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Emerging transitions in organic waste infrastructure in Aotearoa New Zealand

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Abstract

Aotearoa New Zealand is at a critical juncture in reducing and managing organic waste. Research has highlighted the significant proportion of organic waste sent to landfills and associated adverse effects such as greenhouse gas emissions and loss of valuable organic matter. There is current debate about what practices and infrastructure to invest in to better manage and use organic waste. We highlight the diversity of existing organic waste practices and infrastructures, focusing on Auckland, Wellington and Christchurch. We show how debates about organic waste practices and infrastructure connect across three themes: waste subjectivities, collective action in place and language.

KEYWORDS

Aotearoa New Zealand, mauri, organic waste, subjectivity, transition

1 | INTRODUCTION

Aotearoa New Zealand is at a critical juncture in reducing and managing waste (Blumhardt & Prince, 2022). Organic waste[1] in particular has become a matter of increasing concern nationally. Research and public awareness campaigns have highlighted the significant proportion of organic waste that is sent to landfills and the adverse socio-environmental effects including greenhouse gas emissions, poor utilisation of finite landfill space, loss of valuable organic matter and impacts on food security (c.f. NZ Food Waste Champions 12.3, n.d). Recent government action has focused on minimising organic waste to reduce greenhouse gas emissions from landfills. To achieve this, the New Zealand Government's recent emissions reduction plan signals the possibility of banning organic waste from landfill by 2030 (Ministry for the Environment, 2022b). Such a ban would require significant changes and investment in new infrastructures: practices, networks and organic waste processing capacities. In this article, we draw on Te Ao Māori understandings of mauri and Community Economies theories of social change to consider how investment in organic waste infrastructure could support wider socio-economic transitions.

There is current debate on how to best 'manage' organic waste and decide what infrastructure to invest in, both internationally and in Aotearoa. There are a range of different infrastructural possibilities, from large biodigesters with associated collection services, to decentralised, smaller-scale organic waste management options. These options express different understandings of waste, circularity and rationalisations as to what infrastructure

should be prioritised. Here, we understand infrastructure broadly, drawing on Berlant's (2016, p. 393) definition as 'a movement or patterning of social form'. For Berlant, infrastructure is more than a single system or structure and includes a wide range of forms; 'roads, bridges, schools, food chains, finance systems, prisons, families, districts, norms [are] all ... systems that link ongoing proximity to being in a world-sustaining relation' (2016, p. 393). Similarly, Steele and Legacy (2017) understand infrastructure as a site of collective production and enactment of cultural meaning.

Debates about what organic waste infrastructure to invest in have focused on different concerns. These concerns include the merits and risks of centralised versus decentralised organic waste processing and composting (Prince, 2021), the contested role of technology such as anaerobic digestion (Walmsley, 2020), and the role and value of new materials such as 'compostable' packaging and bioplastics (Ministry for the Environment, 2022a). Much of the central and local government work in Aotearoa New Zealand has focused on technical calculations to quantify organic waste volumes and associated greenhouse gas emissions, and then identify the cheapest and most efficient methods to reduce these (cf. Ministry for the Environment, 2021).

In contrast to this quantifying work, feminist and Indigenous research on organic material has focused on care, waste subjectivities and non-Western knowledge paradigms. Examples of this research highlight the important role organic material (including organic waste) plays in the life-sustaining and relational processes of soil, growing food, human–nature and human–human connections (cf. de La Bellacasa, 2017; Hawkins, 2006; Morrow & Davies, 2021; Stronge et al., 2020; Wing & Sharp, 2023) and Māori soil sovereignty and well-being (cf. Hutchings & Smith, 2020). For Morrow and Davies (2021, p. 1) organic material and composting in particular, provide 'a unique opportunity to consider the colliding worlds of worth that operate in and around urban sustainability transitions to zero waste'. This feminist and Indigenous research shows how transitioning to more circular organic waste practices is not only about technology, but also about the socio-economic rationalities shaping wider transitions in human–nonhuman relationships.

In this article, we examine some of the socio-economic rationalities already present in waste management communities across Aotearoa. We focus on the circular and care rationalities that continue alongside more managerialist and technological rationalities. We draw on Māori understandings and community economies thinking to explore how communities are acting collectively while navigating the challenges posed by complicated, and at times hazardous organic materials. We use community economies theories of social change to show how organic waste practices are both shaping and being shaped by people's waste subjectivities, collective actions and language, that in turn reflect and influence investment in organic waste infrastructures. Our research involved working across three Aotearoa New Zealand cities (Auckland, Wellington and Christchurch) using grey literature reviews, media analysis and interviews.

2 | ORGANIC WASTE INFRASTRUCTURES IN AOTEAROA NEW ZEALAND

Historically, organic waste management in Aotearoa has involved forms of composting. Pre-colonisation, Māori had sophisticated composting and food production practices (Best, 1941; Pauling & Ataria, 2010), and throughout the 20th century, urban and rural composting of organic material was an everyday practice for many people (cf. Soil & Health Association of New Zealand, n.d.; Hutchings & Smith, 2020; Morris, 2020). Para Kore (2021) and Morris (2020) suggest that the concept of organic material as 'waste' is a relatively recent shift in the latter half of the 20th century and runs counter to Māori and many early Pākehā understandings of organic material circulating back into soils as part of wider cycles. Increasing consumption, entrenching of linear economic practices, 'abject' associations with food waste, and processes of ongoing colonisation and urbanisation have all contributed to changing organic waste practices during the 20th and 21st centuries that have embedded certain waste infrastructures that need transforming.

Recent research highlights the extent of organic material (primarily food, garden, wood and paper waste) going to landfills, and the adverse effects of this (Ministry for the Environment, 2022b). Best estimates indicate that the largest proportion of landfilled organic waste in Aotearoa is likely to come from households—primarily food waste (cf. Sharp et al., 2021; Sunshine Yates Consulting, 2018). New Zealand households throw away some 157,398 tonnes of food per year, equating to NZ$1.17 billion per year. Much of this ends up in council managed landfills (with notable exceptions like Christchurch), producing an estimated 409,234 tonnes of carbon emissions (methane) as the food decomposes in anaerobic landfills (Love Food Hate Waste NZ, n.d.).

In Aotearoa New Zealand the Waste Minimisation Act 2008[2] (WMA) is the key national legislation that seeks to 'encourage waste minimisation and a decrease in waste disposal', to protect the environment and maximise benefits. The WMA covers responsibilities for: product stewardship, waste disposal charges, local authorities

obligations to create Waste Management and Minimisation Plans,[3] enforcement, offences and reporting/auditing. To implement Waste Management and Minimisation Plans, most territorial authorities manage waste infrastructure, including; recovery and reuse facilities, landfills, cleanfills, transport and logistics and staff. Activities associated with implementing Waste Management and Minimisation Plans must also comply with the Resource Management Act 1991 (RMA), and associated District/City Plans and Regional Plans which are designed to manage the environmental effects of activities.[4]

Table 1 provides a summary of the Waste Management and Minimisation Plans of the three Councils in our study, focusing on organic material. For all three Councils, a key strategy for meeting climate change mitigation targets is to lower methane emissions by reducing organic material in landfills.

While all three Council's Waste Management and Minimisation Plans express an aspiration for transitioning to zero-waste and greater circularity, Councils (and others) are grappling with how to shift away from linear waste systems, when both existing infrastructure and often ratepayers' expectations, are embedded in mostly linear waste practices. All three Councils have recently made investment decisions about collecting and processing organic waste. Auckland Council recently opted for centralised kerbside pick-up of food waste and transportation to an anaerobic digestion processing plant south of the region[5] (Auckland Council, 2020). Wellington is trialling different approaches including kerbside collection of food waste and decentralised smaller-scale composting (Wellington City Council, n.d.). Christchurch has had suburban kerbside pick-up of food waste for many years which is processed at Living Earth compost facility,

TABLE 1 Overview of key concerns and investment priorities in case studies' Waste Management and Minimisation Plans.

	WMMP high-level objectives	Key challenges and issues	Direction of investment
Auckland	2040: Zero Waste Kaitiakitanga: waste as resource	Reuse in product design	Minimise waste generation
		Changing systems	Maximise resource recovery
		Costly to divert waste	Centralise kerbside organic waste collection
		Council does not own waste facilities	Fund education + community waste processing
Wellington	'Waste-free'—by 2026: 600 kg > 400 kg per person waste to landfill	Currently mix general waste with raw sewage sludge in landfill to meet consent conditions.	Investigate regional resource recovery network for food, biosolids, other organic waste
	Coordinate actions across Wellington region	To decrease landfill waste (inc. organics), need to change sewage sludge processing.	Process raw sewage rather than sending to landfill > reduce and divert other waste from landfill
			Trial centralised + decentralised approaches to collecting/processing organic waste
Christchurch	Collaborate with mana whenua, industry, Central Government, for zero waste + circular economy	Discrepancy between public expectations/delivery: residents expect more waste minimisation	Improve/expand existing organics collection, new collection for inner city, address organics processing capacity/odour challenges
	Maximise resource recovery, minimise adverse effects to people/the environment	Transition challenges: long-term planning for international/national level policy changes, climate change impacts (flooding, erosion, rising ground water, etc.) on landfills	Marketing, communication/education programmes. For example, "Learning Through Action" school programmes
	By 2045 reduce greenhouse gas emissions by 50% (2016 baseline)		
	Low contamination rates for recycling and organic collection	Shrinking demand for recyclables overseas	

supports decentralised smaller-scale composting at community gardens and other sites and is exploring organic waste collection options for the central city.

Reflecting concerns about organic waste generally, other initiatives and public awareness campaigns have sought to reduce unnecessary food waste, redistribute edible, surplus food and encourage backyard and place-based composting (cf. Love Food Hate Waste NZ, n.d.; NZ Food Waste Champions 12.3, n.d.; Compost Collective, n.d.). National public campaigns like 'Love Food Hate Waste' have promoted waste reduction tips for households like improved food storage, leftover recipes and shopping tips. For food rescue, the focus has been on collecting and distributing surplus food throughout the supply chain to people experiencing food insecurity (cf. Aotearoa Food Rescue Alliance, n.d.; Diprose & Lee, 2021). Education for backyard and place-based composting has promoted bokashi and worm farms and smaller-scale decentralised composting in community gardens, urban farms, marae, kura and schools (cf. Compost Collective, n.d.; Dombroski et al., 2019; Para Kore Media, 2021). These local-scale composting initiatives have emerged in all three of our case studies, filling gaps in Council's waste infrastructure. These local initiatives and practices are diverse, often context specific and underpinned by different concerns such as; climate change action, waste reduction, reframing organic waste as a resource, soil health and local food production, education for change, community well-being and creating local livelihoods.

This brief summary highlights how diverse concerns and practices are coalescing around organic waste, which is prompting investment decisions and collective actions and in the process re-framing the value of organic waste. However, as Zero Waste Network, et al. (2021) argue, the policy drivers of waste minimisation and reducing greenhouse gas emissions has led to an emphasis on getting as much organic material out of landfill as fast and as cheaply as possible. Although this rationale may have some benefits, it does not necessarily encourage re-thinking the infrastructure and relationships between people, organic material and soil, which ultimately need transforming to transition to a more circular, low-carbon economy.

3 | RESOURCES AND STRATEGIES FOR TRANSITION

The rationalities outlined above are not the only ones present in Aotearoa New Zealand. Māori scholars and activists working on organic materials and soil describe tikanga relating to waste management such as food waste being returned to the earth and unused flax being placed back at the base of flax plants (Bargh, 2014). Pauling and Ataria (2010) note that 'waste management has always been a major concern for Māori due to the cultural importance of maintaining separation between human waste streams and the food chain' (Pauling & Ataria, 2010, p. 20). Pauling and Ataria call for greater participation and acknowledgement of Māori cultural values and preferences in waste management decisions.

This participation and acknowledgment includes appreciating Māori approaches to materiality more generally. In her work with iwi and councils developing urban well-being strategies, Yates (2021) (Ngāti Rangiwewehi, Ngāti Whakaue, Te Aitanga a Māhaki, Rongowhakaata) draws on concepts of mauri, the innate life force in all things. Mauri is a 'network of interacting relationships' (Durie, 2001, p. x), and a force of life present in all things, including things that in Western ontologies are often considered inanimate. Mauri works to knit things together, things which in Western ontologies might be separated into 'spirituality' and 'materiality' (Yates, 2016). Although much of the organic waste governance of Aotearoa has been implemented under settler-colonial norms, in Yates' work, mauri-led planning is essential for human and non-human well-being (Yates et al., 2022).

Mauri also relates to whakapapa, or kinship connections—where the 'livingness' of things extends to kinship relations, where, for example, different hapū (kinship groups) might descend from diverse nonhuman ancestors that include specific rivers (e.g. Te Awa Tupua), mountains, or animals. Such whakapapa relations occur between different nonhuman entities as well—where the relationships between plants, rocks and soil types, insects and clouds have been mapped out as kinship relationships (Roberts et al., 2004). The livingness and relationality of the world are assembled into a different kind of ethics underpinning Māori ontologies. Thinking with mauri provides a way to explore how people act collectively with complex materialities to effect change in organic waste infrastructure. This lively approach to materiality offers different rationalities for thinking about organic waste that pushes beyond the focus on efficiency and cost outlined earlier, as well as wider colonial-settler norms relating to capitalism, resource extraction and use.

For community economies scholars such as Gibson-Graham (2006), changing entrenched Western systems like capitalism requires a politics of economic possibility through proliferating rationalities that are more-than-capitalist (Gibson-Graham & Dombroski, 2020). These more-than-capitalist rationalities are already present in the diverse economic practices of everyday life, which includes many non-capitalist practices of exchange and reciprocity (transactions), of gifting and volunteering (labour) and of self-provisioning and collective action (enterprise). Gibson-Graham (2006) explore a politics of

the subject, a politics of collective action and a politics of language to theorise how social change actually occurs. They suggest first understanding, and then building on those shifts in people's subjectivities, associated collective actions and language that are already underway and which you wish to proliferate. These collective actions can include what Richard Day (2004) calls *the politics of demand*, where citizens gather together to demand change from seemingly more powerful actors such as corporations and governments. But often collective action looks more like what Day (2004) calls *a politics of direct action*, where people start to collectively build different kinds of worlds through everyday practices, like composting. Such collective action can be understood as hybrid assemblages, involving humans and nonhumans (Dombroski, 2016), or the whanaunga and kin identified in a Māori ontological start point (Watene, 2022; Yates, 2021).

The human aspects of hybrid collectives are sometimes in dire need of transformation. Gibson-Graham (2006, p. xxxv) suggest that shifting people's subjectivities requires exploring 'how we might mobilize and transform desires, cultivate capacities and make new identifications with different kinds of subject positions'. Subjectivities can shift through changes in practice and language. Here, we draw on Alkemeyer and Buschmann's (2017) understanding that practices do not entirely determine what people do, but nor are people fully formed ready for action. Rather, competent participation in any practice is a process where specific knowledge, identity and social membership are formed, embedded within power relations. This suggests that performing practices can both help stabilise them through repetition, while also introducing the possibility for diversity, conflict and change.

In what follows we analyse how people's subjectivities, collective action (practices) and language are shifting in relation to organic waste. We are particularly interested in opening up possibilities for change. For example, it is common to speak about place-based collective action as 'small' and 'hopeless' in the face of wider global problems. Yet ubiquitous place-based actions have brought about wider social transformation historically: civil rights, women's and LGBTQ+ movements were not centralised top-down changes to society, but multiple and ubiquitous (see Gibson-Graham, 2006). Gibson-Graham and Dombroski (2020) suggest that a key starting point to open up possibilities for change is by inventorying the heterogeneous practices already underway. In what follows, we outline our approach to inventorying the entangled subjectivities, collective actions and languages shaping organic waste management and transition in Aotearoa New Zealand.

4 | INVENTORYING ORGANIC WASTE TRANSITIONS

This research employed a qualitative case study approach to inventory organic waste infrastructure in two urban Territorial Authorities (Wellington City Council and Christchurch City Council) and one Unitary Authority (Auckland Council). These three cases were chosen for two reasons. First, they are the three largest urban populations and generate a significant proportion of total national organic waste. Second, decision makers in all three centres have either made recent investment decisions on organic waste infrastructure, or are trialling options that may influence decisions elsewhere.

The methods included:

1. Analysis of secondary and grey literature—local and central government reports including the three Council's Waste Management and Minimisation Plans and District/Regional Plans.
2. A search of online media reporting about organic waste and composting in Aotearoa New Zealand.
3. Thirteen semi-structured interviews with key informants from each area.

The evaluation of secondary and grey literature helped us to understand the context of each Council, how organic waste has been managed, future investment priorities and the language shaping organic waste discourses. The online media search was undertaken using *Index New Zealand* and *Stuff*. Three searches were completed using the keywords 'composting', 'organic waste' and 'community composting' with a date range from 2010 to 2021. The online media search returned a total of 150 relevant media articles. These were analysed using a simple coding framework that categorised how organic waste and composting was framed ('positive', 'negative' or 'neutral'), and the kinds of language used to discuss management, collection and processing methods. Interview participants included territorial authority staff (planners and waste management officers) elected officials (councillors) and staff/volunteers from smaller-scale composting organisations (social enterprises and composting businesses). Interviews were recorded and transcribed by the authors and a professional transcription service. Research ethics approval was obtained through [removed for peer-review process].

We used an iterative thematic analysis approach (Braun & Clarke, 2006) to identify broad themes across the secondary and grey literature, media articles and interviews. Our analysis approach involved 'reading for difference' by noting the diversity of experiences and views from participants and inventorying different types

of infrastructures that drew on diverse economies methods (Gibson-Graham & Dombroski, 2020). We then iteratively organised these findings in connection with the themes of transitioning waste subjectivities, collective actions for transition and cultivating a language of transition.

5 | TRANSITIONING WASTE SUBJECTIVITIES

Here we outline how people's waste subjectivities are entangled with practices that involve organic materials. Our research participants involved in smaller-scale composting at community gardens, urban farms and social enterprises described how everyday composting practices were an important way they expressed and enacted desire for different kinds of relationships with organic material and nature. For example;

> The benefits of people knowing how to grow, kids understanding the cycle of life, that when you finish with an apple core it goes into a... composting bin and it turns back into fruit again. There's so many benefits to that, that's just understanding how the world works and reconnecting with place and the life that's in the soil. (Interview with Terry)

> [T]here's a link between composting and growing. So once you have a compost bin, then you have compost and then what do you do with it? I guess you grow veggies. And so that's what we're doing in my flat and also with the house down the road. (Interview with Mitch)

For some of these participants composting was part of their attempt to actually 'be' a different kind of subject by consuming less and contributing to local circular practices that have flow-on effects. For example;

> [K]nowing that I'm helping towards something. Making change or at least... that educational side of it ... I'm just one person but by me interacting with people, that has a cascading effect. (Interview with Mitch)

> [T]he benefits in community gardens and decentralised composting is around the sovereignty of your own waste, a sense of community working together and you are building localised soil structure for growing more food. (Interview with Kylie)

These participants also tended to emphasise the local place-based and holistic impacts of their organic waste practices. While the processing capacity of small-scale composting is lower compared to large operations, participants emphasised that processing uses existing inexpensive technology, creates enjoyable paid and volunteer work for people and helps foster more circular networks and relationships in place by using compost for local soil health and food production. There is a sense in these quotes that their subjectivities are partially co-constituted through these everyday practices of composting. While participants did note specifically reference Māori concepts like mauri or whanaunga, there is a clear sense of the importance of relationships between people–people and people–nature that resonates with a Te Ao Māori worldview.

However, participants working for territorial authorities articulated different expectations relating to subjectivities and organic waste. Some territorial authority participants noted how both support for, and uptake of kerbside organic waste collection was reduced by people having an aversion to rotting food and potential pests decomposition attracts. Some of these participants noted that while people may support home composting and/or kerbside food waste collection in principle, in practice their aversion to decomposition may mean they continue putting their food waste in the general waste collection, rather than separating organic material into a separate bin or composting at home. Territorial authority staff tried to reduce this 'yuck' factor through the design and size of bins, increasing collection frequency (especially during warmer periods), and encouraging people to regularly clean collection bins. These abject meanings associated with organic waste reflect relatively recent urban and Western subjectivities cultivated through linear waste management system that remove 'waste' from people's lives, thereby disconnecting them from natural processes and affects (like decomposition). For example, one participant described the on-going controversy around odour at the large-scale composting facility, Living Earth in Christchurch as reflecting an underlying disconnection between local residents and important natural processes:

> [T]he whole controversy with Living Earth facility and residents continually complaining about the [smell]. I've never smelt anything untoward. It smells like an earthy good compost. (Interview with Sawyer)

These examples highlight how practices involving organic waste are intimately connected to culturally situated waste subjectivities. Some of our participants are actively trying to foster new kinds of subjectivities that

connect people with organic material, soil and food production through composting in place. Although other participants (primarily territorial authorities) are trying to introduce new organic waste practices (such as kerbside organic collection) in ways that cater to existing subjectivities who either value clean and 'efficient' removal systems, or are unable to compost at home.

6 | COLLECTIVE ACTIONS FOR TRANSITION

The challenge of negotiating different and shifting subjectivities emerged across our data, particularly in relation to decision-making about what organic waste infrastructure to invest in, while still operating in a dominant linear economy. A key concern that emerged through interviews related to the complexity and potential toxicity of 'organic material' that poses challenges to processing, decision making and ultimately taking collective action to manage organic waste. All of our participants and data sources highlighted the processing, accreditation and health and safety challenges posed by contaminated or toxic organic materials. These challenges include;

- leaves covered in pesticides and herbicides (like clopyralid[6]);
- microplastics;
- broken glass and plastics;
- arsenic in ash from burning treated timber;
- PFAS[7] on roads and other materials that comes into contact with organic material;
- 'bioplastics' and 'compostable packaging'.[8]

Of most concern to our interview participants were the relatively new 'bioplastics' and 'compostable packaging'. Territorial authority and decentralised smaller-scale compost participants noted most of these materials are not currently able to be composted[9] and undermined existing collective actions to process organic material. In other words, the development of 'bioplastics' and 'compostable packaging' was done with little thought for end-of-life processing, or consideration of how the material/s would affect the value of the compost product, or the processor's accreditation. For example;

> [S]ometimes... people think that if the packaging says 'compostable' my local facility should now take [it], which isn't the case... lots of them [composters] won't take it because they have organic certification for their compost. It's not really allowed as an input. (Interview with Sawyer)

Some participants saw this lack of product stewardship as a form of greenwashing and/or negligence by packaging companies and others. In addition, some participants noted that the impacts of compostable packaging on the final compost product was often either unproven, or added nothing. Rather, these materials pose potential risks to both the compost quality, accreditation processes and receiving environments like soil. For example,

> So at [composting facility], we've had cases of packaging coming in from our customers that is essentially green-washing saying that they're compostable but... it turns out that they have plastics included in the material. And like, we're clued up on it but if you are a home composter you might not [know]. And then the other thing is that, the potential risks of even the stuff that is certified; what that means for our soils. (Interview with Mitch)

Some participants were highly critical of these new materials, arguing that they were essentially a solution that had been created to address single-use plastic packaging, replacing one single-use product with another, thereby perpetuating a linear economy.[10] For example,

> We should just be trying to reduce as much of that single use packaging as possible. I don't care if it's compostable or not... They're still single use. (Interview with Sawyer)

> It's more of just a single use material that feeds into the sell, buy, sell, buy. It's still a single use product and it's still being devalued and downgraded. Reusing a material, even recycling material, is probably better. [L]et's have tougher regulations to reduce from the start or avoid. I'd like to see us heading in that direction more than trying to deal with these products at the end of their life. (Interview with Kylie)

Participants noted how the introduction of these materials have created significant confusion as people did not know whether to recycle them with other plastics, put them in general waste, or put them in organic waste collection. This meant that while many people wanted to 'do the right thing', this was becoming increasingly difficult due to the complexity of materials people deal with. For example;

> A big problem for us as the city council is making sure we don't contaminate recycling with bioplastic and making sure we don't contaminate composting with bioplastics. So at the moment in New Zealand, bioplastics need to be landfilled because there's no actual solution for them. Even if they were genuinely made from corn-starch and fully compostable, right now, we have to reject it because it looks like plastic. (Interview with Terry)

Participants described how the materials were creating confusion for people and leading to increasing contamination rates across different waste collection services for both Councils and small-scale composters. This resulted in further flow-on effects in terms of increased labour time for waste sorters and increased waste going to landfill that could have been recycled or composted because it was contaminated.

Participants described different practices to manage these issues.[11] Some small-scale composters have developed guidance for their contributors to keep compostable packaging out of their collections. Others have developed relatively strict criteria and only take organic material from sources they can verify. For some participants, the risks posed by these problematic materials was so great that they felt Councils needed to control the majority of organic waste collections (particularly packaging and other 'dirty organics') to manage health and safety risks and coordinate public education. However, other participants suggested that there was still an important role for decentralised and home composting for food and garden waste (but not packaging) as many small-scale processors and residents were doing this safely.

Territorial authority participants described how they were grappling with a different set of expectations in relation to collective action. These participants noted that investment decisions for organic waste infrastructure by councils tended to be driven by a need to operate at scale, divert as much organic waste from landfill as efficiently and economically as possible, and comply with public health, sanitation and safety requirements. They also described needing to manage adverse effects of organic waste processing like odour and pests. Reflecting the point about waste subjectivities noted earlier, these participants suggested that many ratepayers wanted centralised and 'sanitary' waste management. In other words, kerbside collection reflecting entrenched linear economy practices towards the bottom of the waste hierarchy. These entrenched expectations reflect waste subjectivities and pose political challenges for councils (particularly councillors) who propose moving to different models such as decentralised smaller-scale composting.[12]

The debates about Auckland's investment in anaerobic digestion illustrate these different drivers and how they are shaping collective action. Some participants described how Auckland Council invested in centralised anaerobic digestion because of the scale of organic waste diversion possible, the ability to process complex compostable packaging, health and safety standardisation, compact space usage, lower labour costs and potentially useful outputs (biogas, digestate/fertiliser). However, other participants noted that metrics that prioritise efficiency and removal of waste can perpetuate the disconnection between people and nature, while locking councils into expensive infrastructure and 'sunk costs'. Some participants argued that Auckland Council's investments can create demand to 'feed the machine' and in some cases may perversely undermine attempts to reduce waste overall as councils (and others) had to meet minimum volumes of waste inputs to make the expensive infrastructure economically viable.

Despite these differences in view, all participants agreed that we need to keep possibilities open for a range of organic material collection and processing methods, and these should not be 'pitted against each other' (cf. also Prince, 2021). Most participants noted that the decision about 'what' organic waste infrastructure to invest in would depend on place, population distribution, geography, scale and the nature of organic materials being collected and processed. For example;

> So decentralised [composting] has a role, [particularly for] home composting, remote locations and institutions especially. (Interview with Terry)

> Because of geographical layout ... Maybe what it might look like for Wellington... is that you might do the [centralised] collection more around the city, rather than in the suburbs ... Then in the suburbs, you've got more [decentralised smaller-scale] composting options. (Interview with Laura)

> We are quite a spread-out country with quite low population in specific areas so decentralised composting provides a really good solution for those smaller communities ... [However] ... I still think there's a dirty—we'll call it 'dirty compost'— ... that needs to take care of the mass urban waste. I think it's a mixture of both. (Interview with Kylie)

Although these issues reflect significant systemic problems, participants did suggest collective actions that councils could take in partnership with others. These included; utilising landfill levies to invest in infrastructure at the

top of the waste hierarchy, brokering relationships between waste producers and people who utilise waste, and reclaiming ownership of waste management systems to shape them (rather than contracting these out).

7 | CULTIVATING A LANGUAGE OF TRANSITION FOR WASTE PRACTICES

In this final section, we reflect on how shifting language relating to organic waste connects across subjectivities and collective action for transition. Our start point for language was the media analysis of the 150 articles, which showed that 49% of media articles portrayed general composting in a positive way, 23% negatively, 14% neutrally (i.e. just describing practices), and the remaining 14% related to tips about home composting. The positive framings of composting tended to portray it as an important everyday practice with multiple benefits (climate, soil, human–nature connection, biodiversity and food production), and if done safely at a small scale would not adversely affect other people or the environment. Some articles highlighted how composting could be done even if urban people did not have access to land through, for example, bokashi systems and contributing to local composting sites close to their homes. The majority of the articles that framed composting as negative generally noted adverse effects of poorly managed large-scale compost facilities (such as odour and pests), rather than negative framings of composting per se.

Similar to the positive media articles, most of our participants suggested that composting—particularly smaller-scale composting helps to reconnect people with natural processes, encourages them to reflect on the amount of waste they generate, and ultimately shift the meaning of 'organic waste' to a 'resource[13] and gift' that requires better stewardship and redistribution. For example;

> [T]here's like a general distaste for the idea of food waste... [but] it is actually a golden, beautiful thing, and a resource that we should be using. (Interview with Mitch)

> At the moment often composting facilities are seen as a way to get rid of waste. When it should be seen as a valuable product ... which can enhance soil. (Interview with Sawyer)

> [M]ake it [compost] available back to the people who have gifted us the waste in the first place. (Interview with Mason)

For many of our participants, framing organic waste as a resource and gift was linked to cultivating healthy soils, food production, and fostering greater place-based circularity. For example;

> There's a strong connection between composting and food growing. So typically, people who actively compost want the compost, they want to use that. It's not a disposal option, it's a resource utilisation ... So that's very much where we're wanting to go with our thinking around waste, it's treating waste as a resource. (Interview with Terry)

These shifts from 'waste' to 'resource' were also apparent in councils' waste minimisation and management plans and other policy documents. Some participants suggested that leading the public shift in meaning from 'organic waste' to 'organic resources and gifts' opens space for different values and waste infrastructure decisions beyond just waste minimisation and/or profit in a linear economy. These different values are part of a politics of language that could effect change through shifting subjectivities and associated practices like reducing consumption, introducing product stewardship to account for true production and end of life costs, and fostering wider infrastructural conditions that enable moving up the waste hierarchy towards refuse and re-use more politically acceptable. However, this is challenging and runs counter to colonial capitalist rationalities. As one participant noted 'the government will never say to people to stop buying things' (interview with Morris). As other participants noted though, Māori understandings and approaches to waste management (and concepts like mauri more broadly) provide helpful foundations upon which to start fostering these shifts in people's subjectivities and associated practices based on tangata whenua and tangata tiriti commitments to change.

8 | CONCLUSION

In this article, we have shown how people, communities and territorial authorities are intervening to reshape waste subjectivities, make decisions about collective action and infrastructure, and in the process re-frame 'organic waste' as a 'resource' that needs better stewardship. We can see long-held waste rationalities from both tangata whenua and tangata tiriti re-emerging, rationalities that shift waste subjectivities away from individual high consumption towards valuing organic material circulating in place for socio-ecological well-being that prioritises human nature reconnection. We have highlighted how investment in

new single-use materials (bioplastics and compostable packaging) at the bottom of the waste hierarchy without end-of-life analysis has created unhelpful disruption and confusion. This illustrates the complexity of processing organic materials and highlights the extent of coordination needed for collective actions moving forward.

We have also highlighted some of the rationalities shaping investment decisions on organic waste infrastructure, including greenhouse gas emissions reduction. We agree that it is vital to reduce greenhouse gas emissions quickly and substantially. But we also agree with our participants who argue that Aotearoa New Zealand needs to shift focus from waste minimisation in a linear economy, to transforming waste subjectivities that create the possibility for investments in socio-economic infrastructure that value place-based circularity and care. The existing diversity of place-based organic material practices across our case studies provide a vital staring point in fostering local circularity and connection by transforming subjectivities through everyday collective action. These transitions are already underway and could play a larger part in infrastructural planning and decision-making, while contributing to the wider socio-economic transition that is necessary for truly sustainable futures.

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ENDNOTES

[1] We use 'organic waste' to refer to household and business food and green (garden) material that is generally framed as 'waste'. We acknowledge that 'organic waste' is only one way of framing this material and throughout the article shift to use the terms 'organic material' and 'organic resource/s'.

[2] At the time of writing, the Ministry for the Environment was updating New Zealand's Waste Strategy, revising the Waste Minimisation Act, standardising recycling and introducing product stewardship schemes for priority materials (cf. Blumhardt & Prince, 2022; Ministry for the Environment, 2022c).

[3] WMMPs are adopted under the Local Government Act 2002 and cover collection, recovery, recycling, treatment, disposal services, waste management and minimisation facilities and activities and funding. WMMPs must also have regard to the New Zealand Waste Strategy and include a waste assessment to forecast future demands for services.

[4] District/City and Regional Plans outline what activities (like a landfill, compost facility, recycling centre or second-hand shop) are permitted and what kinds of environmental effects these activities need to manage.

[5] Auckland Council hope to divert 50,000 tonnes of organic waste per year to anaerobic digestion. The output (liquid biodigestate) may be used as a fertiliser for farms and the methane created will be captured and used to warm local green houses, reducing their reliance on natural gas. However, at the time of writing it is unclear whether the digestate can be applied to land or whether it will require further treatment.

[6] Clopyralid is used to control broadleaf weeds in lawns and gardens and when composted can increase in concentration and adversely impact some plants like tomatoes (cf. https://www.wasteminz.org.nz/about/sector-groups/compost-nz/clopyralid/)

[7] PFAS (per- and poly-fluoroalkyl substances) is an acronym for a group of manufactured chemicals used in products that pose potential health risks to people. In terms of roads, PFAS can be used as a fire retardant which rubs off on organic material like leaves that may then be collected for composting.

[8] Bioplastics and compostable packaging refers to a wide range of material types that may be recyclable, or compostable (depending on the process and infrastructure), or neither of these. We do not have space to do justice to the complexities of these materials here.

[9] The one notable exclusion is anaerobic biodigestion, which Auckland Council have invested in and will be able to process some compostable packaging.

[10] These arguments reflect work by McDonough and Braungart describing the creation of 'monstrous hybrids' whereby 'organic' and 'technical' materials are brought together with little thought for end-of-life processing (2002). Some argue that continued malinvestment in proliferating single-use materials at the bottom of the waste hierarchy then prompts the need for investment in expensive waste infrastructure like anaerobic digestors to process them.

[11] At the time of writing the Packaging Forum was exploring co-designing a voluntary product stewardship scheme for compostable packaging to address some of these issues.

[12] Further challenges included regulatory and procurement structures within councils that do not envisage a distributed, networked infrastructure with multiple smaller waste contractors; managing one large waste contractor is a lot easier than multiple smaller contractors.

[13] The waste as resource discourse can promote profit from the enclosure of waste without considering environmental justice or whether the waste should have been created at all. Our research participants were not advocating this, but rather suggesting that shifts in meaning open space for other waste subjectivities, practices and infrastructure that are not yet determined in Aotearoa New Zealand.

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