But these processes are not homogeneous, and not all types of food loss and waste are equally well suited to all these processes. Whether we're talking about creating feed for animals or feedstock for compost, the specific composition of the food waste matters. This means that to fully understand the scope to use these processes in dealing with our food loss and waste, we would need to understand the composition of our food waste, as well as how much of each specific type of waste is available. This is a real constraint in evaluating the potential of different processes to address our food loss and waste problem. What is clear is that the problem is big enough for multiple solutions situated across the food recovery hierarchy, with local context playing an important role in determining their makeup.

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2.2 But there are examples of good practice and change is afoot

Fortunately, we do not need to reinvent the wheel in building systems to improve our food waste situation. There are examples from around the world and here at home of systems – at all levels, from national to local to single enterprises – which facilitate some of the techniques available to capture value from food waste. Figure X highlights some of these examples.

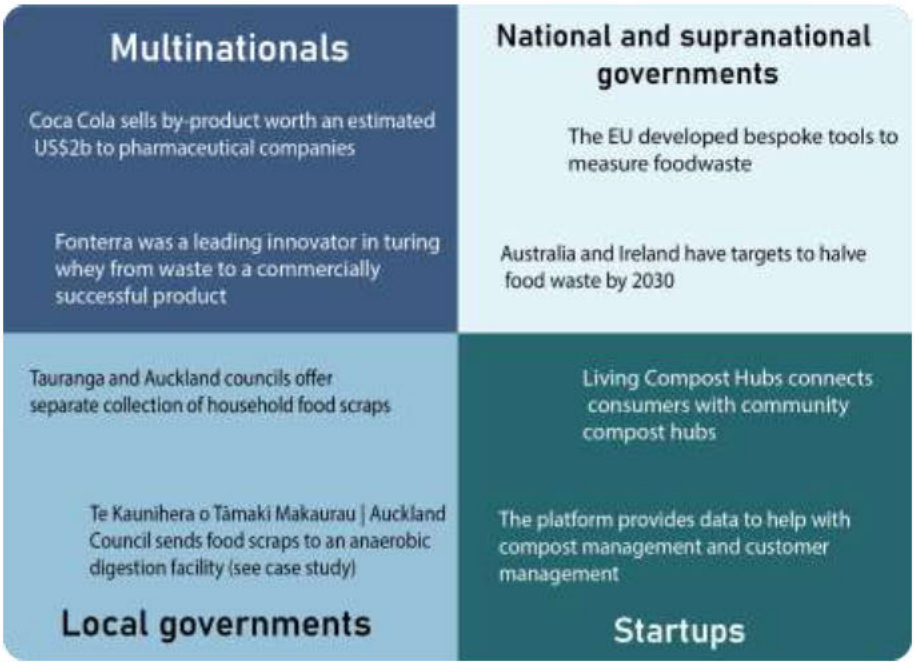

Figure 6: Examples of good practice from multinational corporations, national and supranational governments, local governments, and a Te Whanaganui-a-Tara | Wellington startup. Upper left panel: Coca Cola's processing of coca leaves to make its eponymous soft drink results in about two tonnes of cocaine as by-product;[1] one estimate puts its value at

US$2b.[1] Fonterra innovated in the use of their by-products from cheese production.[1] Lower left panel: see case study X on Ecogas. Lower right panel: one community hub using Living Compost Hubs is Kai Cycle; see case study X.

Fig X shows examples of good practice in capturing value at scales ranging from global to local, and including both the public and private sector. In the case of the private sector, capturing value is driven by economics – turning by-products into revenue streams has obvious benefits for the bottom line. While it's true that in the current era some consumers include a company's environmental practices in their purchasing decisions and thereby provide a Classific incentive for companies to behave in environmentally responsible ways, it is unlikely most producers will pursue innovation in this space if they do not anticipate it being profitable. Governments could consider exploring what is necessary to incentivise the necessary innovation.

Coca Cola and Fonterra are very large organisations, with resources to devote to innovation in the case of Fonterra and an established brand with which to contract for the supply of raw ingredients in the case of Coca Cola. Small and Medium Enterprises (SMEs) may need support to pursue similar paths. But, SMEs may have an advantage at the hyper local scale: scalability. Initially built with seed funding, the Living Compost Hubs platform does not need economies of scale to be effective. Growth in the number of consumers and hubs can happen flexibly without jeopardising the effectiveness of the model.

Local scale actions offer unique benefits. Compost production facilitated by the Living Compost Hubs platform happens in the communities in which the inputs are derived. These communities benefit directly from the resulting compost being donated to local food-growing projects, and from jobs created to ensure a high-quality composting process.

Sometimes though, operating at scale is necessary. Te Kaunihera o Tāmaki Makaurau | Auckland Council's involvement provides some certainty for Ecogas who benefit from a long-term contract,[62] and allows all stakeholders to benefit from economies of scale. ~~Absent~~ Without the Council's involvement, options for individual households to minimise their food waste would have been ~~higher friction~~less available. The appropriate bins are provided by the Council and are collected at the same time as other household refuse. Although the food scraps need to be separated from other household waste, there is no need for further separation, for example, of meat and plant products.

At national scale, there are a variety of approaches possible (see case study for one example, Austria). In the EU, specific targets for food waste reduction are expected to be set by legislation. In contrast, in Ireland the statutory element applies to a wider roadmap to reducing food waste, while in Australia, a new governance body was created to lead in this area. Despite considerable variation in approach, the national/supra national examples have some commonalities: a strategy to reduce food waste; measurable and timebound targets for reducing food waste; and collecting/maintaining high quality data on food waste

Finally, the examples highlighted demonstrate that good practice can come from outside the obvious stakeholders in the food and governance sectors. Living Compost Hubs acts as an exchange or connection service. A group or community organisation seeking to get started in composting will have support in both the composting process and in connecting with input sources, lowering barriers to entry. As we discuss in Section 3 with regard to upcycling and animal feed, a mechanism for connecting producers of food waste with potential users of that waste is crucial. Actors outside the sectors could potentially be part of providing this enabling technology, as Living Compost Hubs has for compost.

MfE's updated waste strategy (see Box 2~~Box 2~~) is an encouraging signal about the direction of travel. Also encouraging is that among the examples of good practice we have highlighted, there are New Zealand models happening at multiple scales, from multinational corporations to small local start-ups. The multinationals have already transitioned to view their waste as a resource rather than a problem, and there is scope to encourage smaller players to similarly capture value from waste using seed funding and other mechanisms of support.

Case study 1: Austria's decentralised approach to household food waste

Separate household food waste collection in Austria began in 1986 in Vienna and subsequently spread throughout the country.[41] The Biowaste Ordinance was enacted in 1992, making separate biowaste collection mandatory at all stages of the food supply chain, including at the household level, unless biowaste is recovered by the household (e.g. by home composting) or generator.[63]

Source-separated household food waste are predominantly processed by a decentralised network of at least 400 composters (roughly one per 20,000 people), with an average processing capacity of 3,000 tonnes per composter per year.[64] Austria's composters are mostly farmers, who process food waste on-farm and use much of the compost to improve soil fertility. Decentralised processing may be coupled with centralised collection in larger cities such as Graz, where collection and pre-processing is centralised before organic waste is distributed to 18 local farms for composting.[41]

Austria has composting manager training schemes, strict rules, and guidelines for making and managing compost, and a compost testing regime to ensure quality. Food waste is collected separately from green waste, which may be collected in separate bins or at drop-off points.[41] Contamination levels are very low, facilitated by education for households[41] and likely further supported by the visible connection households can make between their utilisation of food waste bins and the compost that results,[65] given composting occurs predominantly on local farms.

Box 2: The government's updated waste strategy

In March 2023, the Ministry for Environment (MfE) announced a new waste strategy[26] to change how the country makes, uses, recycles, and disposes of waste, including household food waste. As of 2030, the strategy plans to have food scraps collections available to urban households nationwide, with the aim of diverting some 80,000 tonnes of food waste from landfill annually by 2035.[66] Specifically, this strategy indicates:

1. Household food scraps will be collected the kerbside in all urban areas (towns with >1,000 residents).
2. Territorial authorities (TAs) will collect food scraps at a minimum, with collection of green waste left to the TAs discretion. MfE has previously noted that the joint collection of food and garden waste (also called FOGO) limits downstream processing options and reduces food waste diversion rates.[67]
3. For TAs within 150km of an existing commercial facility for food waste process with sufficient capacity (see Figure 5~~Figure 6~~), kerbside collections can be rolled out 2027.[66]
4. For TAs which require new infrastructure (see Figure 5~~Figure 6~~), kerbside collections can be rolled out by 2030.[66]
5. TAs will have discretion over the organics processing technology they adopt.[68]

The rollout of kerbside waste collection faces several challenges but also provides opportunities. For starters, MfE lists just six organics processing facilities which currently have sufficient capacity to handle food waste from surrounding urban centres (see Figure 5~~Figure 6~~). However, financial support is available ~~from~~ through the Waste Minimisation Fund ~~the Ministry~~ to upgrade existing transfer stations,[66] with several additional facilities listed as potential candidates to support the rollout.[16,67] WMF funding has also been specifically made available for organic (incl. food) waste processing and recovery and includes packages to support councils to rollout food waste collections

Related to this limited infrastructure, just twelve TAs in New Zealand actively collected food waste prior to the release of the new waste strategy,[16,26] meaning a further 55 may~~will~~ need support in the coming years. MfE is also making available research and resources to support councils to introduce new services. There are also implementation hurdles to overcome. For example, multi-unit dwellings will require unique solutions to avoid a pile-up of bins and unwanted smells in settings where space is at a premium.[69,70] Additionally, TAs will have to give consideration to existing collection systems, such as those organised by communities or social enterprises (see section **Error! Reference source not found.**~~4.3~~, Providing social benefits for communities), and their role in a wider rollout of food scraps collections. This presents an opportunity to engage with community expertise, understand context-specific needs, and build up or scale out infrastructure close by to keep resource and waste flows to smaller, more localised scales.[71–74] The collection of food scraps also requires consideration of end-products and their applications, including opportunities in to replenish soils with products like compost and vermicast (section **Error! Reference source not found.**~~4.3~~) and recover energy with biogas production (section **Error! Reference source not found.**~~4.4~~).

~~Additional work on business food scraps collections is ongoing, with the aim of diverting a further 50,000 tonnes of food waste annually by 2035.~~

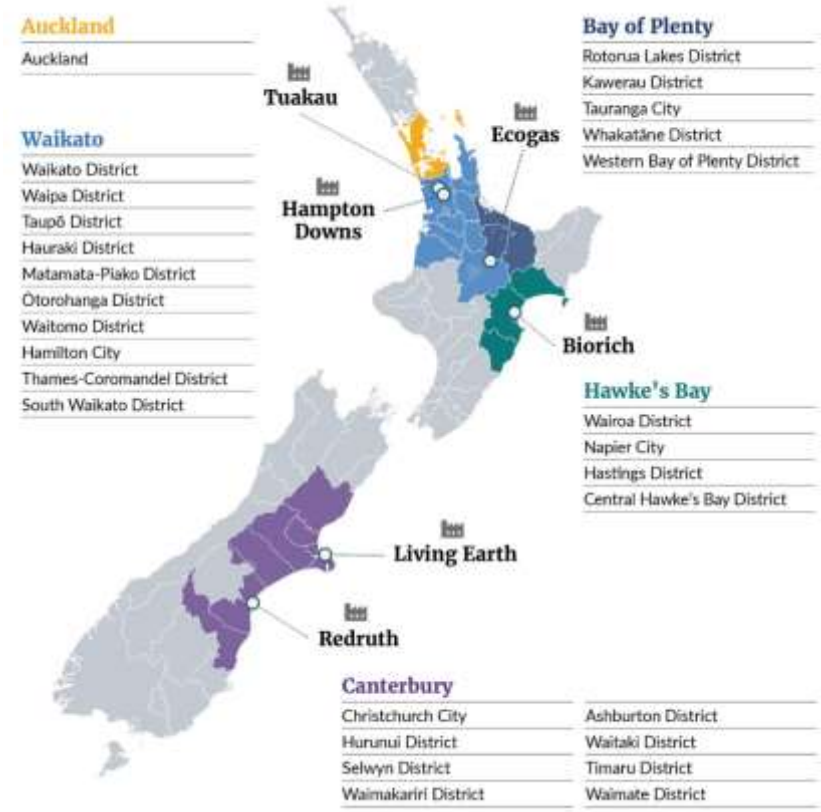

Figure 56: Map of territorial authorities with main centres within 150 kilometres of an organics processing facility with sufficient capacity (grey factory symbols), as determined by the Ministry of Environment in March 2023. [66]

2.3 The levers for change are spread across different parts of government, and all need to be ~~pulled at the same time~~considered together

A key challenge facing New Zealand's efforts to reduce food loss and waste is that the levers for change – policies, regulations, funds, standards, investment, and the like (see Table 1) – sit across different parts of government. The presents a co-ordination challenge, not only because of there are so many pieces to the food waste puzzle, but also because the pieces are tied to different agencies.

For example, the Ministry for the Environment holds pieces relevant to waste, the Ministry ~~of~~ for Primary Industries oversees food production and food safety, the Ministry of Business, Innovation and Employment leads work on the circular economy, and territorial authorities engage with the day-to-day operations of managing food waste within their individual districts. Clearly, all these perspectives are needed to tackle food loss and waste comprehensively, including efforts to capture value from food waste streams. While there is a Cross Agency Food Systems Group (see Table 1) to facilitate a coordinated approach within central government, a stronger authorising environment is likely needed to enact change. Similarly, the TAO Forum provides an opportunity for territorial authorities to collaborate and coordinate their FLW responses but needs a closer connection with central government efforts. The emissions reduction plan,[13] and its circular bio-economy chapter in particular, shows promise as a unifying tool in addressing this multifaceted challenge, but requires a clear delineation of ministerial roles to enable action.

There is a Cross Agency Food Systems Group ... to facilitate a coordinated approach within central government, [but] a stronger authorising environment is likely needed to enact change

Table 1 summarises some of the policy levers across government.