the slow, intentional growth of mycelium, this pragmatic research, rooted in Waitaha's eco-cultural substrate, nourishes the vitality of whenua and whānau, ensuring their interconnected resilience endures as a living, transformative practice beyond this chapter. In the next chapter, I continue to explore the methods of this study, with a shift to the writing about and confronting of systemic challenges and limitations to sustaining the growth of a simple, yet sophisticated food system for Te Pā.

CHAPTER 6: PRACTICING COMPOSTING AS SYSTEMS INTERVENTION

6.0 Introduction: From Exploratory Practice to Systems-Level Intervention

Building on the exploratory trials and composting practices detailed in Chapter 5, this chapter transitions from grassroots experimentation to institutional engagement and the emergence of a systems-level intervention. Composting, as practiced in this study, is no longer only a material method – it is a political, cultural, and ecological strategy for reimagining waste systems in Aotearoa. This chapter documents the shift from experimentation to advocacy, as 20:20 Compost's trials evolved into a broader kaupapa supported by Te Pā o Rākaihautū. It tracks the project's navigation through institutional processes, including direct engagement with Christchurch City Council (CCC), while also revealing the structural limits of procurement and planning ecosystems that continue to marginalise Kaupapa Māori-led innovation.

The shift documented in this chapter is not from practice to theory, but from exploratory praxis to institutional interface. Rift-repair, as developed through composting trials with Te Pā, becomes here a methodological orientation applied to governance contexts: working iteratively across community, material, and policy scales. The question is no longer only whether composting can build soil and strengthen whanaungatanga, but whether such practices can persist, scale, and influence systems structured around industrial efficiency and procurement logics. This chapter therefore examines both the possibilities and the structural constraints encountered when a community-embedded composting methodology enters the institutional field.

6.1 Composting as a Systems Disruptor

Across this transition from exploratory practice to institutional interface, several forms of disruption and friction became visible. These included regulatory uncertainty around on-site composting, insecure land tenure under transitional use agreements, contamination and odour risk within decentralised systems, internal capacity constraints within community collectives, and structural misalignment between community-scale innovation and procurement frameworks designed for industrial providers. I responded to these frictions not by abandoning the composting methodology,

but by iterating across layers: refining technical practice, strengthening relational governance with Te Pā, documenting evidence more rigorously, and translating grounded composting experience into institutional language. In this sense, friction was not an obstacle external to the research; it became part of the method itself, revealing where rift-repair could endure and where structural reform would be required.

When 20:20 Compost was forming and this research project began, I hypothesised the potential for a rapid transformation of Ōtautahi's organics system. Drawing on lessons from Cultivate Christchurch, I saw a viable path for small-scale, community-based composting systems with the capability to manage significant volumes of organic material within localised loops. These systems offered benefits that extended beyond the extractive logic of industrial waste management. Where the Christchurch City Council (CCC) preferred to remove complexity from its organics equation, 20:20 Compost embraced that complexity as a defining feature of life-affirming, living systems. At the heart of this shift was a different understanding of scale – not merely a measure of tonnes or cubic metres of diverted waste, but a broader indicator of ecological, social, and cultural impact. My efforts to co-design and advocate for a decentralised model aimed to show how composting methodologies developed through this study could help relieve pressure on existing infrastructure while creating a skills pipeline and employment model rooted in regenerative and community-centred practices. Composting sites functioned as constituencies in Wakkary's (2021) sense: assemblages of humans, nonhumans, materials, tools, and institutional actors gathered around shared matters of concern. When these constituencies entered municipal forums – deputations, procurement processes, regulatory meetings – they encountered established constituencies structured around industrial efficiency and risk minimisation. The tension between these assemblages shaped the limits and possibilities of the proposed transformation.

With hindsight, this hypothesis requires qualification. While decentralised composting can technically manage significant volumes within distributed sites, its viability depends on enabling conditions rarely present within existing municipal systems: secure land tenure, regulatory flexibility, reliable carbon inputs, contamination control upstream, and procurement frameworks that recognise social and ecological value beyond cost-per-tonne metrics. Without these conditions, decentralised systems remain fragile, reliant on volunteer labour or insecure funding streams. The trials undertaken in this research demonstrate that community-led composting can operate effectively at meaningful scale; however, transforming a city-wide organics system would require structural realignment rather than isolated innovation.

The trials at the core of this research – detailed in Chapter 5 – laid the groundwork for this systems-level intervention. I sought to demonstrate to CCC Solid Waste staff the viability of decentralised operations as a complement, or even alternative, to the Organics Processing Plant (OPP). In my deputation to CCC on 9 September 2021 (see Appendix B), I outlined how the land footprint of our composting trials represented only 1.5% of the total land accessed, resulting in minimal environmental impact while enabling multi-layered returns. These included transport efficiencies (e.g., electric bike trailer collections), māra kai integration, biodiversity gains, intergenerational learning, and the restoration of cultural and spiritual relationships to whenua. This effort coincided with broader shifts in the city's organics infrastructure, particularly through CCC's procurement process and its evolving stance on the future of the OPP. I prepared a proposal for decentralising organics across the city, foregrounding the compounding eco-cultural harm of Christchurch's historical waste infrastructure in east Ōtautahi – discussed in Chapter 2. In a second deputation on 26 May 2022 (see Appendix C, Quote 1), I highlighted the irreparable damage to Te Ihutai from over a century of wastewater and composting infrastructure, and how sending organics to landfill repeated a legacy of harm.

Together with Seed the Change | He Kākano Hāpai and Gavin Sole (Te Atiawa), I engaged in the procurement process with a design concept that sought to transcend single-site solutions. While recognising the slim odds of success within a system that privileges industrial models, I made the case to CCC Elected Members that decentralised innovations were misaligned with traditional procurement pathways. In doing so, I advocated for partnership-based approaches that would honour Te Tiriti o Waitangi by enabling Iwi / Māori participation and restoring coherence between tangata and whenua – coherence undermined by the very logic of the metabolic rift this project seeks to repair. This section thus frames the evolution from exploratory trials to systems advocacy. The work undertaken through 20:20 Compost and Te Pā o Rākaihautū did more than model an alternative; it named the rift, grounded its repair in whakapapa, and co-designed a practice that could be scaled not by size alone, but by resonance with place, people, and the living systems that connect them.

6.2 Advocating Alternatives

Following the success of early trials and the development of 20:20 Compost's methodologies, I moved into a more formal phase of advocacy – engaging with institutional processes and decision-makers at Christchurch City Council (CCC). My first deputation, presented in 2021 under the 20:20 Compost name, reflected a collective identity. However, by May 2022, as the City's

procurement process for the future of organics intensified, I submitted a second deputation in my own name. This shift coincided with reduced day-to-day communication within the 20:20 collective, as members turned to sustaining their own livelihoods. My role increasingly blurred boundaries – as an action researcher, a compost practitioner, a Te Pā volunteer, and a systems advocate. As an action researcher, my inquiry was enacted through doing rather than observing, meaning that research activity became indistinguishable from service and contribution within Te Pā. As a compost practitioner embedded in daily operations, I simultaneously judged that I needed to act as a systems advocate – translating practical composting realities into institutional discourse in order to address its structural rifts and help hold space for Te Pā's aspirations toward kai motuhake. Each of these identities brought distinct responsibilities and perspectives, which I had to carefully navigate while continuing to honour the kaupapa and relationships built through the earlier trial phases.

This advocacy work helped spark new conversations within CCC, and two Council resolutions followed (see Appendix D): on 19 September 2021, elected members referred the 20:20 Compost project to the Sustainability Fund, requesting a report on its outcomes and signalling interest in future partnerships. On 26 May 2022, Council passed a motion to continue supporting and enhancing home and community composting. Both outcomes reflected traction – not only for the ideas but for the methodology grounded in community-scale experimentation and the eco-cultural frameworks introduced earlier in this thesis.

Yet these resolutions also revealed deeper tensions. Despite public support, I witnessed a disconnect between Council staff advice, procurement practices, and elected member direction. Resource recovery staff did not allocate resources to community composting, even after I provided scaled costings aligned with other per-tonne diversion programmes (e.g., Targeted Waste Minimisation Rate). While elected members voiced support, I found no structured avenue to integrate localised composting solutions into the formal procurement pipeline. My proposal – submitted through an Expression of Interest (EOI) and discussed below in 6.3 – was declined at the first stage without substantive feedback, partly because I missed the Request for Information (RFI) stage, despite ongoing communications with staff. The subsequent staff correspondence (Appendix O) demonstrates the procedural narrowing that occurred.

These barriers culminated in the 26 May 2022 Council debate (see Appendix E), where Cr Sara Templeton directly queried staff about upscaling community composting. She referenced the successful trials and asked why no partnership proposal had yet emerged. While staff acknowledged positive developments – noting our capacity to process up to 3,000 tonnes

annually on leased land – they cited pre-treatment issues with kerbside food scraps as an unresolved challenge. Cr Templeton pressed further on the need to fund home and community composting, receiving verbal assurances that budget lines existed for such work. Yet, no funding materialised. Meanwhile, Cr Keown's suggestion to shift away from failed industrial models and toward our decentralised approach was met with a reaffirmation that the procurement process remained open – even though its structure and templates had already excluded the solutions we offered. Council minutes and public recordings from this debate (Appendix E) illustrate the divergence between elected member support and staff-level implementation pathways.

This institutional entanglement highlights a recurring theme in this study: the difficulty of aligning relational, regenerative models with extractive, technocratic systems. The disconnect between lived practice and procurement protocol reveals a modern iteration of the metabolic rift – a disjunction not only between people and nature, but also between community-based care and bureaucratic logic. Where community composting was grounded in whanaungatanga, responsiveness, and reciprocity, the procurement process prioritised scale, predictability, and control. Despite these challenges, the work of advocacy, relationship-building, and persistence laid important groundwork – which I turn to in the following sections, where the emergence of Te Puku Māra and a growing community of practice around composting began to signal what might endure beyond the institutional gatekeeping.

6.3 Proposing a Decolonising Organics Solutions

The EOI proposal I submitted to the CCC brought together composting methodologies and decolonising methodologies for the shared purpose of transforming waste into a resource while restoring relationships between people, place, and ecological systems. Through a layered strategy, the concept wove together decentralised organics processing, soil remediation, and community empowerment, challenging the dominant, centralised waste management paradigm that has historically marginalised eco-cultural system health and Māori participation in decision-making.

The proposal explicitly responded to CCC's identified challenges, including the exclusion of Tī Kōuka, Harakeke, and compostable packaging from the waste stream, targeted management of odour-intensive materials like lawn clippings, and the ongoing contamination issues in kerbside collections. By integrating localised processing hubs and off-site curing sites, the project demonstrated a scalable, adaptable system that reduced the burden on a single central facility while ensuring organic materials were reintegrated into the whenua. At its core, the concept was

to repurpose and downscale the existing Organics Processing Plant (OPP), making changes to the way material was collected. A distributed network of local organics hubs and off-site curing sites extended the system, embedding composting infrastructure within communities and positioning whānau and hapū as active kaitiaki in waste and soil management. This approach moved beyond extraction and disposal towards a model of regenerative return, where organic resources cycled back into the whenua, supporting ecological restoration and food security. Here, composting functioned not as metaphor but as enacted infrastructural design. The decentralised hubs, land tenure arrangements, and governance transfers proposed were concrete institutional mechanisms derived from the composting trials detailed in Chapter 5. The methodological claim was therefore material: that regenerative, community-embedded composting could be operationalised at policy scale if enabling conditions were secured.

The composting methodologies integrated aerated static pile composting, fermentation, and bioactive inoculants to facilitate decomposition and microbial diversity. These techniques complemented decolonising methodologies, which prioritised whānau-led governance, transitional land use strategies, and a return to whenua-based practices that had been disrupted by colonisation. The project confronted the systemic injustices embedded in Christchurch's waste infrastructure, particularly the historic use of Te Ihutai as a site for wastewater discharge, landfill, and industrial waste processing – decisions that systematically excluded Māori from land use governance while harming the ecological and cultural integrity of these spaces. The proposal directly addressed these injustices by advocating for the transfer of the existing Organics Processing Plant (OPP) to a kaupapa Māori-led entity, ensuring that future organics management was aligned with the principles of ahi kā, mauri, and kaitiakitanga. By embedding organics processing within a framework of Māori-led land restoration and food sovereignty initiatives, the project sought to reclaim agency over resource cycles that had been disrupted by colonisation and industrial waste management. By locating organics processing solutions within culturally significant landscapes such as the Ōtākaro Avon River Corridor (ŌARC) and Te Ihutai, the project reasserted Māori presence and agency over land that had historically been used for landfill and wastewater treatment without consent.

The layered strategies of the proposal worked in concert to shift the city's waste management paradigm from extractive to regenerative. The technical layer focused on composting best practices, ensuring efficient processing with minimal contamination. The infrastructure layer established a network of localised hubs and transitional land use agreements to decentralise processing and facilitate ecological restoration. The governance layer sought structural change

by transferring resource management authority to kaupapa Māori leadership, affirming the rights of whānau and hapū to determine the future of their whenua. By interweaving these strategies, the proposal converged composting and decolonising methodologies to create an organics processing system that could meet regulatory and environmental requirements, restore sovereignty, reconnect communities with their whenua, and strengthen climate resilience through place-based ecological restoration. It was both a direct response to CCC's EOI and a critique of the limitations within the current waste management framework – positing that community-led solutions were not only viable but essential for a just and regenerative future. This multi-layered strategy hinged on securing land tenure agreements, fostering Māori community leadership, and embedding a circular economy that privileged local benefit over commercial-scale extraction. By scaling in alignment with ecological and community capacity, the project offered an alternative to large-scale industrial composting – one centered on relationships, reciprocity, and the interdependence of material, social, and eco-cultural systems. Ultimately, it stood as a model of how composting and decolonising methodologies could regenerate both whenua and whakapapa, transforming waste management into an act of restoration and self-determination.

However, this proposal also clarified the limits of the original hypothesis. While decentralised systems proved technically viable at pilot scale, citywide transformation would require structural reform in procurement design, land access, contamination governance, and risk allocation. Without these shifts, community-led systems remain peripheral rather than central actors in municipal infrastructure.

6.4 Critiquing the Procurement Process

The Christchurch City Council's (CCC) Expression of Interest (EOI) process for organics processing was fundamentally constrained by its predetermined preference for a single, large-scale industrial facility. Despite CCC's own recognition of the benefits of community-led, decentralised composting, the procurement framework structurally excluded these models from meaningful consideration. The process reflected a broader failure to engage with kaupapa Māori solutions, lacked transparency in decision-making, and privileged large corporate operators over more adaptable and cost-effective approaches. The EOI framed the problem as one of relocation and optimisation rather than systemic transformation, prioritising continuity in collection and processing methods over reimagining how organics could be managed at a city-wide scale. By treating the kerbside collection system as out of scope, the tender locked in the inefficiencies of the existing waste stream, which is dominated by contamination and bulk processing challenges.

This decision pre-emptively constrained the types of solutions that could be proposed, preventing an integrated approach that could intervene at source to reduce contamination, improve processing efficiency, and distribute organic resource management more equitably. In this context, rift-repair encountered its most visible institutional resistance. In this sense, the barrier was not composting as practice, but the institutional architecture within which it was required to compete – an architecture optimised for scale, predictability, and risk minimisation rather than relational, distributed, and Kaupapa Māori-led models.

6.4.1 Lack of Transparency in Decision-Making

A critical limitation of the EOI process was CCC's refusal to release the full, unredacted Jacobs report on the future of organics processing (see Appendix F). When requested, CCC withheld key information on cost estimates, existing consents, and potential Council-owned sites, citing concerns about prejudicing future commercial negotiations. However, this decision directly disadvantaged non-corporate applicants, particularly kaupapa Māori and community-led initiatives, by preventing access to essential data that could have informed alternative proposals. The claim by CCC that this information "would not have a material impact in determining a solution that meets Council's objectives" ignored the reality that bidders were required to secure their own land, making public land assessments highly relevant. The exclusion of this information effectively protected the status quo, reinforcing an assumption that only a large, centralised facility could be viable. Without transparency, the procurement process lacked the necessary conditions for equitable participation, particularly for kaupapa Māori solutions that required deeper consideration of whenua-based approaches.

6.4.2 Pre-Determined Industrial Model Over Localised Solutions

The requirement that prospective suppliers secure privately owned or long-term leased land placed independent and community-based operators at a structural disadvantage. CCC's refusal to consider public land within the scope of the tender meant that bidders were forced to absorb the capital expense of land acquisition – an approach that disproportionately favoured large corporate entities with access to significant financial resources. This created an artificial barrier to entry for kaupapa Māori-led and community-based proposals, despite Council's own policies on sustainable procurement and waste minimisation acknowledging the value of localised, circular economy approaches. The EOI reinforced an industrial-scale solution at the expense of distributed, networked alternatives. By privileging efficiency within a single centralised facility over resilience through diversification, the tender failed to accommodate the potential of a hybrid

system – one where a downscaled Organics Processing Plant (OPP) could complement a network of localised hubs, reducing transportation burdens and enabling community stewardship over organic resources. The EOI's narrow framing of "complete solutions" as those capable of handling all organics at scale effectively dismissed the viability of modular, adaptive models that could evolve in response to local needs and eco-cultural imperatives.

Despite acknowledging in earlier minutes that community-scale composting solutions could reduce the burden on a central processing plant, CCC limited consideration to large industrial-scale sites (3-4 hectares) in the north-west rural sector, reinforcing the assumption that a single large facility was the preferred model. When questioned, CCC dismissed the potential for networked solutions, stating that these properties "would in any event likely be unsuitable for a small-scale, geographically spread community initiative". This response failed to engage with the potential for a mixed-use land model, which could integrate community composting hubs within broader ecological restoration or food production efforts. Furthermore, CCC explicitly directed community composting initiatives outside of the EOI process, instructing them to liaise with the Resource Recovery Team instead. This contradicted the advice given by staff to Councillors during debate that I triggered with my deputations; that the approach would be to attract a diversity of potential solutions through the procurement process.

> "The fear is that people like him, the groups he works with, and others that have emerged in our city over the last 10 to 12 years don't fit within traditional procurement policy. They don't align with the way councils and governments design solutions—they are essentially the opposite. Yet, at times, they offer really good solutions. It's just about making sure that..." [1:11:51, Cr. Aaron Keown]
>
> "Well, I disagree with that as well. We are actively working to ensure that we're considering all options." [1:11:56, CCC Staff Officer 1]
>
> "Christchurch City Council's policy is one of the most dedicated approaches to engaging with the smaller market and exploring more innovative procurement methods, rather than just following a standard tick-box process. So, we are most definitely not excluding them. And remember, we will be coming back to elected members with the procurement plan for approval—that's probably where that debate can take place." [1:12:20, CCC Staff Officer 3]

However, despite my further engagement, no meaningful support materialised from the EOI process or the Resource Recovery Team (further reflection on this outcome is included below). This effectively relegated decentralised solutions to a secondary, unfunded status, rather than recognising them as integral to a more flexible and cost-effective city-wide organics system. As I noted in the CCC Sustainability Fund end of project report in 2023 (see Appendix I), this exclusion meant that: "The RfP actively excluded anything other than tenders for one large, centralised and

industrial facility, whereas a diverse, distributed approach for organics infrastructure is considered best practice internationally".

6.4.3 Failure to Uphold Te Tiriti o Waitangi Principles

Despite the clear implications for Māori land, resource management, and ecocultural restoration, CCC stated that it had not engaged with Iwi during the EOI process. Given the historic misuse of Māori land for waste management – particularly in Te Ihutai, where CCC wastewater treatment and landfill operations had long disrupted cultural sites – this failure to engage represented a significant breach of Te Tiriti o Waitangi obligations. This exclusion was particularly problematic given that 20:20 Compost was in the process of transitioning into a kaupapa Māori-led entity, in partnership with Te Pā o Rākaihautū. My 2023 end of project report to the CCC Sustainability Fund (Appendix I) reinforced this, calling for: "a Te Tiriti-led partnership that builds on the success of 20:20 Compost's trials and experience, with a focus on prioritising engagement with Māori-led entities such as kura, marae, whānau, and hapū-led initiatives."

The lack of engagement with Te Pā, Papatipu Rūnanga, or other Māori-led entities meant that CCC actively marginalised kaupapa Māori solutions, despite its own commitments to social and environmental procurement. When questioned in January 2023, CCC staff revealed that it was not tracking how many contracts were awarded to Māori suppliers or social enterprises. It also could not identify a pathway for a community-based model and noted that the procurement team was responsible for meeting Council requirements alone. This exposed a deeper systemic issue in how procurement decisions are made in relation to community proposals. Without formal mechanisms for kaupapa Māori participation, the procurement process simply perpetuated existing power imbalances, ensuring that Māori and community-led solutions remained peripheral rather than central to decision-making. While CCC's procurement policy encourages local procurement and social procurement initiatives to provide economic and employment opportunities within Christchurch communities, it does not explicitly reference Māori-owned enterprises. Nationally, the New Zealand Government introduced a progressive procurement policy in December 2020, mandating that government agencies award at least 5% of their annual procurement contracts to Māori businesses. However, in September 2024, this policy was rescinded, reflecting a shift in governmental priorities.

6.5 Embedding Alternatives

Something deeper and more enduring has emerged from Te Pā o Rākaihautū in 2024 and 2025: a kaupapa Māori-led practice for organics transformation now known as **Te Puku Māra**.

> "Puku Māra as a term is unique to Ko Mahi Ko Ora. You could say we're remediating soil by feeding the whenua's natural digestive and remedial systems. As such it is a Nature-based Solution (NbS) drawing on Mātauranga Māori held within the Nōkū Te Ao community and curricula. Material brought onto the Red Zone site breaks down in situ. We're not a 'composting depot' trying to accelerate decomposition and on-sell compost products. Consequently, we're not using machines that cannot process certain biomass such as Harakeke and Tī Kōuka, both taonga species to Ngai Tahu" (Ko Mahi Ko Ora, 2024).

Amongst many things, Te Puku Māra reframed composting methodologies as an Indigenous Biocultural Technology[22] – which is certainly much more than composting. I observed the emergence of Te Puku Māra and was a part of its machinery, and it worked because of the conditions and community that were unique to Te Pā at time. Years of trial activity, institutional resistance, policy engagement, and community relationships melded beyond me and composting, much deeper into Te Pā, through Ko Mahi Ko Ora, and into a coherent expression of place-based, regenerative, and culturally grounded praxis.

The trials at Seven Oaks and Te Ōraka had demonstrated both promise and constraint, but it was within the daily rhythms of Te Pā's wharekai, māra kai, and whānau engagement that composting became embedded. With support from Ko Mahi Ko Ora and partnerships with Kaupapa Māori entities like Nōku Te Ao, the composting methodology developed through this study began to extend into a living framework – one that integrated with eco-cultural restoration, whenua-based learning, and intergenerational transformation. This living work was institutionalised not by becoming bureaucratised, but by it becoming more deeply rooted in whakapapa and tikanga specific to Te Pā, and the relational ethos of Te Ao Māori as a seedbed of indigenous knowledge system leadership. Institutionalisation occurred through embedding composting within educational practice, land restoration routines, and whānau governance structures rather than through municipal adoption. This distinction is critical: rift-repair endured where relational sovereignty existed, and stalled where procedural sovereignty dominated.

Composting here was never simply a technical act. It became a carrier of story – reactivating mātauranga and creating a platform from which future systems could emerge. Its strength lay not only in what it diverted from landfill, but in how it redistributed agency, leadership, and care into community hands. While institutional procurement processes had failed to embed composting in

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[22] https://www.scoop.co.nz/stories/ED2501/S00004/nzs-te-pa-o-rakaihautu-wins-2025-zayed-sustainability-prize-in-global-high-schools-east-asia-the-pacific-category.htm#:~:text=Abu%20Dhabi%2C%20UAE%2C%2014%20January,East%20Asia%20%26%20the%20Pacific%20category.

the city's infrastructure, the practice itself had been institutionalised elsewhere – within whānau, whenua, and the networks of care that sustain cultural ecosystems. Kaupapa like Te Puku Māra now prefigure what eco-cultural infrastructure for post-industrial cities could look like when led by whakapapa and grounded in justice.

6.6 Reflections on Influence and Incompleteness

I do not wish to claim responsibility for the success of Te Puku Māra as a direct outcome of this study, nor any of the composting methodologies reflected in this text and in the Companion Flipbook. The credit for any of the emergence and success of composting should go to Te Pā for the way it has embraced and integrated composting methodologies into its already transformative architecture as a Kura-a-Iwi. I do think it is fair to say the seeding and driving forward of composting methodologies through the course of this project is evidence of the possibilities for composting when practiced as something more than a technical approach to waste management. And much remains unresolved. The ambition to shift the organics system of Ōtautahi through formal institutional reform – via CCC procurement, ECan policy, or mainstream resourcing – was not realised. Despite evidence of efficacy and strong relationships, structural barriers remained immovable. The procurement process, as critiqued in section 6.3, confirmed that community-led, Kaupapa Māori approaches were incompatible with systems still designed to serve industrial capital and risk-averse governance. This could be read as failure. Yet the research question was not whether procurement reform would succeed within the project timeframe, but whether composting could operate as a rift-repair methodology across scales. At community scale, this was demonstrably achieved; at institutional scale, it remained structurally constrained. But from the perspective of composting methodologies, it is simply unfinished decomposition. Institutional transformation is rarely quick or linear; it resists the timelines of funding cycles or academic projects. What has been seeded, however, is a practice aligned to mātauranga that endures – not because it fits the system, but because it grows despite of and beyond it.

The influence of this project lies in what it helped cultivate:

- A lived demonstration that composting can serve as a vehicle for decolonisation, food sovereignty, and place-based education.
- A proof-of-concept for relational, regenerative infrastructure grounded in tikanga and Te Tiriti principles.
- A challenge to the extractive ontology embedded in waste management – replaced by a composting methodology attuned to whakapapa and mauri.

- A community of practice that continues to evolve beyond this thesis – interwoven through Te Pā o Rākaihautū, Ko Mahi Ko Ora, and a wider movement for eco-cultural repair.

This chapter has presented these threads not as a polished solution, but as a living system – composted, composting, and yet to be fully transformed. Its incompleteness is not a deficit, but an invitation to continue the mahi. The disruptions encountered – regulatory, institutional, cultural, and operational – were met as diagnostic moments that supported iteration for both the resilience of community-embedded composting and the structural conditions that continue to constrain its expansion.

6.7 Prefiguring Regenerative Decision-Making

Composting, in this study, became more than a technique. It became an ontological shift – a way of seeing, being, and acting within landscapes of disruption and possibility. This shift was observable in practice: in curriculum integration at Te Pā, in the operationalisation of Te Puku Māra, and in the documented governance interfaces described earlier in this chapter. Through the act of building compost together – listening to microbial change, responding to ecological signs, and holding space for whānau aspirations – deeper practice emerged: one that reveals how living systems can guide us toward regenerative decision-making. Rather than locating governance solely within institutions, this study uncovered a form of relational governance already alive in communities – one that moves through whanaungatanga, whakapapa, and whenua. Composting revealed itself as a mycelial practice: distributed, adaptive, and connective. It wove people and places into new alignments, quietly bridging rifts created by extractive systems and colonial disconnection.

At Te Pā o Rākaihautū, particularly through the reactivation of Te Ōraka, composting became a method for aligning with this cultural substrate. It offered not just a means to manage organic waste, but a way to honour mauri, amplify mana motuhake, and support the self-determined restoration of whenua. In this way, regenerative decision-making emerged not through design frameworks or governance protocols, but through careful, embodied relationship – through tending the ground as much as the ideas that shape it. This is not a rejection of institutional involvement, but a call for its re-composition – one paced to the cycles of care, decay, and renewal that composting models so well. These cycles, grounded in whakapapa and supported by Te Tiriti o Waitangi, point toward a living ethic of governance that restores balance by centring the right relationships, not simply the right answers.

As this chapter draws to a close, it becomes clear that the most enduring contribution of this research may not be in the diversion of organics, the critique of procurement, or even the formation of new composting infrastructure. Instead, it lies in showing that systems can be composted – not dismantled in haste, but decomposed with care, and remade through relationship, reciprocity, and regeneration. The final chapter now turns to reflect on what has been seeded, what has transformed, and what might continue to grow – not only in soil, but in the shared visions of those willing to restore balance, one heap at a time.

CHAPTER 7: CONCLUSION

7.0 Composting as Cultural Infrastructure

Chapter 7 synthesises what this thesis now claims, based on composting practiced as lived infrastructure across seasons, sites, and institutional interfaces. It consolidates the contributions, implications, limits, and transfer pathways of rift-repair as both ecological care and treaty-shaped political work. This final chapter gathers the threads of this practice-oriented research project – its trials, its relationships, its systems, and its iterative methodologies – to present a layered, relational body of work. The last two exegetical chapters have tracked the emergence and scaling of composting methodologies across landscapes, communities, and various challenges as a journey of eco-cultural revitalisation. This chapter reflects on what endures and reveals the many layers of composting as relational repair practice. Here, composting is reframed not only as a methodological tool, but as **cultural infrastructure** – a living system that binds people and place, tangata and whenua, through rhythms of care, decomposition, and regeneration. The reflections below are not conclusions in a conventional academic sense. They are composted understandings: slow, recursive insights formed through years of hands-on practice, listening, writing, and collective becoming.

In conventional research on waste and infrastructure, value is often demonstrated through finished outputs, generalisable models, and controlled evaluation conditions. This thesis contributes differently. Its claims are grounded in longitudinal, first-person participation in a live infrastructure problem – where the “data” includes breakdowns, maintenance, negotiation, and the slow building of trust across whenua, whānau and institutional interfaces. The rigour of this work rests not in detachment, but in traceability: practice logs and reflections, operational documents, photographs and material traces, and publicly accountable records generated through council engagement. What becomes knowable through this approach is not only *whether* composting works, but *what it takes to endure* as a relational and more-than-human practice within colonised and contested governance environments.

What follows then is not a formal summary, rather an effort at weaving some of these ways of knowing and seeing composting. This kōrero moves between the tangible outcomes of this research and the deeper ontological shifts it provokes – from waste to whakapapa, from policy to practice, and from separation to coherence, wholeness and connectivity. Each section edges

closer to what composting reveals about how we might live, learn, and be determinant influences for the better, in deeper relationship with whenua and one another.

7.1 Composting as a Relational Legacy

This thesis argues that composting can operate as rift-repair when it is treated not as end-of-pipe waste processing but as relational infrastructure that sustains soil, learning, and accountability. In Ōtautahi, that repair is inseparable from the conditions that authorise care – tikanga, partnership obligations, regulation, contracts, and institutional power. If this project were to pause in July 2024 where the last image was taken for the Companion Flipbook to this text, the tangible markers left behind would tell a story not of completion, but of a continual process of becoming a deeper and more effective form of relational infrastructure. And this might look like a relatively modest legacy: A rolling lease agreement for land that in most other terms is a large maintenance liability, a cause of community concern, a couple of temporary structures in the form two shipping containers, and 36 large concrete blocks that require heavy machinery to move. There is a small fleet of civil earthworking equipment, a skip bin of litter, a few silage tarpaulins, and many tonnes of decaying organic matter becoming soil in a landscape returning to wetland ecosystem. On the surface, that is some of the material legacy this project is related to and would leave for the next person to care for.

More importantly though, going to the deeper significance of this research, is what lies beneath or is not immediately visible; the relationships, systems, and regenerative patterns seeded and rhizomatically threaded through this work. These became small parts of an enduring legacy: a functioning governance arrangement embedded within the already high-performing whānui[23] of Te Pā o Rākaihautū and Nōku Te Ao; a publicly accountable and purpose-driven cultural infrastructure; whānau-led composting enterprise with no debts, only some reporting milestones and outstanding funding to spend; a fledgling *Kaitiaki Taiao* internship for senior Te Pā students; a commercial partnership generating modest income; thirty hectares of whenua under a live lease for soil remediation, supported by the local consenting authorities, and with a publicly retrievable record of middle management stating:

> “The overall aims of the project are to improve the soils in an innovative manner… we are supportive of this work occurring.”

[23] https://maoridictionary.co.nz/search?keywords=whanui

And even deeper – beneath the planting cover, beneath the visible activity – lies an ecological and relational legacy, layered and threaded through the whenua. It is a material legacy, more-than-human in its composition and effect, shaped by the work of soil organisms, whānau, and whenua alike. This legacy now feeds and resources new growth. What remains largely unseen, but is no less vital, is the way this carbon-rich soil is actively sequestering carbon dioxide, drawing pollutants from the sky – from *Rangi* – and returning them to *Papatūānuku*, where they can be metabolised into forms that support life in more appropriate domains. Through this project, compost has been layered, waste has been recovered, and soils have literally been built – transforming what was once discarded into the living infrastructure of restoration.

These outcomes are not solely mine or this project's. They were built with participation by others – by whānau, tamariki, colleagues, volunteers, my brother, microbial kin – in partnership with the whenua and guided by higher purposes, a kaupapa. What has emerged is a distributed, interdependent infrastructure and ecology: one that holds composting not as a product, but as a practice of relationship, repair, and regeneration. Participatory Design scholarship describes a shift from designing discrete artefacts toward *infrastructuring* – the ongoing creation of socio-material conditions that enable participants to reconfigure systems over time (Björgvinsson et al., 2012; Ehn, 2008; Wakkary, 2021). This works in the context of rift-repair, as this is an intergenerational project, dealing with successive generations of *dis*-repair. Infrastructure, in this sense, is not fixed; it is a relational achievement between local practices and broader systems (Star & Ruhleder, 1996). What endures from this project can be understood in these terms. The lease agreements, governance rhythms, soil-related protocols, internship pathways, and composting routines together form a participatory infrastructure for rift-repair. Crucially, this *constituency* (see also section 4.5.1) includes nonhumans (Akama et al., 2020) – soil organisms, moisture cycles, decay processes – as actors in shaping future possibilities. The relational legacy of this research is therefore infrastructured rather than concluded: it remains capable of being reconfigured by whānau, whenua, and microbial communities alike.

7.2 Composting as a Decolonial Method of Rift-Repair

The contributions of this thesis are practical and conceptual: they show how composting becomes a method of knowing and a method of repair when lived-with over time. Each contribution is bounded by what the research could ethically carry forward: practice evidence, consented materials, and publicly accountable records. Composting, as it unfolded through this research, was never just about soil or organics or creating a legacy to stand by. It was always a way of

being – a mode of relating, noticing, and caring that grounded what motivates me and my practice in something deeper than organic waste management. In the rhythms of gathering, layering, forming, and watching, composting in dialogue with decolonising methodologies called me to slow down, to listen closer, and to pay more attention to life as it reorganises itself in response to ruptures. It was messy in the middle, and it mattered that it was. The work carried multiple kinds of friction: (1) *technical frictions* – leachate, odour, moisture and temperature control, and contamination arriving upstream; (2) *social licence frictions* – the reputational shadow of Christchurch's wider compost failures, neighbour anxieties, and the vulnerability of community-scale practice to complaint-driven scrutiny; (3) *institutional frictions* – procurement logics oriented to industrial scale, narrow scopes that treated collection and contamination as "out of bounds," and risk allocation that favoured corporate bidders; (4) *relational frictions* – the slow pace of trust, the humility required to learn within tikanga boundaries, and the ongoing work of being accountable as a Pākehā practitioner in a Kaupapa Māori context; and (5) *methodological frictions* – the labour of documenting while doing, and the ethical discipline of refusing extractive "research capture" when relationships required care instead of explanation. These frictions were not interruptions to the research; they were the empirical substance through which rift-repair became legible.

As a lived, ongoing coming together and intersection of values and responsibilities, composting has taught me that relational work cannot be rushed. It requires the willingness to keep showing up even when results are not guaranteed. It asks us to stay with the trouble and grit through the times when it is labour-intensive (physically and intellectually). It demands and teaches determination for the good of something more than just ourselves. Empirically, the research offers a longitudinal, first-person account of composting in the "wild edges" of real conditions – odour, labour, contamination, learning, and compliance – where maintenance and failure are method, not noise. This addresses the documented gap in sustained studies of living systems in design research.

As I came to understand through my engagement with Te Pā o Rākaihautū, composting can plug into whakapapa. It can extend care to the whenua and its tipuna, to each other, to becoming a kind of cultural infrastructure – not an artefact, but a living system that regenerates through time, practice, and careful attention. It is here that composting can take shape as a **method of rift-repair**: a way of responding to the material, cultural, and ontological separations that have been imposed by colonisation and extractive systems. By bringing composting into relationships with tikanga and Kaupapa Māori environments, the practice tended toward a methodology of

decolonial repair – not by claiming to be one, but by listening carefully, walking alongside, and making space for Indigenous-led restoration of relationships between people and whenua. This is not a given for composting, it is made and embodied.

The thesis contributes a rift-repair methodology operationalised through co-designed action research across three inseparable scales: material practice, collective arrangement, and institutional interface. This framing makes “how composting is done” the central analytic unit, rather than composting as a generic good. Composting is not only what we do; it is how we become in relation to one another. It is method, metaphor, and matter – all coalescing through a modest and simple practice. And in the context of colonised landscapes like Ōtautahi, it can become an act of rift-repair: of refusing separation, of reweaving the relational fabric between tangata and whenua, and of regenerating the conditions for intergenerational wellbeing. The thesis bridges more-than-human designing-with to metabolic rift and decolonising methodologies, sharpening what “accountability” must mean in colonised, governance-saturated landscapes. Designing-with here is not only interspecies attentiveness; it is also confrontation with the infrastructures that structure who can care and what care is permitted to endure.

7.3 Composting as Ontological Practice

Throughout this study, composting has emerged not only as a technical or ecological act but as a way of being in the world – an ontological practice grounded in responsiveness, humility, and deep relational care. It invited me to tune into the sensibilities of the living world, to listen for what was needed, and to respond through action. This was not always glamorous work. Often it meant picking up rotting and discarded materials by hand, noticing subtle changes in a pile's odour, moisture or temperature, or quietly restoring order after a disturbance (‘in the field’). But it was in these mundane and iterative tasks that the work was always alive, and the relational infrastructure began to hold and bear fruit. Composting required a commitment to steady pace and consistent presence, to allowing the world to speak back, and to working honestly with that feedback. This research could not have proceeded without a willingness to learn from microbial and more-than-human communities, from whānau at Te Pā, and from the rhythms of whenua. In that sense, the practice shaped me as much as I shaped the work. I was becoming with composting in a more “expansive and inclusionary” way (Wakkary 2021, p. 218).

These composting practices unfolded across the eco-cultural landscapes of Waitaha, Ōtautahi, and Te Ihutai. The ethics of this study were formed in dialogue with those landscapes and the people who live within them. Composting became a way of enacting ontological shifts that made

sense to these people and places – away from extractive, linear models of "waste," and toward circular, care-based relationships with whenua and each other. This is not to suggest that composting, as practiced here, resolves all the ontological tensions at the heart of colonised land and infrastructure systems. But it does begin to open a different posture in relation to these challenges. It asks: *What can emerge if we shift from managing waste to nurturing whakapapa? What if we composted our assumptions about control, ownership, and progress?*

By aligning composting with values of whanaungatanga, reciprocity, and Taiao-based action, this research cultivated a practice that was grounded, imperfect, and responsive. These are critical qualities that may be a key to imagining and enacting futures that counter indifference to living worlds. Applied to urban organics governance, the thesis reframes the "problem" from managing waste volumes to restoring relational cycles of nutrients, responsibility, and whenua vitality. This has direct implications for how institutions like Christchurch City Council procure services, define compliance, and measure success beyond throughput. If rift-repair is taken seriously, organics system design must be judged by whether it increases the capacity to care – socially and materially – rather than by whether it efficiently removes materials from view. That shift reorients metrics toward soil function, community access, and enduring relational responsibility.

Composting with Te Pā taught me that systems don't fail in one domain at a time. Composting, then, is not only a metaphor but a method for attending to what we inherit, what we carry, and what we choose to transform. In the cases where some*thing* was not working, the practice required multiple responses – material adjustments and relational adjustments. The piles "spoke" through matter, but they also spoke through the relationships and routines that produced its conditions. What can transfer from this work is not a universal "composting model," but a set of invariants: accountable participation, long duration, co-design across the three scales, and governance arrangements that authorise care. What varies by place are the recipes, materials, climatic constraints, and institutional interfaces. Becoming with compost, in this sense, is learning to read feedback across human and more-than-human worlds, and to respond with care that is technical *and* accountable. Composting is an ontology for ethically determining the change we want to see in the world.

7.4 Composting as a way to Scale Deep

Throughout this research, composting has operated not only at the level of technical practice or community engagement, but as a mechanism for re-patterning relationships – with soil, with whānau, with institutional systems, and with ourselves. The question of scale inevitably arises in

work that seeks transformation. Often, ‘scaling up’ is equated with increased volume, institutional endorsement, or policy change. ‘Scaling out’ may refer to replication across sites, geographies, or communities. But what emerged most powerfully through this study was the potential to **scale deep**.

The concept of scaling deep was first developed by Tatiana Fraser (Fraser, 2023; Fraser et al., 2016) in the context of systemic social innovation. Scaling deep describes change that works through the transformation of values, relationships, and cultural norms rather than just technical or structural interventions. In their McConnell Foundation report, Moore, Riddell, and Vocisano (2015) argue that systemic change cannot be sustained without cultural and relational shifts – shifts that embed new norms, practices, and patterns of meaning. They suggest that successful innovations “cannot simply expect to scale up to effect systems change without having gone through the lessons and capacity building experiences that occur when scaling out, or scaling deep” (Moore et al., 2015, p. 82).

In the final stages of this project, I had the opportunity to meet Tatiana Fraser during a wānanga held in Ōtautahi, a brief exchange that affirmed a lesson I had already begun to learn through this project and with Te Pā. I entered the research with a focus on scaling composting systems – imagining replication of a ‘proven model’ as the pathway to realising its transformative potential. But through my relationship with Te Pā o Rākaihautū, I came to understand more the importance of whakapapa, and the deep embeddedness of place, memory, and tikanga in shaping any practice that aspires to transformation. Without Te Pā and the people acknowledged in this study, I would not have shifted course toward a more relational and regenerative approach – one that insists on grounding in care, specific cultural contexts, and the making of enduring commitments. This shift demanded a different orientation – less toward outward growth and more toward inward entanglement. It asked me to stay with complexity, discomfort, and the slow unfolding of trust and meaning. In this sense, the research began to resonate with deeper cosmological frameworks of emergence and becoming. While I have not fully explored these frameworks here, the mahi of *Te Korekoreka* (Tokona Te Raki, 2022) and the creation stories of Ngāi Tahu is an example of the powerful sources of Indigenous knowledge available for those continuing with this line of inquiry.

Composting in this study enacted such change not by winning a larger market share or institutional dominance, but by transforming how people including myself relate to waste, to whenua, and to each other. It operated at the scale of tika, pono, aroha – of daily rituals, of tamariki learning with their hands in soil, of whānau showing up to sort food scraps and layer materials with care. These practices might appear small or mundane, but they represent the embedding of new ecological

and relational logics into everyday life. The practices are the evidence of a rift-repair method that started to work in the context of Te Pā o Rākaihautū, an educational institution and cultural context that is already well-practiced in enduring rifts. This is the realm where ontological shifts occur: not only in how people behave, but in how they see and feel *with* the world. For example, the restoration of composting practices at Te Pā was not merely the reinstatement of a waste management system, but a symbolic and material re-weaving of whakapapa with whenua – an enactment of mana motuhake through the determination of soil sovereignty. Through repeated action and sharing of this story, the composting practices became a relational node – a place of reconnection and repair. Like the steady growth of a mycelial web through the composting soil, this kind of change is hard to quantify, but it is deeply felt – and then it is there for all to see. It does not require some indeterminate other to be real, though it may in time enable those forces to be better. It changes what is seen as possible.

The enduring value of this research lies in its attention to the systems that are often invisible to large civic institutions. These systems are the mycelial networks of cultural substrates, community practice, and intersectional, interspecies wisdom. This is the *who* and *what* gets that get harmed when institutional agents act under urgency, under duress, and 'forget' to proceed with respect to these enduring sources of knowledge. These knowledge systems, the ways of knowing ***how*** to proceed through more inclusive processes, must be tended to if wider system change is to endure and realise its potential for expansive impact. Some of the composting methodologies offered here are not blueprints to be copied, but seeds to be adapted to the specifics of a given time space and circumstance. Seeds grow best when nurtured into connections in a soil that is teaming with life.

Scaling deep means accepting the slow work of transformation. It means honouring the unseen: the microbes and fungi, the stories, the protocols, and the small gestures that accrue meaning over time. In this way, composting becomes a methodology for cultural revitalisation – not just by what it produces, but by *how* it produces, and with *whom*. It teaches that change does not need to be dramatic to be profound. It needs only to be grounded, held in relation, and nurtured with care.

7.5 Composting as Offering: Contributions to Place, Practice, and People

This project could have taken the reader on a very different tour through whole other wormholes of soils and teaming! Suffice to say that cultural, ecological, and spiritual context of the places we

stand, *really* matter, and I view these as offerings we encounter every day. It is safe to assume the reader is fortunate enough to eat and discard food scraps most days – these are offerings that pass by us daily. If you happen to be at Te Pā around lunch time, then certainly most days you will be offered that very opportunity: to eat and discard food scraps. This project began with a simple act: an offer to kōrero, of lunch, of gathering food scraps and returning them to the soil. It ends (but not really) with a rich layering of relationships, insights, and responsibilities. Composting has functioned not only as a research method, but as a sustained offering to the communities, places, and partnerships that enabled it. This offering is both material and relational: it is the soil life tended at Te Ōraka, the relationships cultivated with Te Pā o Rākaihautū, and the methodologies refined through years of action, reflection, and adaptation.

Rather than a discrete intervention, this research is best understood as a relational composition – a living infrastructure co-formed through composting practice. The compost heaps, like the research itself, were never static. They were layered, turned, and transformed by many hands. The outputs – from the establishment of a Kaitiaki Taiao internship, to baseline soil data, to a network of Kaupapa Māori-aligned composters – are not solely owned but shared, not complete but continually unfolding. They are seeds for others to tend.

These outcomes matter not because they can be measured, but because they were co-produced through trust, tikanga, and reciprocity. The decision to embed the research within Te Pā's rhythms – in classrooms, kitchens, and community wānanga – ensured that it remained accountable to the people and places most affected by the challenges it sought to address. In this way, composting became a mode of presence – a way of listening, contributing, and being alongside.

Through this relational praxis, composting emerged not only as a method of soil regeneration, but also of cultural re-weaving. It helped reconnect fragmented systems – between policy and place, between waste and revitalisation, between past harms and future healing. By anchoring composting within Indigenous Māori frameworks of care and interdependence, the research revealed new ways of living and making together in the aftermath of rupture.

If there is a central contribution here, it is this: composting can become a cultural infrastructure. Not just a technique, but a practice capable of grounding regenerative design, relational accountability, and system transformation. In the landscapes of Ōtautahi and Te Ihutai – places long strained by a colonially-determined metabolism – this practice offered a small but meaningful shift toward more ethical and embodied futures.

Projects can take stories, legitimacy, or “community voice,” while leaving communities to carry the maintenance, risk, and aftermath. A composting methodology informed by decolonising practice can resist this by offering ongoing contribution, actively seeking consent and consensus, and accountability – showing up to do the labour, respecting tikanga limits on what should be written or circulated, and treating relationships as the infrastructure that the research must serve. In this study, rift-repair could not be claimed through representation alone; it had to be enacted through continued responsibility and care.

7.6 Composting as Continuity: A Living Methodology

Composting, as explored through this thesis, is not a practice that finishes. It is a continuous methodology – iterative, unfinished, and always in relation. What began as a strategy for diverting organics from landfill has matured into a living systems approach for repairing rifts in soil, culture, and governance. What began as an experiment in waste has become a way of participating in the slow, intergenerational labour of restoration.

This continuity is vital. As Anna Tsing reminds us, we must look for “life in the ruins” (2015, title page). Composting teaches us that what appears to be waste or decay is often the substrate for new growth. This thesis has attempted to dig deep in that space – not rushing to resolution, but staying with the trouble, as Haraway (2016) might say, long enough for transformation to take root. Composting, in this thesis, is a practice of staying with the work of renewal: returning materials to soil while returning responsibility to relationships. Rift-repair is therefore measured not only in better soils, but in whether whakapapa-connected ways of living can re-enter everyday infrastructure.

The future of this work lies with those who continue to tend it: the whānau of Te Pā o Rākaihautū, the Kaitiaki Taiao who tend to life at Te Ōraka, the tamariki who learn through doing, and the wider community of practice evolving around Te Puku Māra. The methodologies offered here are not blueprints, but seeds – adaptable, relational, and awake to their context. They are shaped by the whenua that holds them, and by the people who bring them to life.

If composting is to support ethical and embodied futures, three commitments follow from this research. First, a *practice commitment*: composting capacity is built through sustained doing – through seasonal repetition, maintenance, and learning-with materials. Second, a *governance commitment*: community-led organics work requires tikanga-aligned protocols and careful stewardship of documentation so that knowledge is shared without becoming extractive. Third, an *institutional commitment*: councils and public agencies must support communities to resource

the “unseen infrastructure” that enables scaling deep – secure land access, training pathways, contamination prevention upstream, monitoring, and relationship work – rather than funding only capital assets and tonnage targets.

As this doctorate and exegesis comes to a close, the composting continues. It continues through teaching, planning, writing, digging, and kōrero. It continues through the growing visibility of Kaupapa Māori determined infrastructure. It continues in the daily acts of care that connect soil with sovereignty.

Like the slow, intentional growth of mycelium, this deeply pragmatic research is growing roots that love the cultural substrate and the soils of Waitaha. My hope is that they will continue to nourish and grow the vitality of a whenua and whānau restored; that they ensure resilience and continual state of prosperity, enduring as a living, transformative practice, far beyond this project alone.

Across the thesis, composting is enacted as rift-repair through three inseparable strands: 1) place-based practice with Te Pā o Rākaihautū, 2) technical experimentation and refinement, and 3) sustained interface with municipal governance – showing how a living methodology can generate eco-cultural revitalisation while meeting, and sometimes being constrained by, institutional systems.

Above all, let this continue to be an invitation: to stay grounded, to build with others, and to trust that, even in systems shaped by rupture, by death and decay, life insists on returning.

TIHEI MAURIORA

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APPENDICES

Appendix A: Ethics Approvals

Appendix A1. University of Canterbury Human Ethics Committee

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

HUMAN RESEARCH ETHICS COMMITTEE
Secretary, Rebecca Robinson
Telephone: +64 03 369 4588, Extn 94588
Email: human-ethics@canterbury.ac.nz

Ref: HEC 2021/109

4 February 2022

Preston Bailey Peryman
School of Earth and Environment
UNIVERSITY OF CANTERBURY

Dear Preston

The Human Research Ethics Committee advises that your research proposal "Repairing Metabolic Rifts for Societal Transformation: Localised Composting and Organics in Aotearoa New Zealand" has been considered and approved.

Please note that this approval is subject to the incorporation of the amendments you have provided in your email of 29th January 2022.

Best wishes for your project.

Yours sincerely

Dr Dean Sutherland
Chair
University of Canterbury Human Research Ethics Committee

Appendix A2. Ngāi Tahu Consultation and Engagement Group

Ngāi Tahu Consultation and Engagement Group

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

17 August 2021

Tēnā koe Bailey

Re: Repairing Metabolic Rifts for Societal Transformation: Localised composting and organics in Aotearoa New Zealand.

This letter is on behalf of the Ngāi Tahu Consultation and Engagement Group (NTCEG). The NTCEG considered your proposal and acknowledge it is a worthwhile and interesting project and you are clear about how you ought to take participants' (cultural) needs into account if and when applicable.

Given the scope of your project, no issues have been identified and further consultation with Māori is not required. You have been able to effectively show the ways in which you have successfully engaged with and considered Māori within your application. You have presented a number of culturally competent practices across your work, these underpin an excellent understanding that you have when working and collaborating with Māori.

Thank you for engaging with the Māori consultation process. This will strengthen your research proposal, support the University's Strategy for Māori Development, and increase the likelihood of success with external engagement. It will also increase the likelihood that the outcomes of your research will be of benefit to Māori communities.

We wish you all the best with your current project and look forward to hearing about future research plans. The NTCEG would appreciate a summary of your findings on completion of the current project. Please feel free to contact me if you have any questions.

Ngā mihi
Sarah Wiki-Bennett (on behalf of the NTCEG)

Research & Innovation | Te Rōpū Rangahau
University of Canterbury | Te Whare Wānanga o Waitaha
Private Bag 4800, Christchurch | Ōtautahi
ethicsmaoriconsultation@canterbury.ac.nz

Appendix A3. Auckland University of Technology Human Ethics Committee

05 May 2025

Amanda Yates
Faculty of Design and Creative Technologies

Dear Amanda

Ethics Application: **23/86 Thinking with composting to support healing in colonised landscapes: practices for activating communities of diverse exchange**

Thank you for the updated documents as requested by AUTEC.

Based on the information provided the conditions have been met however, AUTEC is not permitted to give retrospective ethics approval as set out in section 2.6 of the HRC Research Ethics guidelines.

However, as recruitment and human data collection were completed prior to student transfer, the University of Canterbury ethics approval number is the valid approval to use in the thesis submission and publications.

Should you have any further enquiries, you can contact the Secretariat at ethics@aut.ac.nz

(This is a computer-generated letter for which no signature is required)
The AUTEC Secretariat
Auckland University of Technology Ethics Committee

Cc: pbperyman@gmail.com

Appendix B. Deputation to Christchurch City Council, 09 September 2021

“Organic waste management that fits with suburban Christchurch... The other main point of difference for community composting is the actual footprint in terms of square metres of each compost pile occupies only 1.5% of the total land area we have access to as part of our first two trial phases. This means the impacts on surrounding environments and residential areas are on a micro level when compared to the OPP. This system can then be replicated and dispersed geographically, potentially localising transport movements for waste collections and opening options for alternative transport models, such as a trailer towed by an electric bike ...and it’s culturally responsive. The balance of the land area accessed for our community composting trials is managed as māra kai, as teaching and learning spaces for all ages, combining biodiversity restoration and intergenerational nurturing of connections between whānau, community and land, including whenua of high cultural significance to Ngāi Tahu within the ŌARC”.

Permanent link to full script:
https://christchurch.infocouncil.biz/Open/2021/09/CNCL_20210909_MIN_5441_AT_files/CNCL_20210909_MIN_5441_AT_Attachment_32685_2.PDF

Appendix C. Deputation to CCC Finance and Performance Committee, 26 May 2022

Quote 1: “In real organic systems, there's no such thing as waste. The tragic state of where we're at today is a direct result of the separation we've created between people and the environment. Again, this is an impossibility and we must transform the way we govern ourselves in relation to natural cycles. My deeper concern today is whether you recognise that there is a 100+ year legacy of irreparable damage to the Ihutai created by ‘waste’ infrastructure choices of the City - including the WWTP, and the OPP, and the land confiscated from Iwi in the 1950s. To send all organics to landfill not only fails to recognise the value of this material, it is a continuation of this extremely poor legacy. In the context of the ongoing damage being done to this culturally significant landscape, sending organics to landfill today looks like a knee-jerk response to a relatively short-term problem.” (Bailey Peryman, deputation to Finance and Performance Committee, Christchurch City Council, 26 May 2022)

Quote 2: “Because localised alternatives are emerging innovations, they don’t fit in the usual boxes where you look to for solutions. The Future of Organics report does not cover localised alternatives, all but presuming that one large, industrial processing facility is the only option. We can join in the procurement process forthcoming and wait for that to roll out over the next 3-5 years, we'll probably be missed or fall through the gaps, or you can use the powers you have today to authorise continuing support for our operating systems to provide immediate relief for local communities. In choosing to develop partnership-based solutions, you are choosing to transform organics processing for our region as a whole, acting on your responsibilities as Treaty partners to support the participation of Iwi/Māori communities in waste management decisions, and you start on the long road towards addressing the legacy problems of this city’s ‘waste’ infrastructure impacting on te Ihutai, as well as the issues before you today.” (Bailey Peryman, deputation to CCC Finance and Performance Committee, 26 May 2022)

Appendix D. Christchurch City Council – resolutions in Council

1. “7. Refer the 20/20 Organics Composting project to the sustainability fund for funding, and if funding is approved request staff report back on the outcomes of the 6 month trial with a view to Council partnering in the project if successful.” (19 Sep 2021)
2. “Request Council to continue to support and enhance home and community composting initiatives.” (26 May 2022)

Appendix E. Christchurch City Council – discussion in Council, 26 May 2022

Transcript of discussion led by Councillor Sara Templeton [begins 53:04 - https://youtu.be/bsdqHSOv2bs?si=g2VwH4vRan8ZxEC-&t=3183]

- Cr. Sara Templeton: "Thank you. I'd like to turn to the potential for upscaling alternative, community-based solutions. In Bailey's presentation—both today and last year—it sounded like the trials have been successful. I believe there was supposed to be a report back on the potential for partnering to enhance and upscale these efforts. I'm wondering if that report is coming soon and whether we could provide some assistance through a resolution today?"
- CCC Staff Member 1: "I actually visited the 2020 operation this past week—really positive things happening there. They've just converted their land holding into a lease, which means they can now ramp up their operations. As Bailey described, they now have the capacity to take about 3,000 tonnes. The challenge with their operation is that they would need a pre-treatment process if they were to take kerbside organics—it would have to be treated before being incorporated into their windrows. Right now, they are processing commercial food waste and blending it with public drop-off garden waste and flat leaves. While there are opportunities to partner with 20:20 and other community-based composting initiatives, it's not currently viable to process a significant portion of kerbside green waste."
- Cr. Sara Templeton: "So if we're looking at scaling back operations at the organics processing plant, we need more facilities beyond just those existing community initiatives. But it was clear from the visit that they believe they could scale up relatively quickly—not an immediate solution, but still something that could be beneficial to the community in the long run. How can we enhance that?"
- CCC Staff Member 2: "This is part of the procurement process we're about to enter. We're not just looking at building a new facility—or multiple facilities—but also at whether we can separate waste streams. Certain facilities might take specific parts of the waste stream, and we want to explore those options. Rather than going to market with a predefined final solution, we're taking a more iterative approach—rethinking how organics flow through the system."

- Cr. Sara Templeton: "Is there potential to expand home-based composting? I know that before I was elected—pre-quake—Council was actively promoting bokashi and similar approaches, with lots of education to encourage people to compost food scraps at home instead of putting them all in the green bin."
- CCC Staff Member 3: "Absolutely. Those points were raised at the last council meeting and have been taken on board by our team. We have commitments in the Waste Management and Minimisation Plan to reduce organic waste, and part of that includes promoting home composting. Our team is working on making home composting easier and addressing the challenges for inner-city residents who may not have gardens but still need an organics processing solution."
- Cr. Sara Templeton: "And what about resourcing for these initiatives? Will that come to us soon? We're clearly keen to work on this and are open to investing in solutions that minimize waste and reduce odour. In the past, we've been told there's no budget or resources for these kinds of initiatives. Is that still the case?"
- CCC Staff Member 3: "This is part of our action plan and forward work program. We do have a waste minimization budget allocated to support these initiatives."
- Cr. Sara Templeton: "So there is enough budget to move forward?"
- CCC Staff Member 3: "Yes, there is."
- Cr. Sara Templeton: "Cool, thank you."

[ends 57:12]

Transcript of discussion led by Councillor Aaron Keown [begins 1:09:37 - https://youtu.be/bsdqHSOv2bs?si=RrAMdBgzDnP87S_c&t=4177]

- Cr. Aaron Keown: "One of the things that was really clear this morning is from Bailey's presentation that he sees an opportunity... how do we guarantee from today that he's in the tent as much as he needs to be to make sure that if that's a viable option we go that way and just flip the whole thing on its head and go away from the industrialised version that we've tried and has now failed and we move to something else, how do we make sure that's in whatever we decide today?"
- CCC Staff Officer 3: "We are going out with a multi-stage procurement. We're not saying, 'This is what we want'; instead, we have objectives and requirements, and we'll work our way through that process with the market. We might come back with more than one option—or there might be one definitive option—so we need to be careful when preempting decisions. By doing so, we risk limiting the market by giving the impression of

a preconceived idea. We're considering all options; there isn't just one provider who can offer a solution, but multiple ones. We need to allow all these options to emerge before predetermining just one. The way to ensure that happens is by clarifying the outcomes we want to achieve, building that into the procurement process, and following sound practices to ensure everyone gets a fair chance." [1:11:20]

- Cr. Aaron Keown: "The fear is that people like him, the groups he works with, and others that have emerged in our city over the last 10 to 12 years don't fit within traditional procurement policy. They don't align with the way councils and governments design solutions—they are essentially the opposite. Yet, at times, they offer really good solutions. It's just about making sure that..." [1:11:51]
- CCC Staff Officer 1: "Well, I disagree with that as well. We are actively working to ensure that we're considering all options." [1:11:56]
- CCC Staff Officer 3: "Christchurch City Council's policy is one of the most dedicated approaches to engaging with the smaller market and exploring more innovative procurement methods, rather than just following a standard tick-box process. So, we are most definitely not excluding them. And remember, we will be coming back to elected members with the procurement plan for approval—that's probably where that debate can take place." [1:12:20]

Appendix F. GETS Portal CCC Ōtautahi Christchurch Organics Solution RfP

Screenshots taken from the GETS portal.

Addendum – 3 of 25727754

Tuesday, 13 September 2022 4:14 PM (Pacific/Auckland UTC+12:00)

Briefing Key Notes

The Council will not release the full Jacobs Future of Organics report at this time. Resolution 5 of the 28/4/22 Finance & Performance Committee meeting FPCO/2022/00019, agrees that the redacted info can be released when the Chief Executive is satisfied that there are no longer grounds under LGOIMA for withholding the info.

The redactions in the Jacobs report relate to cost estimates, details of the existing consents & contractual arrangements for the organics processing service and will not be released at this time as this info could potentially prejudice future commercial negotiations in relation to the existing composting operation and /or the purchase of a new site or negotiation of a new commercial service.

The report considered a number of Council owned sites round the city as locations for a new organics processing plant. As Council is now approaching the market seeking a complete solution which includes a site, this information is not relevant to the current process.

The current procurement process is a reset of Council's previous approach to selecting an alternative organics processing solution. The information redacted in the report would not have a material impact in determination of a solution that meets Councils objectives. The procurement process seeks to maximise the possibilities for a suitable solution allowing for consideration of any solution that demonstrably meets our objectives. We strongly encourage Prospective Suppliers to determine a solution from first principles as opposed to using any previously undertaken analysis as a basis.

The Metro Place location is used as a baseline for comparison only; there is no assumptions on the starting point of the process or this being part of the solution.

Kerbside collections are out of scope.

Currently the OPP has rear loading trucks arrive into the processing hall & drop off loads between three & eight tonnes, both compacted & un-compacted, depending on the truck make & model.

Reconsidering standpoint about Council owned sites

Friday, 16 September 2022 4:45 PM (Pacific/Auckland UTC+12:00)

Status: Public

Q: In an earlier response Council has stated: "The report considered a number of Council owned sites round the city as locations for a new organics processing plant. As Council is now approaching the market seeking a complete solution which includes a site, this information is not relevant to the current process." All of these sites represent potential solutions that would result in capital cost savings for the public and ratepayers. Especially in light of the likely total cost of a complete solution replacing an existing asset with substantial residual functional life/capacity. Can you please release the sites considered in the Jacobs report, if only addresses, as these could all form part of a networked solution that is not concentrated to one site only. This is consistent with minuted Council intent to support and enhance community composting solutions, which also needs to be considered.

Wednesday, 21 September 2022 8:37 AM (Pacific/Auckland UTC+12:00)

A: We reiterate our previous advice that we are withholding the council owned site information contained in the Jacobs report for the reasons set out under LGOIMA as previously advised.

To assist further it might be useful for you to understand that they would in any event likely be unsuitable for a small scale geographically spread community initiative. The scope for identifying the properties in the Jacobs report was that they were not located close to communities or residential areas and were of significant scale to enable an industrial/commercial operation with a 500m buffer zone. As a result they were all large sites in excess of 3-4 ha and were therefore all in the north west rural sector of the city and as such would not be compatible for a geographically spread networked solution. It also needs to be noted that this list included sites that are actively being used for a public work service/activity and therefore not readily available without separate consideration of the costs and benefits.

Council understands the potential benefit in encouraging community initiatives which could reduce the burden on the City's Organics Processing Plant. Should you wish to present a community scale composting initiative to Council we suggest you do that outside of the current EOI process, through the pathway of liaising with Council's Resource Recovery Team.

Upholding Te Tiriti o Waitangi Principles

Wednesday, 14 September 2022 2:49 PM (Pacific/Auckland UTC+12:00)

Status: Public

Q: Which Iwi have been engaged during this EOI process?

Friday, 16 September 2022 11:07 AM (Pacific/Auckland UTC+12:00)

A: Council has not yet engaged with iwi in relation to any specific alternative Organics processing solution.

Appendix G. Reflections from 20:20 Compost team

‘When compost is more than food waste - nurturing land, people and community’ (Bex de Prospo, 28 Nov 2024): https://www.seedthechange.nz/ournews/2024/11/28/komahikoora

- “Te Pā had an existing food cycle where they were already doing all the right things, but they weren’t quite linking up and flowing,” Bailey says. “I began spending more time there composting each week with the kids during school time. We quickly got their organics cycle functioning quite well, and before long we were producing amazing food. The garden was growing; we were pulling resources in. This natural flow started taking hold. While we could’ve just pressed ahead with that scaleable model we started 20:20 with, we weren’t convinced that it would get to the people who would most benefit from it.”
- “The project weaved its way through a variety of iterations,” Erin says, “wondering how it wanted to be, and where it wanted to live. Like all living things, projects need a home and a community that cares for them. This one found its home at Te Pā.”
- “I was inspired by Parihaka,” Huia says, “and the idea of Māori reactivating their place on ancestral land. When the project started, my vision for composting at Te Pā was to be part of a project to enable tangata whenua to reconnect and restore their land, as well as increase food resilience... Whatever happens next, I think the project is already doing what I envisaged when it started. That land has been reactivated; in such a short time, we have already touched so many whānau.”

Appendix H. Response to CCC Staff – Organics Options, 19 May 2023

Note. This is a sample of the document prepared for CCC Resource Recovery Staff.

19 May 2023
miriama@parakore.maori.nz
bailey.peryman@rakaihautu.com

Response to CCC Staff: Organics Options

Compiled by Bailey Peryman, Miriama Buchanan (Para Kore), and Gina-Lee Duncan (Te Pūtahitanga o Te Waipounamu).

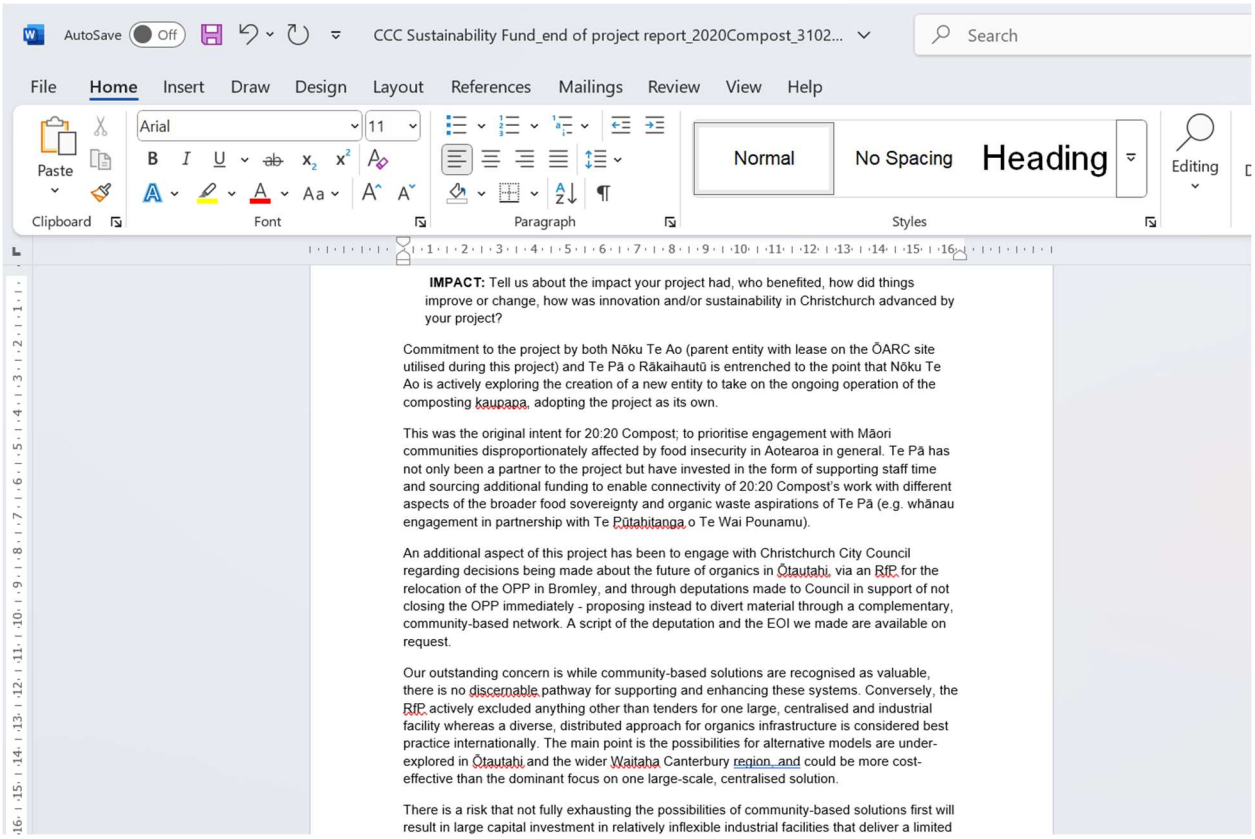
Summary for CCC Staff

Introducing Pā Wairākau

Pā Wairākau is a community solution for local organics collections, processing and distribution. Pā Wairākau is led by a kaupapa Māori indigenous approach, to restore the fragile ecosystem that alternately supports life and well being. This is a cost-effective approach to providing a solution to the urgent problems with the Ōtautahi Organics Processing Plant in both the interim and the long-term. Success in Ōtautahi has the potential to provide:

Appendix I. Sample from End of Project Report – CCC Sustainability Fund, 31 February 2023

Excerpt from report: “There is a risk that not fully exhausting the possibilities of community-based solutions first will result in large capital investment in relatively inflexible industrial facilities that deliver a limited outcome and do not benefit communities through the resilience that comes with a diversity of localised organics solutions.”



Appendix J. Transitional Land Use license agreement and area map

Licence Agreement

Parties

1. **HER MAJESTY THE QUEEN** in right of the Government of New Zealand acting by and through the Chief Executive of Land Information New Zealand (LINZ) pursuant to section 91(1)(b) of the Greater Christchurch Regeneration Act 2016 as licensor; and

2. **HE WAKA TAPU TRUST** (**You**) as licensee.

Terms and Conditions

1. The land shown green and described in **Schedule One** is owned by the Crown and administered by LINZ (the Land).
2. LINZ grants You a licence to occupy the Land for a term of twelve months (the Term) commencing on the date the Crown provides confirmation to You pursuant to clause 23(c) (the "Commencement Date") and expiring twelve months thereafter or the date the land is legally transferred to CCC, whichever is earlier, subject to the terms and conditions set out in this licence.
3. You may only use the Land to undertake research on soil remediation for future productive and sustainable land use.

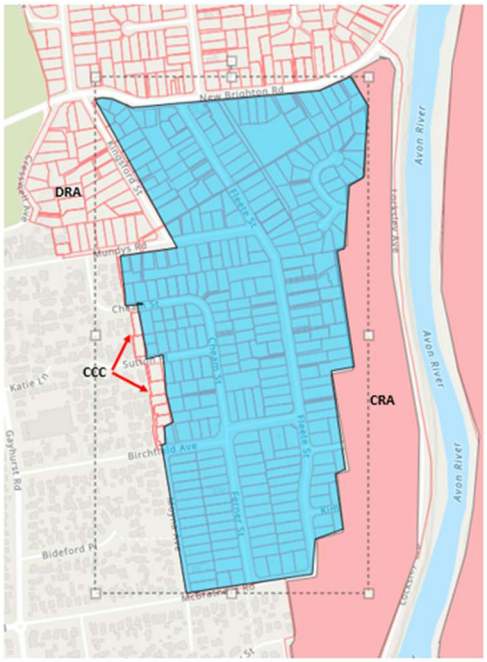
SITE TWO

McBratneys Rd/Ferner St/ Birchfield Ave/Sutton Plc/ Cheam St/ Mundys Rd

Appendix K. Map of revised Transitional Land Use area for Te Ōraka

FLEETE STREET AREA

CURRENT AND PROPOSED LEASE/LICENCES



Appendix L. Approval of Transitional Land Use License for Nōku Te Ao

On 20/05/2021, at 2:01 PM, [redacted]@linz.govt.nz> wrote:

Tēnā koe Rangimarie

Good news on a Thursday. I have the cancellation of He Waka Tapu Licence and the approval to grant a Licence to Noku Te Ao Charitable Trust on the same terms and conditions. The Licence is ready for your signature when you are available. I am available over the next few days as follows:

Friday

- 11am to 12.30pm
- 2..30pm to 4.00pm

Monday

- Available all day except for lunch break

Let me know a time that suits your busy schedule and I will book the same room to meet with you. We can go through the Licence Agreement prior to your signing.

Best regards

Appendix M. Early correspondence with Te Pā leadership

On Tue, May 19, 2020 at 3:08 PM Rangimarie Parata Takurua [redacted] > wrote:

Kia ora Bailey, yes where the marked out rectangle which is a big footprint but the idea was to design a whole village including mara kai etc across this space.

Rangimarie Parata Takurua

[redacted]

On 11/05/2020, at 12:36 PM, Rangimarie Parata-Takurua [redacted] wrote:

Kia ora Bailey it was great to finally meet with you and talk to you. Here are at the documents I mentioned that might be helpful.

<Te Pā o Rākaihautū_ EDUCATION BRIEFD4 .pdf>
<Te Pā- Preferred Site Waikākāriki RZ-1C rev.pdf>

Rangimarie Parata Takurua
Chair
Te Pā o Rākaihautū

Appendix N. SPICE composting expert technical support

> > On Wed, 2 Dec 2020, 10:13 AM Gerry Gillespie, <[redacted]> wrote:
> > Thank you Bailey.
> > You may need a little more nitrogen but don't worry at this stage.
> >
> > Yes I would try to get some structure into the pile you need air, in the mix in both the first and the second stage.
> >
> > Also remember the second stage of the process is facultative (fermentative) not anaerobic. The second stage at the lower pH uses facultative anaerobes which switch from aerobic to anaerobic and back depending on circumstance.
> >
> > This also means the outputs of one biological process become inputs to another. This also means you will have no odour and more material at the end than you would if you were using a fully aerobic, uncovered process.
> >
> > Good luck with it all. Ask if you need more assistance.
> >
> > Away from the computer at the moment - back home tomorrow.
> >
> > Gerry
> > Sent from my iPad
> >
> > > On 1 Dec 2020, at 3:54 pm, Bailey Peryman <[redacted]> wrote:
> > >
> > > Kia ora Gerry,
> > > Our next phase of community composting trials are underway using the SPICE method.
> > > See attached images of the shredded paper we have available and the c:n calculation we're using as a guide.
> > > These weights are roughly the materials we will be working with.
> > > Just wonder how this looks to you and whether you think we'll need some more bulk in there (e.g. twiggy carbon) to get good structure to start with or whether the inoculum will support anaerobic processes to complete the decomposition?
> > > Not wanting to go fast, aiming for quality and to prove the anaerobic phase is not odorous when SPICE method is followed.
> > > Bailey
> > > <Screenshot_20201201-174726_Chrome.jpg>
> > > <20201124_142416.jpg>
>

Appendix O. CCC staff correspondence

EOI feedback follow-up

[redacted]@ccc.govt.nz> Thu, Jan 26, 2023 at 3:48 PM
To: Bailey Peryman <[redacted]>
Cc: [redacted]s@ccc.govt.nz>, [redacted]>

Kia Ora Bailey,

We have reviewed your request and it has been forwarded to our Waste management, community funding and partnership team for further direction. The request you have proposed is community based model and procurement team is responsible to meet the council requirements alone.

Once I get the feedback from the relevant team, I will let you know the outcome.

Kind regards,

[redacted]
Procurement Best Practice Lead
REPC Procurement & Contracts

Appendix P. Evidence of request for engagement with Mana Whenua, Ūpoko Ngāi Tūāhuriri

On Thu, Sep 29, 2022 at 11:37 AM [redacted] > wrote:

> Kia ora Bailey
>
> I am responding to your email request for engagement with mana whenua regarding the organics processing plant.
>
> Te Maire Tau, Ūpoko Ngāi Tūāhuriri is able to meet with you to discuss but he has advised, best to wait until after the Council elections.
>
> (Te Maire is on the Papatipu Runanga Committee with CCC).
>
> I will be in touch with you to arrange a meeting after the new Mayor is elected.
>
> Also I will no longer be in this role so I will email you from [redacted]
>
> Ngā mihi,
>
> [redacted]

Appendix Q. Email correspondence with Seed the Change | He Kākano Hāpai

Hi Bailey,

This looks good to me, and happy to have STC|HKH's name on it.
Attached is our Insurance and Certificate of Incorporation.
All good to go, just send me a copy of the final application once it's submitted.

Good luck!

[redacted]

[redacted]

Seed the Change | He Kākano Hāpai
Hep C Action Aotearoa
Drinkable Rivers
LinkedIn

SEED THE CHANGE
HE KĀKANO HĀPAI

Hepatitis C
Get Tested
Get Treated
Get Cured!

On Fri, 14 Aug 2020 at 00:00, Bailey Peryman <[redacted]> wrote:

> Kia ora Claire,
> Further to this. I have prepared a full application for Transitional Land Use after a quick turnaround of the initial EOI by LINZ.
> Attached for you to review. Google Doc version linked here.
> My aim is to submit this full application tomorrow/Friday on advice from LINZ so we make into the review pipeline this time around (there may be significant delays to future application approvals due to COVID). Fortunately I had done most of this work in anticipation of there needing to be a tight turnaround and as part of my contract to the CCC for red zone activations of food resilience initiatives.
> In any case, my intention is that Seed the Change's exposure is limited to the composting activities listed as 'Stream Three' in the application, which can only commence under conditions that I state in this application. So the exposure for STCHKH is minimal and subject to CCC and ECan approvals that I expect we will need to have signed off before we beyond the pilot phase which we will conduct on the sites we've signed up already (i.e. not the red zone lands). My objective is to be ahead of ourselves with access to land should the pilot be successful, and for this growth to be integrated to a wider movement for local food security connected with the red zone opportunity in general.
> I hope this makes sense and is clearly reflected in the application.
> Look forward to your feedback.
> I have the necessary documentation from He Waka Tapu who are also drafting an MoU around their involvement with this application and project.
> If STCHKH agree to be a party to this application then we will need a copy of trust's registration certificate and PLI insurance certificate.
> Bailey