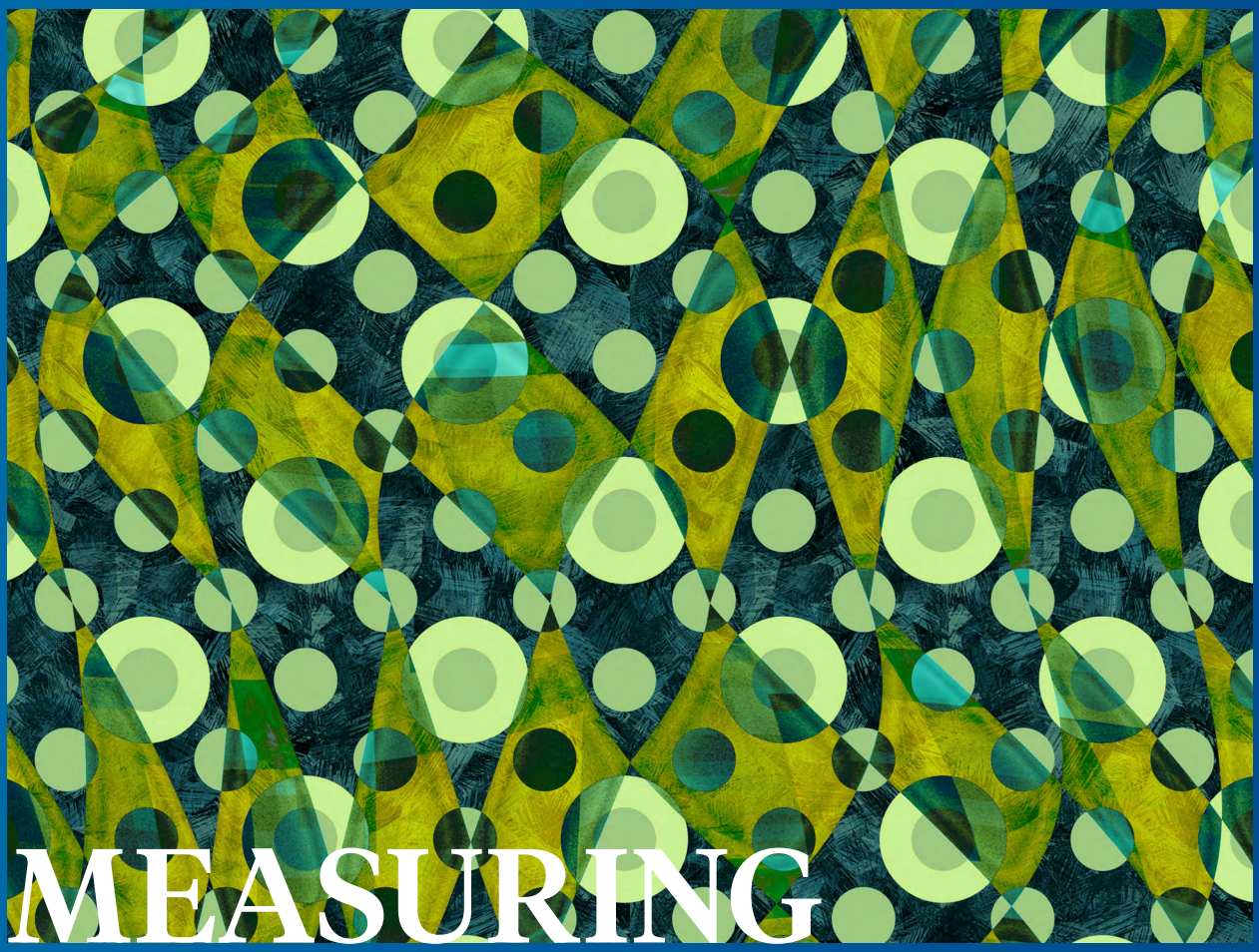
TE KUNENGA KI PŪREHUROA | MASSEY UNIVERSITY
UNIVERSITY OF NEW ZEALAND



MEASURING CIRCULAR ECONOMIES

INDUSTRY INSIGHTS REPORT



Lead authors: Professor Kelly Dombroski (Massey University), Dr Georgia McLellan (AUT) and Professor Nitha Palakshappa (Massey University)

Contributors: Craig Anderson, Hannah Blumhardt, Gradon Diprose, Derrylea Hardy, Stephen Healy, Emily Levensen, Lila Laird, Abby Mellick Lopes, Sita Venkateswar, Jay Whitehead

The logo pattern on the front cover is an adaption of that sourced here: https://pixabay.com/illustrations/shapes-abstract-pattern-decorative-8232905/

AI Statement

AI assistance (Microsoft co-pilot and Claude) was used in creating first drafts of texts based on the audio recordings of our speakers at the *Measuring Circular Economies Symposium*. All text has been edited and checked by the authors (all sections) and the contributors (sections pertaining to their work).

Copyright

CC by: This license enables reusers to distribute, remix, adapt, and build upon the material in any medium or format, so long as attribution is given to the creator. The license allows for commercial use.

Suggested Citation: Dombroski, K., McLellan, G., & Palakshappa, N. (2026) *Measuring Circular Economies: Industry Insights Report.* Massey University, Palmerston North.

Table of Contents

Acknowledgements iii
Executive Summary iv
From linear to living systems: why 'measuring what matters' is the next step for circular economies in Aotearoa New Zealand iv
Why the focus on measurement now? v
How can this report be used? vi
What follows vi

Section I: Introduction to Circularity 1
What is circular economy? 3
Circular economy in Aotearoa New Zealand 4
Māori circular economies perspectives 5
Challenges to achieving greater circularity in Aotearoa New Zealand 6
Challenge One: Energy 6
Challenge Two: Single-use packaging 7
Challenge Three: Conceptual and measurement challenges 8

Section II: Measuring difficult things 9

Section III: Industry Insights 13
Food 15
Case Study 1 – Walking the talk: the importance of measuring fresh produce circularity 15
Case Study 2 – The one thing keeping vegetable growers out of the circular economy 17
Fibre 19
Case Study 3 – Kowtow: Clothing with a positive impact 19
Case Study 4 – UsedFULLY: Spiral economy products from textile waste 21
Case Study 5 - Kākahu Toitū - Whatungarongaro te tangata, toitū te whenua (As people disappear from sight, the land remains) 22
Industry Insights: Concluding thoughts 24

Section IV: Where to next for measuring circular economies? 25

References 28



Acknowledgements

This work was resourced by Massey University Strategic Research Excellence Funds received in 2025 to explore opportunities for the development of a Circular Economy Return on Investment tool. The funds enabled us to host the Measuring Circular Economies Symposium, held at Te Rau Karamu Marae, Massey University Wellington, on 16 October 2025 and organised by a team including the authors of this report. Grateful acknowledgement goes to Daena Moller, our very capable intern, who was instrumental in administration and logistics associated with the October event. We also thank Lila Laird, postdoctoral scholar on the Marsden Fund Reduce, Reuse, Repair project for drafting a piece of text reporting on the symposium, some of which was used in this report.

A special thanks to our Keynote Speaker, Dr Jay Whitehead who talked about 'measuring hard things', and strengthened our resolve that measurement must be relational, not extractive. We would also like to thank Associate Professor Stephen Healy and Professor Abby Mellick Lopes, who travelled from Australia to participate in the mahi, as part of our ongoing collaborations with them. The work explored throughout this report has also been shaped by practitioners who are already 'doing circular' in less than perfect conditions, as outlined in Section III. We thank Jacob Lawes and colleagues advancing measurement in fresh produce; Emily Levenson for clarifying the economics growers face; Tessa Bradley for proving that design for longevity is possible; Bernadette Casey for widening the horizon of what counts as circular value; and Adrienne Whitewood for demonstrating what Indigenous design can unlock. We are grateful for the candid insights shared by these practitioners. Finally, we acknowledge the support of colleagues from Massey University's College of Creative Arts, Professor Faith Kane and Dr Angela Kilford, who are also working towards circularity in the fibre space.

Photos throughout the report were taken by Sy Taffel, Jason Eric Bunderon, and members of the project team during the Symposium on 16 October 2026.



Executive Summary

From linear to living systems: why ‘measuring what matters’ is the next step for circular economies in Aotearoa New Zealand.

Waste is a visible symptom of deeper systemic issues. Across Aotearoa New Zealand, organisations, councils, iwi and communities are striving to move beyond the linear logic of *take–make–dispose* toward circular ways of organising production and consumption, mindful of care for both land and people. However, intentionality alone provides no guarantee of systems transformation. In reality, decision makers still face a host of practical barriers – e.g., energy limitations, infrastructure gaps, supermarket led packaging systems, and policy settings attuned to linearity – as well as conceptual roadblocks that favour status quo over the often complex, relational work required to make circularity real. Our report is an attempt to shift that reality. We explore where and why circularity is hindered, what types of social and technical innovation are currently emerging, and how ‘better’ measurement can help us identify ‘better’ investments. We begin by situating circular economy as more than just a design toolkit or a new label for recycling. At its strongest, circularity calls for integrated, place-based systems in which resources are reduced, repaired, reused, and only then remanufactured or safely returned to nature. In Aotearoa, such aspirations intersect with Māori economic thinking that is regenerative, relational and inherently circular – spirality: cycles that return and evolve rather than simply close. Recognising this heritage matters. It challenges narrow interpretations of circular economy and highlights reciprocity, kaitiakitanga and rangatiratanga as foundational for transition.

This report addresses three structural challenges that consistently undermine circular progress. First, energy. Circular systems run on energy. The energy returned on energy invested (EROEI) is declining globally, while much of our economy – from food production to freight – still relies on diesel. The logistics of recovery, sorting and reprocessing are energy intensive and sensitive to price volatility. Ignoring this leads to circular strategies that look feasible on paper but are likely to fail in practice. Second, packaging. Reuse and refill systems remain niche in a system dominated by single use packaging and a supermarket regime that externalises waste costs and rewards volume. Without regulatory settings and infrastructure that normalise reuse at scale, households are merely requested to ‘choose circular’ within systems designed for easy disposal. Third, concepts and measurement. Idealised ‘closed loop’ graphics can obfuscate leakage, loss and the social labour that keeps materials moving. When coordination, trust, repair skills, labour and learning are invisible, they remain unmeasured – and what we do not measure, we rarely invest in. We ground our industry insights within this scenario.

In food and fibre, we see both ingenuity and constraint. Horticulture leaders are strengthening data quality and aligning with Sustainable Development Goals (SDG)-based indicators yet signal the persistent gap between sustainability rhetoric and verified action. Vegetable growers demonstrate the practical politics of low margins: being green is aspirational if you are in the red. In fibre and fashion, pioneers like Kowtow are designing for longevity and recovery, while innovators such as UsedFully are advancing high value, open loop pathways that reimagine what ‘circular’ can mean at scale in a New Zealand context. Designers like Adrienne Whitewood are extending the frontier by infusing fibres with rongoa-aligned properties, pointing to Indigenous-led innovation that is both culturally grounded and commercially promising if capital, capability and manufacturing partners can be mobilised. Across these cases, the constant is relationship and collaboration: between growers and processors, designers and repairers, iwi and industry, councils and communities. Circularity advances with speed when relationships are strong and trust is present.

If the work of circular transition is relational, then our measurement must be too. Standardised tools that measure recycling rates, diversion tonnes, or end-of-life recovery ratios remain necessary but insufficient. Where is the organising, convening and capability-building that allows materials to circulate? How are the energy dependencies and the friction of reverse logistics accounted for? Ultimately there is tension, a struggle with benefits that are slow, emerging, qualitative, or distributed across multiple actors. In response, this report argues for measurement that aligns three things:

- **Admits the 'leakiness' of the real world.** Indicators must cope with contamination, variability and partial circularity without dismissing progress that is iterative and local.
- **Measures the 'enablers'.** Coordination, cultural readiness, governance, repair capacity, and trusted partnerships are not 'soft extras' – they are the infrastructure of circularity.
- **Integrates multiple lenses.** Material flow metrics should sit alongside energy and emissions profiles, sector specific indicators, and qualitative evidence –especially narratives and wānanga-based methods that surface community defined value.

We see particular promise in approaches that align with Māori concepts such as *spirality* and *tauutuutu* (reciprocity), expanding circular economy beyond closed loop rigidity toward context-appropriate pathways. We argue for the right kind of rigour – fit for our country's scale, geography, and diverse economies.

Why the focus on measurement now?

Policy and market signals are shifting, waste and resource strategies are changing. Businesses are increasingly asked to substantiate claims and prioritise investments in a tougher economic climate. At the same time, communities and iwi are calling for transitions that are just, locally grounded and intergenerationally responsible. Measurement sits at the intersection of these demands – integrating value to create pathways that enable transformative change towards the system that we hope to build. But only if it reflects the system we actually have – and the system we intend to build.

This report therefore serves two purposes. First, it provides a realistic account of barriers and opportunities for circularity across selected food and fibre contexts in Aotearoa New Zealand, drawing on literature, case studies, interviews and sector dialogues. Second, it prepares the ground for a companion CROI—Circular Economy Return on Investment approach. By CROI we indicate a decision support lens that brings material, energy and financial metrics into conversation with relational, cultural and governance enablers – so that investors, organisations, iwi authorities, councils and community enterprises can compare options on what they really return over time. CROI offers a way to view the full spectrum of value created from reduced inputs and avoided waste to strengthened capability, collaboration, local employment, cultural integrity, resilience and learning.

How can this report be used?

- **For businesses and industry bodies:**
  use the sector insights to 'stress test' your strategies, identify the enablers you are not yet resourcing, and specify the Aotearoa appropriate indicators you will report against (material and relational).
- **For policymakers and funders:**
  look for the 'missing links'– the facilitating roles, shared infrastructure and standards that no single actor can offer alone but that unlock circular flow.
- **For iwi, hapū and community organisations:**
  consider where spirality and tauutuutu can reframe the highest value pathways for local materials, and how story-based evidence can sit alongside metrics in governance and investment decisions.
- **For researchers:**
  the questions surfaced in each case study point to a substantive research agenda on measurement, logistics design, collaborative relationships, consumer behaviour, and Indigenous-led innovation – essentially production to consumption.

What follows

Section I revisits circular economy concepts and the kinds of social innovation and investment needed for transition, including Māori perspectives. Section II builds the case for measuring circular economies, distilling lessons from Aotearoa and Australia. Section III offers New Zealand based case studies in food and fibre, highlighting innovations, barriers and research needs. The final section signals a measurement pathway – principles, indicators and capabilities – that sets up the development of a CROI framework in subsequent work.

Circular transition is not a single leap but a series of steps that creates momentum for real transformation. We aim to help those who want to take the next step, confident that what they invest in today will return value to people, place and planet tomorrow.



Section I: Introduction to Circularity

Waste is increasingly recognised as a major global challenge, with prevention and diversion emerging as key strategic goals for regions seeking to reduce carbon emissions and pollution. Many businesses, industries, governments, and community organisations are working to adopt these approaches, frequently using circular economy frameworks. However, they often find it challenging to make well-informed choices when investing in initiatives designed to reduce or redirect waste.

Such challenges stem from long established linear systems of production and consumption, where producers have little responsibility for the end-of-life impacts of their products, and where the knowledge and relationships that support reuse and repair have been devalued or lost. As a result, both industry and society often find it difficult to determine how best to act.

This report addresses these issues by developing insights into the barriers industries face when transitioning toward more circular economies, and by advancing thinking about how measuring aspects of circularity might help businesses and other decision-makers assess opportunities to increase circularity. We begin by introducing the concept of the circular economy in more detail and discussing the forms of social innovation and investment needed to support such a transition. Section Two examines the case for measuring circularity, drawing on research and case studies from Australia and New Zealand. Section Three presents a series of New Zealand-based case studies that illustrate current innovations and the barriers faced by different industries, businesses and social organisations. The final section explores what the future of the circular economy in Aotearoa New Zealand might look like, making the case for further research into measuring and assessing circular initiatives.



What is circular economy?

Circular economy refers to a way of organising society that breaks with the current linear economic model of 'take, make, dispose'. Instead, it promotes circular material flows – reduce, repair, reuse and return (see Blumhardt & Prince, 2022; Corvellec et al., 2022).

For generations, social scientists have argued that the economy is embedded within society, rather than society serving the economy (Polanyi, 2001; Tronto, 2017). The concept of the circular economy builds on this view and draws from earlier ideas about the metabolic cycle, and the 'metabolic rift' created by industrialisation, urbanisation and globalisation (Bahers & Giacchè, 2019; Foster, 1999). Historically, food was often consumed, digested and returned to the soil close to where it was grown, maintaining nutrient flows through the metabolic cycle (Goburdhone & Dombroski, 2023).

In contemporary Aotearoa New Zealand, however, food for up to **forty million people** is produced using local soil, water and labour, then exported – ultimately contributing nutrients to distant soils and wastewater systems rather than back to our own. This disruption of the nutrient loop is what is meant by the metabolic rift: the circle has been broken.

Circular economy thinking aims to restore more circular forms of cycling. For non biodegradable items, circularity involves using materials multiple times across generations, remaking and repurposing them before eventual re manufacture or disposal. For many businesses, councils and changemakers, circular economy remains more of an aspiration than a lived reality, and the term can be used as vaguely as 'sustainability'. Much of what is currently labelled circular economy focuses on designing new products that can break down more easily (metabolise) than existing versions. Yet at its best, circular economy

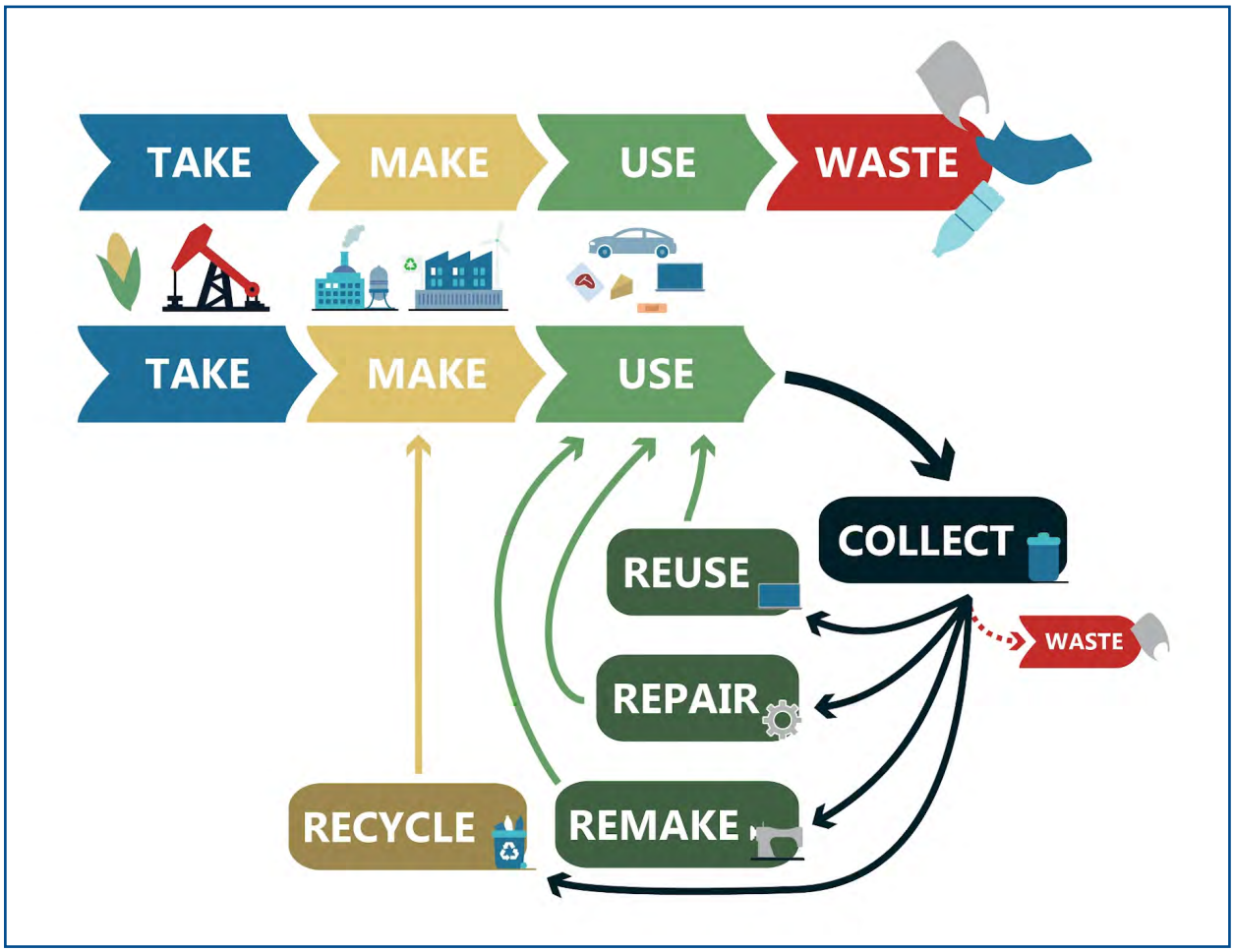


Figure 1: Visualising Circularity (source: https://www.sciencelearn.org.nz/images/4687-circular-economy)

represents full social and economic systems integration – where resources are reused and repaired many times before recycling or disposal becomes necessary (Purvis et al., 2025, see Figure 1).

Given the wide range of meanings attached to the term, it is important to develop ways to assess or measure how circular a product, business or waste system truly is. If something is marketed as 'circular', what does this actually entail? Our research does not seek to define circularity in a fixed or exclusive way, but rather to develop practical approaches to assessing and measuring circularity – and the barriers to achieving it – that can support better conversations, policy-making and transitions toward more circular practices. This work is particularly timely in Aotearoa New Zealand, where waste minimisation and waste management policies are evolving, and the broader resource management system is undergoing significant reform.

Circular economy in Aotearoa New Zealand

The concept of the circular economy in Aotearoa gained momentum as a framework for addressing the country's pressing environmental challenges from around 2017 (Hodge et al., 2025). High per capita waste generation and biodiversity loss were priority concerns for the Ministry for the Environment (MfE). Both the Ministry of Business, Innovation and Employment (MBIE) and MfE began using the circular economy to communicate the necessary shift away from a linear "take-make-dispose" model toward a more sustainable and regenerative system.

Between 2017 and 2023, policy documents increasingly referenced circularity in relation to waste minimisation, resource efficiency and economic innovation. This culminated in initiatives such as the Waste Strategy and the Circular Economy and Bioeconomy Strategy (Hodge et al., 2025). However, circularity has largely been operationalised through a 'weak' model – one that emphasises end-of-life waste management and consumer behaviour rather than systemic supply chain transformation and innovation (Diprose et al., 2025). Although circular economy has been positioned as a tool for sustainable development, its future has become uncertain under the National-led government, which as of 2025 has deprioritised environmental regulation in favour of economic growth (including scrapping the Ministry for the Environment).

Internationally, however, circular economy remains central to efforts to imagine and plan regenerative, low waste futures, and both research and business practice in Aotearoa New Zealand continue to reference the concept. As Blumhardt and Prince (2022) note, this persistence reflects the fact that "people care about waste. While many unfolding ecological catastrophes, from climate change to biodiversity loss, can be hard to grasp or easy to deny, waste and plastic pollution are tangible, visible problems confronting people daily" (2022: 72).

Key challenges to realising a circular economy in Aotearoa New Zealand stem from the fragmented landscape in which grassroots initiatives and high level conceptual frameworks operate with limited coordination or action between them – what researchers describe as the 'ecosystem phase' (Diprose et al., 2022). This phase requires cross sector collaboration among businesses, government, iwi, NGOs and communities to enable the flow of materials, knowledge and innovation (Diprose et al., 2025). Such collaboration is often constrained by siloed approaches, a lack of safe and inclusive spaces for co governance, and limited incentives to support systemic change.

Although circular economy language is increasingly adopted – especially in relation to waste reduction and climate action – it often remains focused on material efficiency rather than deeper transformations in economic structures or regenerative practices (Diprose et al., 2022; Diprose et al., 2025; Hodge et al., 2025). Research gaps include understanding how circular economy principles can align with Māori economic values such as kaitiakitanga and rangatiratanga; how to create and sustain new governance models for circular economies; and how to shift from product focused interventions to systemic, regenerative approaches that challenge the extractive logic of the existing economy.

Māori circular economies perspectives

While there is but a limited amount of literature addressing Māori perspectives on circular economies it invariably suggests a strong alignment between Māori economic thinking and circular economy principles (Diprose et al., 2022; Ministry of Business, Innovation and Employment, 2024; Rout et al., 2024). Diprose et al. (2022), for example, found that circular economy language is frequently invoked in relation to Māori economies, while Rout et al. (2024) argue that a convergence is emerging between Māori economic kaupapa and wellbeing oriented economic strategies such as circular economies.

Across the literature, four key threads emerge regarding Māori circular economies. First, Māori economies are described as inherently regenerative, restorative and relational, and therefore already circular in nature (MBIE, 2024; Perryman, 2022). Although colonial-capitalist structures have disrupted aspects of this circularity over time (Perryman, 2022), many foundational circular elements remain embedded within Māori economic practice (Amoamo et al., 2018; Scobie & Sturman, 2024).

Second, the circularity of Māori economies is highly contextual. The Ministry of Business, Innovation and Employment (2024) notes that "each iwi, hapū and whānau (Māori enterprise) are likely to have an existing circular spiral lens that is anchored by their own set of values, knowledge and whakapapa" (p. 57). This inherent and context specific circularity raises questions about the usefulness of framing Māori economies through the term 'circular economy', which may risk oversimplifying or obscuring Māori specific economic concepts.

Third, several authors argue that Māori economic systems may be better understood through the notion of spirality rather than circularity. Traci Houpapa (in MBIE, 2024) describes this as a "spiral economy where there's regeneration and growth" (p. 57). MBIE (2024) similarly positions Māori economies as spiral in essence and identifies five Māori economic models that reflect this spirality:

- **Te Takarangi** – a te ao Māori reflection of the Doughnut Economics model
- **Huri Rawa, Hauri Rauna** – Circular Indigenomics: a Māori philosophy and pragmatist approach to circular economies
- **Te Whai Oranga** – a mātauranga Māori/whakapapa centred regenerative wellbeing model
- **He Ara Waiora** – Treasury's te ao Māori wellbeing and living standards framework
- **Me Tū ā Uru** – a relational framework (MBIE, 2024)

This thread suggests that future conceptualisations of Māori circular economies may be more fruitful if they draw on existing mātauranga around spirality. A growing body of work explores these ideas (Reid et al., 2021; Scobie et al., 2025; Walker, 2020).

Finally, the literature addresses the role that Māori and Māori economies might play in a broader Aotearoa based transition toward circular economies. MBIE (2024) proposes that this transition may involve two shifts and a convergence: a shift within Western economic systems from linear to regenerative thinking; a shift within te ao Māori toward revitalising inherent spirality; and a convergence of these two systems into a dual approach to wellbeing. MBIE (2024) also highlight the potential for using indigenous species and mātauranga Māori to develop high value circular products and note that Māori are well positioned to lead circular economy efforts in primary industries such as forestry and fisheries due to high levels of resource ownership.

These government framed perspectives must be examined critically, given the Crown's historical role in undermining the circular nature of pre colonial Māori economies. Nonetheless, Māori voices and leadership are essential for any transition toward just circular economies in Aotearoa. As Perryman (2022) argues:

> "Indigenous leadership and relational philosophies are therefore becoming increasingly essential for Aotearoa's socio political redevelopment and the transition to a circular economy based on intergenerational responsibility and socio ecological justice" (p. 84).

Challenges to achieving greater circularity in Aotearoa New Zealand

Aotearoa New Zealand faces a range of significant challenges as it seeks to transition toward economies that enable greater circularity and reduce reliance on linear ‘take-make-waste' systems. While momentum for change continues to build across industry, government and communities, the pathway forward is neither straightforward nor uniform. This section outlines three major challenges that currently constrain progress: the limits posed by energy availability and infrastructure, the country’s extensive dependence on disposable and single use packaging systems, and the conceptual and measurement shifts required to more accurately understand, evaluate and support circular practices. Together, these challenges highlight the complexity of the transition ahead and the need for coordinated, cross-sector approaches to support meaningful change.

Challenge One: Energy

Achieving greater circularity in Aotearoa New Zealand’s economy is fundamentally constrained by energy dynamics. Circular systems depend on the recovery, transformation, and redistribution of resources – processes that all require energy. Because both global and local economies remain heavily dependent on fossil fuels – approximately 70% of Aotearoa New Zealand’s primary energy use – the energy return on energy invested (EROEI) becomes a central barrier to circularity. When the energy required to extract, process, and deliver resources approaches or exceeds the energy gained, circular practices become increasingly untenable. This challenge is compounded by the reality that renewable energy infrastructure itself relies on fossil fuels for mining, production, transportation and maintenance, making so called ‘renewables’ more accurately described as ‘re buildables’.

A second energy-related constraint lies in the strong relationship between energy availability and economic prosperity. High levels of social progress and GDP are strongly correlated with abundant supplies of affordable energy, although the correlation with social progress is very nuanced depending on governance. As global EROEI declines, economic growth slows, generating political pressure to prioritise short-term productivity over long-term sustainability (MacKay, 2016; Morgan, 2013). Although Aotearoa New Zealand’s electricity generation is largely renewable, the wider economy - including agriculture, transport, manufacturing and logistics - remains heavily diesel-dependent. Declining global diesel reserves and rising crude oil extraction costs increase the price of resource recovery and recycling, thereby undermining the economic feasibility of circular models (Delannoy et al., 2021). These rising energy costs also contribute to inflation and diminish the investment capacity needed to build and maintain circular infrastructure.

Systemic risks, including resource scarcity, fragile global supply chains, and intensifying geopolitical competition, further exacerbate these energy challenges. Circularity depends on localised, resilient systems and reduced reliance on imported materials and technologies. Yet Aotearoa’s geographic isolation and relatively small market size heighten dependence on global supply chains for both raw materials and specialised equipment. As EROEI declines and associated energy and resource costs rise, Aotearoa New Zealand becomes less attractive as a production hub, making it more difficult to scale circular initiatives. Addressing these constraints will require strategies that reduce total energy and resource use, strengthen local production systems, and systematically integrate energy considerations into circular economy metrics.

Challenge Two: Single-use packaging

A second major challenge to achieving greater circularity in Aotearoa New Zealand is the entrenched dominance of single use packaging and the structural influence of the supermarket duopoly. Recent research by Blumhardt et al. (2025) highlights that, while reusable packaging systems such as refill stations and returnable containers are present in Aotearoa New Zealand, they remain marginal and largely confined to small independent retailers. These businesses face significant structural disadvantages, including higher overhead costs, limited store space, and restricted bargaining power compared to the supermarket duopoly. Without regulatory intervention or economic incentives to rebalance these inequities, reusable packaging systems struggle to compete against lower-cost single use packaging, which externalises much of its environmental cost and impact to the public.

Affordability, accessibility, and convenience further constrain the uptake of reusable packaging. Products offered in reusable formats tend to be more expensive due to increased labour, cleaning requirements, and reverse logistics. Geographically, most zero-waste or refill-focused stores are located outside high traffic commercial areas and often offer fewer amenities such as parking. For time constrained or price sensitive households, these barriers make it difficult to participate in reuse systems even if they want to. This intention–behaviour gap underscores the need for system-wide infrastructure and mainstream retailer participation if reusable packaging is to scale.

Blumhardt et al. (2025) also identify two further obstacles to the uptake of reusable packaging: inadequate data and insufficient cultural integration. Most businesses who do operate reusable packaging systems do not measure their environmental impacts or track reuse rates, making it difficult to assess outcomes or build a compelling case for investment. Additionally, cultural considerations, particularly Māori perspectives on food safety, waste management and contamination, are rarely incorporated into packaging system design. Addressing these issues is essential for ensuring that circular initiatives are equitable, culturally grounded, and aligned with broader environmental and social justice goals.



Challenge Three: Conceptual and measurement challenges

A third set of challenges relates to how circularity is conceptualised and measured. Dominant circular economy models such as Ellen MacArthur Foundation's 'butterfly diagram' or visualisations of biological metabolic cycles portray circular systems as neat, closed, and self-contained. While useful for communicating core ideas, these simplified representations obscure the inevitable messiness, leakage, and partiality of real-world circular practices (Healy & Mellick Lopes, 2025).

Another conceptual challenge is the erasure of social innovation and human agency. Mainstream circular economy frameworks focus heavily on 'consumers' and 'users', overlooking the relational labour of repairers, coordinators, volunteers, educators and community groups who make circularity possible. When these forms of labour are conceptually invisible, they also become immeasurable. Existing metrics struggle to capture social learning, trust-building, coordination work, and creative material recombination. As a result, the value generated by social practices remains largely hidden within standard accounting and assessment systems.

Circularity also involves material and logistical complexities that challenge measurement. Reverse logistics systems – whether for spent coffee grounds or e waste – must contend with contamination, inconsistent material flows, transport constraints, and hazardous components. As Healy and Mellick Lopes (2023) argue, many circular economy interventions focus on large-scale technical reforms to existing waste infrastructure, reinforcing 'set and forget' systems while failing to account for the complexity of human social practice. Meaningful measurement requires granular data on material quality, volumes, contamination rates, collection cycles, and processing outcomes – data that is difficult and costly to obtain.

A further challenge arises from the 'system straddling' common to early-stage circular initiatives, which must navigate between entrenched linear infrastructures and emerging experimental approaches (Kok et al., 2025). Policy frameworks frequently expect circular initiatives to scale before enabling conditions exist, marginalising smaller experimental practices that generate crucial local knowledge. Measurement is also hindered by regulatory systems designed around linear waste management. For example, in Australia waste levy revenue is restricted to waste management projects (NSW EPA, 2024), whereas in Aotearoa New Zealand the equivalent levy can fund waste minimisation initiatives (MfE, 2025). As a result, measures of circularity often default to landfill diversion, failing to recognise strategies that reduce consumption or redesign systems altogether.

Finally, social organisation, as opposed to technology, emerges as one of the most significant and under recognised challenges. Successful circular initiatives require alliances across farmers, processors, transporters, recyclers, community groups, and research institutions. These relationships rely on trust, facilitation and long-term coordination – forms of value that are difficult to quantify. They generate benefits through governance, relationality and shared learning rather than through easily measurable outputs (Lejano, 2019). Without metrics that capture the organisational and relational capacities underpinning circular systems, circularity risks being evaluated solely through material throughput, overlooking the social foundations required for lasting transformation

Section II: Measuring Difficult Things

As discussed in the preceding sections, some of the most important dimensions of circularity are social: innovation, coordination, experimentation, qualitative forms of value, and the logistical complexity of real-world practice.

Yet these are also the dimensions that are the most difficult to measure. The challenges are structural, shaped by conceptual models that privilege idealised circular systems, by policy misalignments, and by the longstanding undervaluation of social processes. Effective measurement therefore requires expanding beyond technical indicators to include relational, organisational, qualitative and experiential dimensions. Measurement models grounded in idealised representations of circularity often struggle to accommodate friction, contamination, loss and other forms of 'leakage' that are intrinsic to real circular practices but currently have no recognised place in reporting frameworks.

Several measurement tools have been developed (see Table 1). The Material Circularity Indicator (MCI), for instance, improves on simple waste or recycling-rate measures, but remains focused on material inputs and end of life recovery and cannot easily incorporate energy use, emissions, or social relations (Figueirinhas et al., 2026). Company level tools such as Circulytics extend further by assessing enabling conditions such as innovation, business models and cultural readiness; this provides a scorecard that organisations can use to track their own progress. The Circularity Gap Report, launched in 2018, measures global and national circularity performance by focusing on resource flows and material reuse (Circle Economy, 2025), making it particularly useful for macro level policy and international benchmarking (World Economic Forum, 2024). The European Union has also developed a set of indicators that track production, consumption, waste, and innovation as components of circular economy progress (Eurostat, n.d.).

These different measurement approaches serve distinct purposes, but with the exception of frameworks like Circulytics, there has been limited effort to capture the relational work that underpins circular systems. The labour of building connections, maintaining trust, coordinating materials, and sustaining social practices remains largely absent from circular economy measurement. Until measurement frameworks explicitly recognise these forms of value, a significant portion of what makes circularity possible will remain invisible.

Name	Focus	Level of Analysis	Key Features
Material Circularity Indicator (MCI)	Material inputs and end-of-life recovery	Product/Material	Improves beyond recycling rates; does not include energy, emissions, or social relations
Circulytics 2	Material flows + enablers (innovation, business models, cultural readiness)	Company	Provides scorecard for businesses to track progress
Circularity Gap Report	Resource flows and material reuse	Global/National	Useful for macro-level policy and benchmarking
EU Circular Economy Indicators (Eurostat)	Production, consumption, waste, innovation	Regional/EU	Official monitoring framework with thematic indicators

The absence of social dimensions in circular economy measurement is not unexpected. Many of the most significant forms of social, ecological, and cultural value are inherently difficult to quantify. Conventional measurement frameworks – such as standard SROI tools or quantitative indicator sets – tend to prioritise what can be easily counted: financial returns, volumes of waste diverted, or numbers of participants. While technically straightforward, these metrics capture only a narrow slice of reality and often overlook relational, cultural, and long term impacts. Measuring 'difficult things' requires not only developing ways of recognising relationality and social innovation but also acknowledging that some of the most important contributions cannot be reduced to numbers.

Jay Whitehead of Matatihi works from the principle that measurement must be relational rather than extractive (Whitehead, 2025). Measurement should be carried out with communities, not imposed upon them. This involves co creating evaluation frameworks that reflect the values, knowledge, and priorities of those directly involved. When measurement is embedded in relationships, trust, and mutual accountability, the process itself becomes a source of value creation. Collaborative practices, learning, and social cohesion can then be made visible without forcing them into artificial quantitative forms (see Figure 2, from Jay Whitehead's presentation).

Whitehead also emphasises story based and qualitative methods as essential for capturing complex impacts. Narrative accounts, wānanga, collective reflection, and participatory workshops enable communities to articulate the meaning, significance, and lived experience of their actions. Such approaches reveal dimensions of impact that quantitative metrics systematically miss, including cultural integrity, identity, and the quality of relationships. In this way, measuring difficult things becomes a matter of documenting richness, depth, and context rather than simplifying outcomes into a single figure.

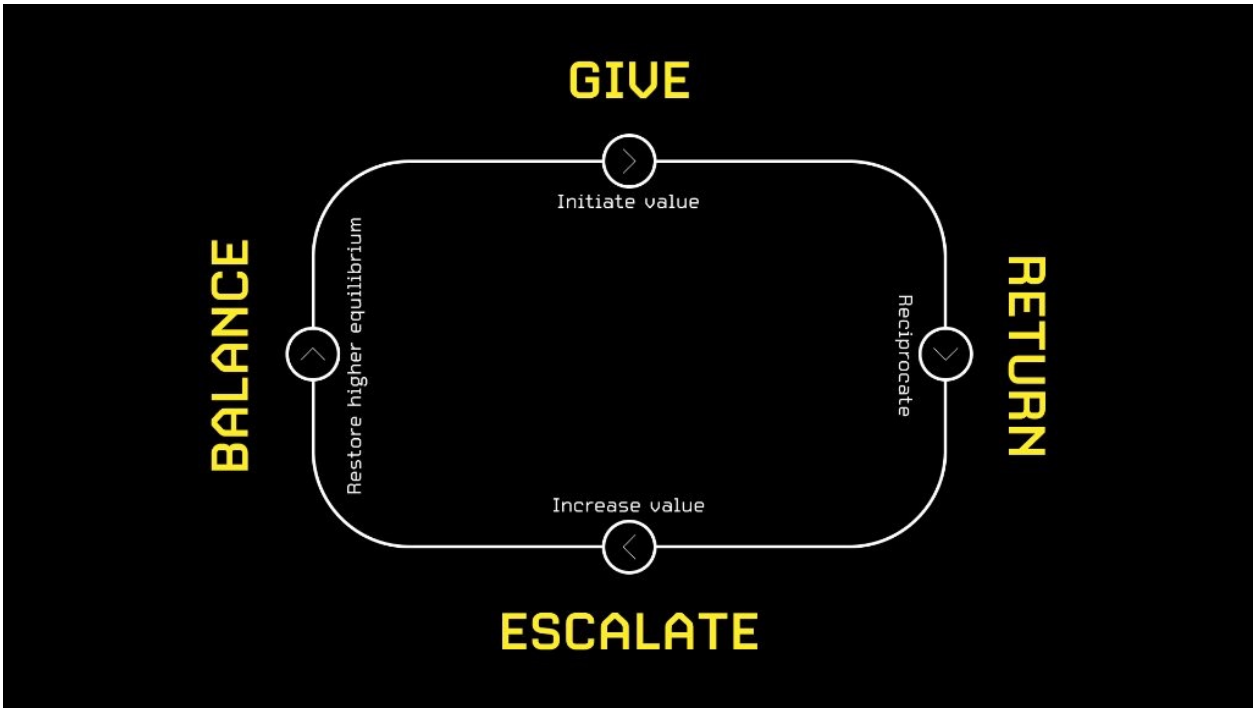


Figure 2: Importance of Relationships in Circular Economy Measurement (Whitehead, 2026)

Finally, Whitehead argues that measurement must be culturally grounded and responsive to local context. What constitutes value in one community may differ significantly in another. Measurement frameworks therefore need to be flexible and guided by those whose lives, lands, and futures are implicated. By foregrounding community defined indicators, narrative approaches, and shared understanding, measurement can expand to encompass what is typically invisible in conventional evaluation. This ensures that difficult things are both acknowledged and recognised as central to meaningful impact.

Whitehead's concept of escalating reciprocity connects with Western conceptualisations of reciprocal care such as that theorised by Joan Tronto (2017). In response to Whitehead's talk at the Measuring Circular Economies Symposium, Stephen Healy drew such links to reciprocal care as well as Elinor Ostrom's research on the commons (Ostrom 1990). Ostrum emphasises that the collective care of commons requires continuous improvisation and a revisiting of protocols throughout time. Healy noted that such escalating reciprocity is a form of "revisiting", and is important for responding to the significant challenges of our time, particularly climate change, which requires an "intergenerational response under uncertain conditions". For Healy, then, any measurement must not only be culturally grounded, but also continuously renegotiated.

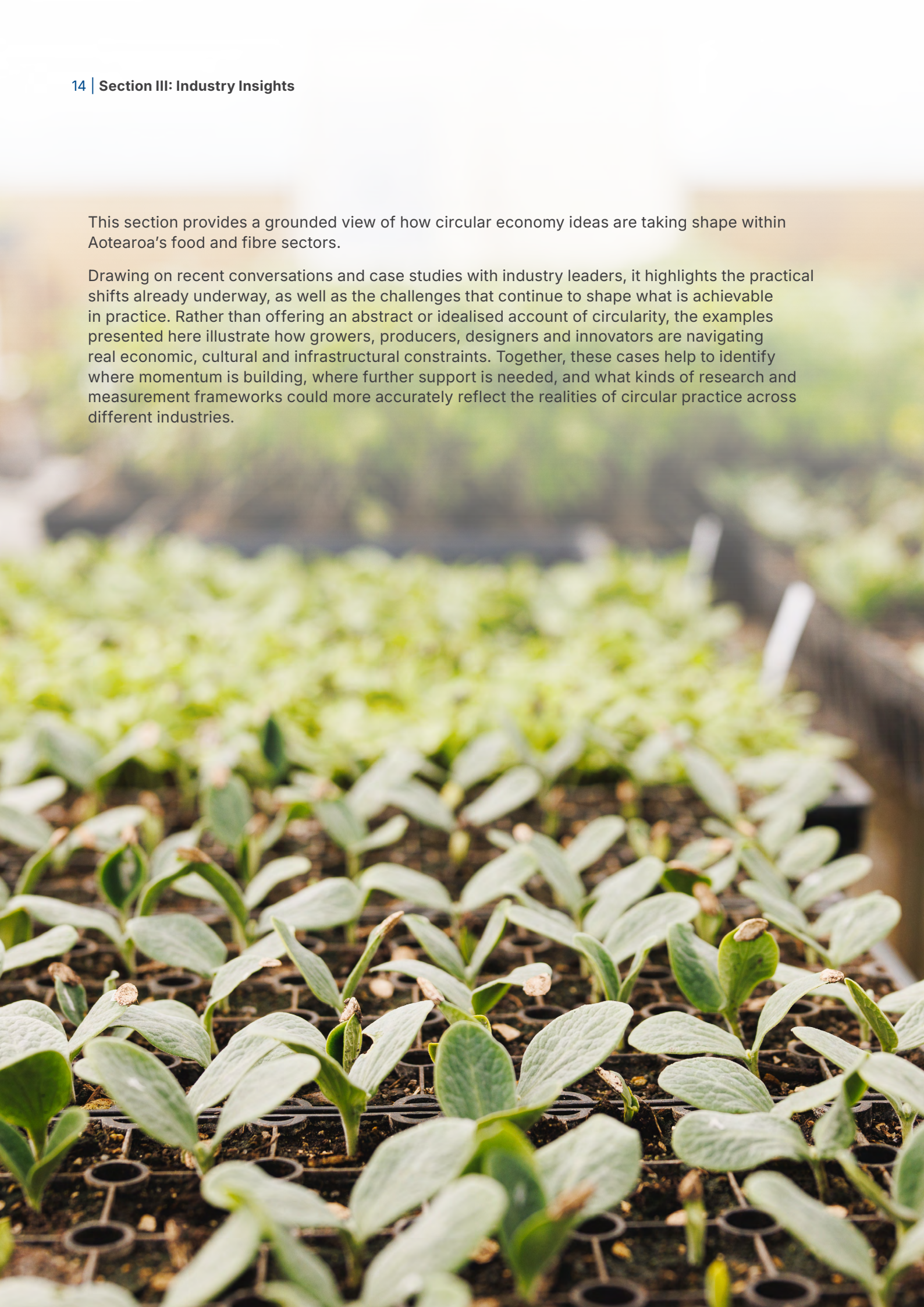
Escalating reciprocity also points to another, opposite, challenge of our time: the presence of negative escalations in the world. In response to Whitehead's 2025 talk, Abby Mellick Lopes highlighted how harmful, powerful things are also escalating, diminishing people's capacity "to care, to common, to build reciprocity, and to build relationships and social ties". She notes that amongst the current stresses of our time, many are running low in this capacity. For Mellick Lopes, the question is how we might 'cost' those harms in order to make them visible and to respond to them.

In bringing together care and materials, Mellick Lopes also noted that, in the early days of the circular economy disciplines of eco-design, researchers used the concept of 'material input per unit of service'. This resource efficiency metric quantifies the number of natural materials a product requires to deliver service units over its lifespan. The unit of service could involve a single use item that is used and quickly thrown away. But if you extend a product's lifespan through sharing, care or repair (noting the life of many single-use items is not able to be expanded in this way) you reduce the material input required. This means the material input per unit of service can be vastly diminished because you expand how long those materials are in use. The point here is that we may have measurements and approaches to measurement to draw on that help us value caring for products and materials through time.

Section III: Industry Insights

This section provides a grounded view of how circular economy ideas are taking shape within Aotearoa's food and fibre sectors.

Drawing on recent conversations and case studies with industry leaders, it highlights the practical shifts already underway, as well as the challenges that continue to shape what is achievable in practice. Rather than offering an abstract or idealised account of circularity, the examples presented here illustrate how growers, producers, designers and innovators are navigating real economic, cultural and infrastructural constraints. Together, these cases help to identify where momentum is building, where further support is needed, and what kinds of research and measurement frameworks could more accurately reflect the realities of circular practice across different industries.



Food

Case Study 1 – Walking the Talk: The Importance of Measuring Fresh Produce Circularity

Jacob Lawes – former Projects Manager - The AgriChain Centre.

Jacob Lawes was the Projects Manager at the AgriChain Centre and Chair of United Fresh's Technical Advisory Group, which provided industry leadership in sustainable food systems through research, governance, and technical guidance. His work supported the fresh produce sector to strengthen data quality, accountability, and measurement across supply chains.

Circular economy practices and achievements

Jacob emphasised the value of the Sustainable Development Goals (SDGs) as the globally recognised and internationally accepted framework that supports sustainability efforts, including circularity. With 17 goals, associated targets, and clearly defined indicators, the SDGs provide an internationally recognised set of SMART-based benchmark system that organisations, industries, and governments can use to measure ongoing performance towards an internationally standardised goal. Within the fresh produce sector, United Fresh New Zealand's Fresh Facts offers an annual, data driven overview of sustainability performance, helping the New Zealand fresh produce industry align what, when, and how industry data is measured, across every supply chain. Complementing this, the 2023 industry guidelines *Towards Achieving the United Nations Sustainable Development Goals* translate SDG targets into practical, actionable steps for fresh produce organisations. In addition, the AgriChain Centre has developed an SDG based sustainability assessment to support growers and businesses in evaluating their operations using consistent and transparent criteria.

Industry needs, research questions, and barriers

A central challenge Jacob identified is the gap between sustainability talk and sustainability action. Although sustainability language is becoming increasingly common, many claims lack any data that would substantiate them. Misunderstandings about what sustainability actually entails, a narrow focus on selected criteria, and targets that are not "SMART" all contribute to weak implementation. Growers and businesses often rely on regulatory requirements or supply chain standards as their benchmark, assuming that "if government isn't requiring it, it doesn't matter." This has contributed to a culture of "passing the buck," where industry participants wait for others – particularly those perceived as the "worst offenders" – to take the first step.

Jacob emphasised that unsubstantiated sustainability claims are nothing more than propaganda and does not represent actual progress. Appropriate measurement against internationally standardised benchmarks is therefore critical; without verified data, reporting cannot support good governance or legal compliance, and stated commitments remain disconnected from actual practice. Measurement is therefore essential: organisations must assess their performance using relevant, New Zealand specific data and track their own realities rather than relying on generic or assumed indicators. Despite this, uptake remains limited. Yet, despite the variety of pressures on industry to implement and measure sustainability actions, uptake remains limited. As Jacob observed, circularity in the food sector currently resembles a "leaky tyre": although reuse is discussed, most material still flows directly to disposal.

Possible research questions emerging from this industry

1. How can the fresh produce industry better implement consistent and data- based sustainability efforts, using the industry specific framework that was created by United Fresh New Zealand, that enables benchmarking to a global standard?
2. What factors contribute to the gap between sustainability rhetoric and evidence based action in the fresh produce sector, and how can this gap be reduced?
3. How effective are SDG aligned frameworks – such as Fresh Facts and sector guidelines – in driving measurable sustainability improvements for growers?
4. What interventions or incentives are required to increase the uptake of robust measurement tools throughout the fresh produce supply chain, to enable industry to meet best practice, instead of relying on assumptions, regulations, and unverified claims?



Case Study 2 – The One Thing Keeping Vegetable Growers out of the Circular Economy

Emily Levenson – (formerly) Environmental Policy Advisor - Horticulture New Zealand

Emily Levenson was formerly an Environmental Policy Advisor at Horticulture New Zealand, representing more than 4300 commercial fruit and vegetable growers across Aotearoa. Her work focuses on policy issues spanning resource management, climate change, freshwater, land use, energy, and waste. Horticulture New Zealand advocates for growers nationally, working between industry and government to ensure growers' needs are reflected in legislative and regulatory settings.

Circular economy practices and achievements

In the horticulture sector, a key circular economy success story is the partnership between commercial glasshouses and the Reporoa organic waste processing plant. Auckland's kerbside food scraps are processed in anaerobic digesters, generating biogas that is used to heat nearby glasshouses growing tomatoes for domestic markets. The facility also captures CO_2 from the digestion process and supplies it to the glasshouses, replacing the CO_2 that growers currently obtain by burning natural gas to increase plant yields. While highly effective, this model is difficult to replicate more broadly as it requires close co location and significant infrastructure investment – costs that most growers cannot absorb on their own.

Industry needs, research questions, and barriers

Vegetable growers face significant economic constraints that limit their ability to adopt circular practices. Because nearly all vegetables grown in Aotearoa New Zealand are sold domestically, growers operate within tight margins shaped by supermarket pricing and consumer willingness to pay. Retailer and wholesaler markups leave little profit, and some growers end up selling below the cost of production. Alongside rising input costs, these pressures mean growers are financially constrained and unable to invest in circular systems without external capital. As Emily noted, "you can't be green if you're in the red."

Existing value-added circular products tend to come from the fruit sector, where export revenue provides greater financial capacity for innovation. Expanding circularity within vegetable production will require research into opportunities for domestic processing – for example, replacing imported ingredients such as onion powder with New Zealand grown alternatives. Understanding when consumers might be willing to pay more for New Zealand produced processed foods is an important question, particularly in light of recent examples such as the discontinuation of contracts for Hawke's Bay peach growers where imported products have displaced local ones.

Finally, audience discussion highlighted that, while community coops and farmers' markets offer circular solutions at small scales, they are insufficient for large commercial growers who must operate within the dominant retail environment, supermarkets, to achieve sufficient scale for commercial viability. Expanding circularity in the vegetable sector therefore requires system level economic change, targeted infrastructure investment, and market conditions that enable growers to participate meaningfully.

Possible research questions emerging from this industry

1. Of the processed fruit and vegetables products purchased in NZ, how many are made from imported as opposed to domestic ingredients?
2. Are there opportunities for domestic sourcing, and what would it take for that to be commercially viable? (For example, onion powder – we import this from India. What would it take for this to be commercially viable in New Zealand).
3. When are New Zealand consumers willing to pay for NZ produced, processed fruit and vegetables products? Are NZ consumers willing to pay more for NZ products because they will usually cost more than imports? Challenge is to build consumer appetite for paying more for NZ produced products.



Fibre

Case Study 3 – Kowtow: Clothing with a positive impact

Tessa Bradley, Head of Product and Sustainability, Kowtow Clothing

Tessa Bradley leads ethical sourcing, Fairtrade cotton use, and circular design at Kowtow Clothing. Her role ensures responsible labour practices and drives sustainability across the brand's global supply chain. Since its founding in New Zealand in 2006, Kowtow has built a strong reputation as a pioneer in ethical and circular fashion, producing Fairtrade organic cotton garments manufactured in India.

Circular economy practices and achievements

Kowtow was founded on two core commitments: ensuring that fashion can be made in a humane, ethical and kind way, and designing in ways that work with nature rather than against it. All garments are produced using 100% natural fibres and are intentionally designed to return safely to the earth at end of life. Central to Kowtow's circular approach is eliminating waste and pollution, keeping materials in use for as long as possible, and regenerating natural systems.

A major achievement has been designing for longevity and recovery from the outset of each garment. Kowtow's design team forgo conventional synthetic trims such as polyester threads, plastic buttons and metal zips, using natural, biodegradable alternatives instead. This helps in making many garment fully compostable. In 2024, the company launched a plastic free collection that can safely return to nature.

Kowtow also operates several circular programmes. The Take Back initiative accepts Kowtow garments that are no longer repairable; trims are removed for reuse or returned to suppliers for recycling. The repair programme, in operation since 2018, uses skilled repair partners in Aotearoa New Zealand and Australia to extend the life of garments and encourages customers to undertake their own repairs. Care guides further support longevity by helping customers look after their clothing. Through the Relove programme, pre loved Kowtow pieces are recirculated, extending their wearable life and supporting the company's transition toward becoming a fully circular business.

Industry needs, research questions, and barriers analysis

Despite these innovations, Kowtow faces substantial barriers to advancing circularity. Material innovation remains challenging: there is limited global capacity for true fibre-to -fibre recycling of natural fibres, particularly at the small scales relevant to Aotearoa New Zealand. Local infrastructure also lags behind – there are few textile recycling or composting facilities – meaning that even circular materials often end up in landfill.

Economic factors further constrain progress. Small batch circular innovations such as repair, reuse and resale are significantly more costly than producing new garments at scale, making it difficult for many brands to participate. Fast fashion consumption habits create additional behavioural barriers; durability, care and repair remain undervalued, requiring broader cultural and system level shifts. Gaps in traceability and data also limit the ability to measure circular flows across supply chains, making it difficult for businesses to understand, evidence and improve their circular performance.

Possible research questions emerging from this industry

1. What shared indicators could be developed to measure circularity in textiles beyond waste diversion metrics, including durability, retention, and regeneration?
2. How can New Zealand map textile material flows to better understand what happens to garments after use, and where leakage points occur?
3. What would it take to make fibre-to fibre recycling of natural fibres viable in small markets such as Aotearoa?
4. What motivates consumer participation in repair, take back, and resale programmes, and what systems or technologies would support greater uptake?
5. Circular practices are an expensive undertaking for producers (B-Corp certification, living wage, etc) and these costs often get passed down to consumers. How can we make circular processes practices more affordable for both producers and consumers in Aotearoa?



Case Study 4 – UsedFULLY: Spiral economy products from textile waste

Bernadette Casey (Co-founder and CEO)

Bernadette Casey is Co founder and CEO of UsedFULLY and a leading textile and sustainability expert in Aotearoa. She is interested in circular economy innovation across the fashion and textile sectors and advocates for systemic change, focusing on large scale solutions to textile waste and resource recovery.

Circular economy practices and achievements

UsedFULLY's core mission is to identify the highest value applications for textile waste and redirect materials away from landfill. Bernadette outlined three primary fibre categories –protein (wool, silk, cashmere), cellulose (cotton, linen, hemp), and synthetic (polyester, nylon, acrylic) – each of which requires distinct recycling or repurposing pathways.

A major breakthrough has been Strengthtex, a fibre reinforcement product created by adapting forestry leader Scion's timber processing technology for use with textiles. This innovation improves roading performance and durability, reduces reliance on imported fibres, lowers bitumen use, and supports industrial scale textile waste diversion. A Wellington City Council trial in late 2022 demonstrated improved load response, reduced drain down, and longer lasting road surfaces. Since then, UsedFULLY has expanded into a range of additional high value products, including adhesives, mortars and building materials – some of which are worth up to five times more than converting textiles back into textiles. The company is now fully commercial, operating an Auckland plant capable of processing three tonnes of textile waste per week.

UsedFULLY also challenges the limitations of "closed loop" circular economy thinking. Expecting textiles to be recycled only back into textiles is economically unfeasible in Aotearoa New Zealand and constrains innovation. UsedFULLY draw on the concept of spirality – a more expansive, open loop model that seeks the highest value pathway for materials rather than insisting on perfect closure. This approach opens new possibilities for resource flow, reciprocity and high value reuse.

Industry needs, research questions, and barrier analysis

A key barrier is the economic infeasibility of textile-to -textile recycling at Aotearoa New Zealand's scale. International recycling models require feedstock volumes far larger than what the country can supply. UsedFully's spiral economy approach offers a promising alternative.

Possible research questions emerging from this industry

1. What forms of circular economy modelling – including spiral economy approaches – are most viable for small market contexts like Aotearoa?
2. How can high value, open loop pathways (e.g., roading, construction materials) be scaled to increase textile waste diversion nationally?
3. How might spirality connect with tauutuutu and reshape national approaches to textile circularity and resource governance?

Case Study 5 – Kākahu Toitū - Whatungarongaro te tangata, toitū te whenua (As people disappear from sight, the land remains)

Adrienne Whitewood, Founder and Designer, Ahu Boutique

Adrienne Whitewood (Rongowhakaata/Nga Puhi) is a fashion designer and Creative Director whose work draws deeply from Māori art, culture, and traditional concepts. Guided by her kuia and sewing since age eight, Adrienne graduated with a degree in fashion from AUT in 2009. She founded Ahu Boutique in Rotorua in 2013 to champion high-end contemporary Māori design and debuted her solo show at NZ Fashion Week in 2017. Her ethos centres on creating emotional connections to Indigenous design. Adrienne is currently working on some big projects pursuing sustainable textiles and manufacturing processes to create truly circular products.

Circular economy practices and achievements

Adrienne's circular practice stems from a story about ancestors sleeping on beds of kawakawa, prompting her to explore how the antimicrobial and healing properties of rongoā Māori might be embedded directly into fibre. Working with Scion, she has been developing a fully Aotearoa made circular fibre using merino wool treated through tannin processes derived from *undaria* (an invasive seaweed) and harakeke. Early testing focuses on whether these treatments can withstand washing while retaining their properties.

Her aim is to create 'forever pieces' that align with tīpuna knowledge of hauora, relationality, and living closely with medicinal plants. This includes exploring how the concept of rongoā might be micro encapsulated into fibre – drawing inspiration from international examples while maintaining a distinctly Māori and locally grounded approach. The project also seeks to share ancestral knowledge through textile design, bringing Māori healing and material practices into commercial applications.

Industry needs, research questions and barriers

The biggest barriers to advancing this innovation are financial and infrastructural. Initial testing required more than $100,000 of support from Scion, and further development will require substantial ongoing R&D investment. Funding pathways are unpredictable, often shifting with changes in government and competitive funding processes that do not always recognise or value culturally driven innovation. High production costs in Aotearoa New Zealand also constrain what can be manufactured commercially, and limited domestic textile manufacturing capacity means there are few facilities suitable for scaling new fibre technologies.

Adrienne is also exploring how to move beyond novelty products toward meaningful applications such as marae bedding or mattress fillers, but this requires stable investment and specialised partnerships. Key needs for progressing this work include sustained pūtea for R&D, identifying niche or high value markets for antimicrobial and rongoā infused fibres, and building partnerships with organisations capable of supporting manufacturing, distribution and technical refinement. Growth is currently limited by funding criteria, high production costs, and the scarcity of New Zealand textile manufacturers, all of which restrict the contexts in which the fibre can be applied.

Possible research questions from this industry

1. What forms of investment, partnership, and infrastructure are needed to scale Indigenous, circular textile innovations within Aotearoa's high cost manufacturing environment?
2. How can rongoā Māori properties be incorporated into fibre in ways that are scientifically robust, culturally grounded, and commercially viable?
3. What market niches or specialised applications (e.g., marae bedding, health related textiles) could best support the development of locally produced, antimicrobial fibres?
4. How might textile design grounded in Māori knowledge contribute to wider transitions toward Indigenous led circular economies?



Industry Insights: Concluding thoughts

Across the food and fibre sectors, this industry insights section has highlighted both the growing momentum toward circular economy practices in Aotearoa New Zealand and the significant structural barriers that continue to constrain transition. Each case study demonstrates a distinct form of innovation – from enhanced measurement frameworks in horticulture to advances in textile processing and design in the fashion sector. Taken together, these examples show that circularity is uneven, fragile and highly context dependent. Persistent measurement and data gaps remain a challenge: many businesses and innovators struggle to substantiate circularity claims or to track their progress over time.

Economic constraints are equally significant. Research and innovation require sustained funding to trial and test new possibilities for circular transition. Yet many circular initiatives struggle to scale because existing infrastructures, markets and regulatory settings continue to favour linear production. Progress in both sectors depends on substantial R&D investment, long term partnerships and more supportive policy environments.

Importantly, it is not only financial resources that matter. Relationships among actors – within industries and across communities, agencies and supply chains – are critical for enabling innovation across places and scales. The case studies underscore the centrality of social and relational dimensions of circularity: trust, coordination, cultural frameworks and Māori concepts such as spirality and *tauutuutu*. These approaches broaden the scope of what circular practice can entail, moving beyond 'closed loop' technical models toward reciprocal, regenerative pathways better suited to Aotearoa's scale, context and economic realities.



Section IV: Where to Next for Measuring Circular Economies?

Taken together, the insights from across the food, fibre, and textile sectors make it clear that Aotearoa New Zealand circular economy transition is constrained not only by infrastructure and economics, but by the absence of measurement systems capable of capturing what circularity in practice.

Existing tools tend to focus on idealised loops, clean material flows, and easily counted indicators. Yet our case studies demonstrate that real circularity is partial, iterative, and socially and culturally embedded. This demands a new kind of measurement – one grounded in the realities of Aotearoa and aligned with the forms of value that matter here. Tessa Bradley, Kowtow, captured this sentiment perfectly during her presentation, as shown in Figure 3.

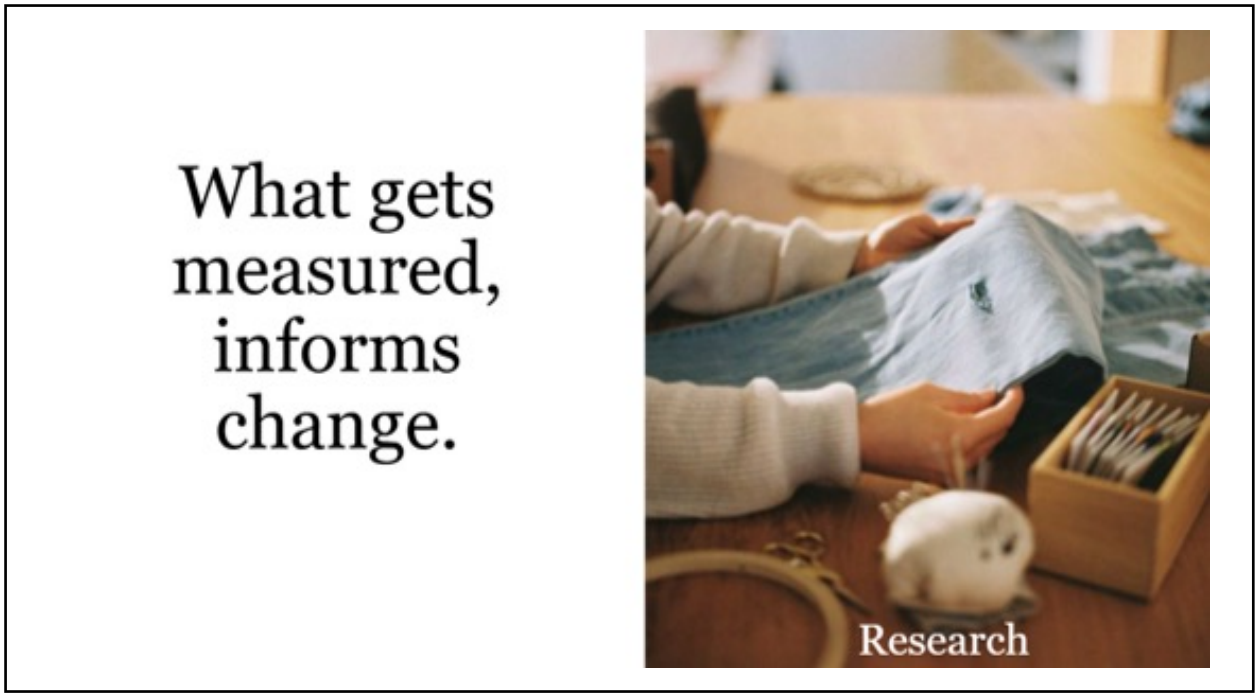


Figure 3: Measurement Informs Change (Bradley, 2026)

A Circular Economy Return on Investment (CROI) tool could offer a pathway to address these gaps. First, such a tool could provide measures that reflect real-world leakage, friction, and partial circularity, enabling organisations, iwi, communities and policymakers to understand what progress looks like under 'real-life' conditions rather than theoretical ones. It would also need to include social and relational aspects of circularity, such as coordination, trust, innovation networks and cultural frameworks, which are repeatedly shown to be essential drivers of successful circular practice.

To be effective, measurement must be local. A CROI tool would draw on global knowledge to develop New Zealand specific, sector appropriate indicators that reflect our industries, infrastructure, geography, scale and cultural values. It would also strengthen traceability and data systems for material flows, giving organisations the ability to track impacts, substantiate claims, and identify opportunities for improvement.

Recognising that circularity generates both numerical and narrative forms of value, a CROI framework would combine quantitative and qualitative approaches, making space for lived experience, cultural meaning and slow emerging impacts. Crucially, it would integrate Māori concepts such as spirality and tauutuutu, expanding what counts as circular value and aligning measurement with the relational, regenerative principles that resonate in Aotearoa.

A CROI tool could also capture long-term and gradually unfolding benefits, helping decision makers evaluate returns that typical short-term metrics fail to recognise. Alongside this, it would build industry capacity for evidence-based measurement, empowering growers, designers, manufacturers and innovators to collect and use data effectively.

Finally, the development of a CROI tool would support collaboration across sectors, enabling shared standards, common language, and coordinated learning across industries. This would reduce duplication, strengthen partnerships, and accelerate the transition toward a circular economy that is grounded in Aotearoa's values, realities and aspirations.

Overall, the complexity, diversity and relational nature of circular practice in Aotearoa New Zealand make clear that a new measurement approach is required. Our vision for a CROI tool could help us to understand progress, guide investment, support policy, and recognise the full spectrum of value produced through circular initiatives. It is the next step in building a circular economy that is credible, culturally grounded, and capable of delivering long term benefits for people, place and industry.



References

Amoamo, M., Ruwhiu, D., & Carter, L. (2018). Framing the Māori economy: The complex business of Māori business. *MAI Journal: A New Zealand Journal of Indigenous Scholarship*, 7(1), 66-78. https://doi.org/https://doi.org/10.20507/maijournal.2018.7.1.6

Bahers, J.-B., & Giacchè, G. (2019). Towards a metabolic rift analysis: The case of urban agriculture and organic waste management in Rennes (France). *Geoforum*, 98, 97-107. https://doi.org/https://doi.org/10.1016/j.geoforum.2018.10.017

Blumhardt, H., Diprose, G., Collins, E., Peryman, M., & Worden, D. (2025). *Reusable Packaging in the Grocery Sector: Understanding Impacts and Outcomes*. Zerowaste Network Aotearoa.

Blumhardt, H., & Prince, L. (2022). From lines to circles: reshaping waste policy. *Policy Quarterly*, 18(2), 71-80.

Circle Economy. (2025). *The circularity gap report 2025*. Available at https://circularity-gap.world/

Corvellec, H., Stowell, A. F., & Johansson, N. (2022). Critiques of the circular economy. *Journal of Industrial Ecology*, 26(2), 421-432. https://doi.org/https://doi.org/10.1111/jiec.13187

Delannoy, L., Longaretti, P.-Y., Murphy, D. J., & Prados, E. (2021). Peak oil and the low-carbon energy transition: A net-energy perspective. *Applied Energy*, 304, 117843. https://doi.org/https://doi.org/10.1016/j.apenergy.2021.117843

Diprose, G., Dombroski, K., Stronge, D., & Greenaway, A. (2025). Expanding circular economies through transformative re-investments. *Local Environment*, 31(6): 827-845. https://doi.org/10.1080/13549839.2025.2533143

Diprose, G., Walton, S., Greenaway, A., & Collins, E. (2022). How is the circular economy emerging in Aotearoa New Zealand? *Āmiomio Aotearoa Research Brief*. http://waikato.ac.nz/assets/Uploads/Research/Research-Projects/Amiomio-Aotearoa/Environment-Scan-Research-Brief-Final-Sept-2022.pdf

Eurostat. *Circular economy monitoring framework*. European Commission. Retrieved 5 December from https://ec.europa.eu/eurostat/web/circular-economy/monitoring-framework

Figueirinhas, D., Vakulenko, Y., Pålsson, H., & Hellström, D. (2026). Advancing circularity metrics: Revisiting the Ellen MacArthur Foundation's Material Circularity Indicator. *Resources, Conservation and Recycling*, 226, 108682. https://doi.org/https://doi.org/10.1016/j.resconrec.2025.108682

Foster, J. B. (1999). Marx's theory of metabolic rift: Classical foundations for environmental sociology. *American journal of sociology*, 105(2), 366-405.

Goburdhone, S., & Dombroski, K. (2023). Thinking with soils: Can urban farms help us heal metabolic rifts in Aotearoa? *New Zealand Geographer*, 79(2), 127-131. https://doi.org/https://doi.org/10.1111/nzg.12363

Healy, S., & Mellick Lopes, A. (2023). Postcapitalist composting: reverse logistics and organic waste, designing for diverse livelihoods. *Journal of Cultural Economy*, 16(4), 622-630. https://doi.org/10.1080/17530350.2023.2241194

Hodge, S., Barrett, P., & Kurian, P. (2025). The circular economy in Aotearoa New Zealand: a critical evaluation of policy and its current prospects. *Kōtuitui: New Zealand Journal of Social Sciences Online*, 20(4), 1069-1088. https://doi.org/10.1080/1177083X.2025.2504489

Lejano, R. P. (2019). Relationality and Social–Ecological Systems: Going Beyond or Behind Sustainability and Resilience. *Sustainability*, 11(10), 2760. https://www.mdpi.com/2071-1050/11/10/2760

MacKay, D. J. (2016). *Sustainable Energy-without the hot air*. Bloomsbury Publishing.

Ministry for the Environment. (2025). *Overview of the waste disposal levy*. https://environment.govt.nz/what-government-is-doing/areas-of-work/waste/waste-disposal-levy/overview/

Ministry of Business Innovation and Employment. (2024). *Barriers, enablers, and approaches for a more circular economy*. Available from www.mbie.govt.nz

Morgan, T. (2013). *Perfect Storm: Energy, Finance and the End of Growth*. https://ftalphaville-cdn.ft.com/wp-content/uploads/2013/01/Perfect-Storm-LR.pdf

NSW Environment Protection Authority. (2024). *Waste Levy Guidelines*. Available from https://www.epa.nsw.gov.au/

Ostrom, E. 1990. *Governing the commons: The evolution of institutions for collective action*. Cambridge: Cambridge University Press.

Perryman, M. (2022). *Te Wai Whau: A Kaupapa Māori citizen science approach to plastics pollution.* Massey University.

Polanyi, K. (2001). *The Great Transformation: The political and economic origins of our time*. Beacon Press.

Purvis, B., Else, T., Genovese, A., Jimenez, A., & Venkataraman Guru, R. (2025). Grassroots initiatives for a bottom-up transition to a circular economy: exploring community repair. *Local Environment,* 30(10), 1240-1256. https://doi.org/10.1080/13549839.2025.2467385

Hancock, F. (2021). Calls to 'feed the 5 million first' before export NZ Food. Radio New Zealand. 21 July 2021. https://www.rnz.co.nz/news/business/447324/calls-to-feed-the-5-million-first-beforeexporting-nz-food

Reid, J., Rout, M., Whitehead, J., & Katene, T. (2021). *Tauutuutu: White paper executive summary*. Available from https://ourlandandwater.nz/

Rout, M., Spiller, C., Reid, J., Mika, J., & Haar, J. (2024). Māori economies and wellbeing economy strategies: A cognitive convergence? *Local Economy*, 39(3-4), 165-186. https://doi.org/10.1177/02690942251323559

Scobie, M., Forward, T., Webb, D., Mclellan, G., & Barrett, J. (2025). *Amplifying Māori approaches: The transformative potential of Māori economies*. Available from https://www.weall.org.nz/

Scobie, M., & Sturman, A. (2024). *The economic possibilities of decolonisation.* Bridget Williams Books.

Tronto, J. (2017). There is an alternative: homines curans and the limits of neoliberalism. *International Journal of Care and Caring*, 1(1), 27-43. https://doi.org/10.1332/239788217×14866281687583

Walker, W. (2020). *Te mana o te ao tūroa - Hei tupu i te koru - He tirohanga whakaaro - A tangata whenua autoethnography - Rights and power of the natural world - Growing koru economies* University of Canterbury.

World Economic Forum. (2024). *Harmonizing Metrics to Measure Circularity: A Call to Action. Briefing Paper*. https://reports.weforum.org/docs/WEF_Harmonizing_Metrics_to_Measure_Circularity_A_Call_to_Action_2024.pdf

CONTACT DETAILS

Professor Kelly Dombroski k.dombroski@massey.ac.nz
Professor Nitha Palakshappa n.n.palakshappa@massey.ac.nz

Further information and recordings from the symposium can be found at the following link:
https://youtu.be/kCkXuMfCRHo?si=aSMuAkXWaqvI0jhQ







TE KUNENGA KI PŪREHUROA | MASSEY UNIVERSITY

UNIVERSITY OF NEW ZEALAND