

The Circular Economy Opportunity for Auckland

and how business can realise it

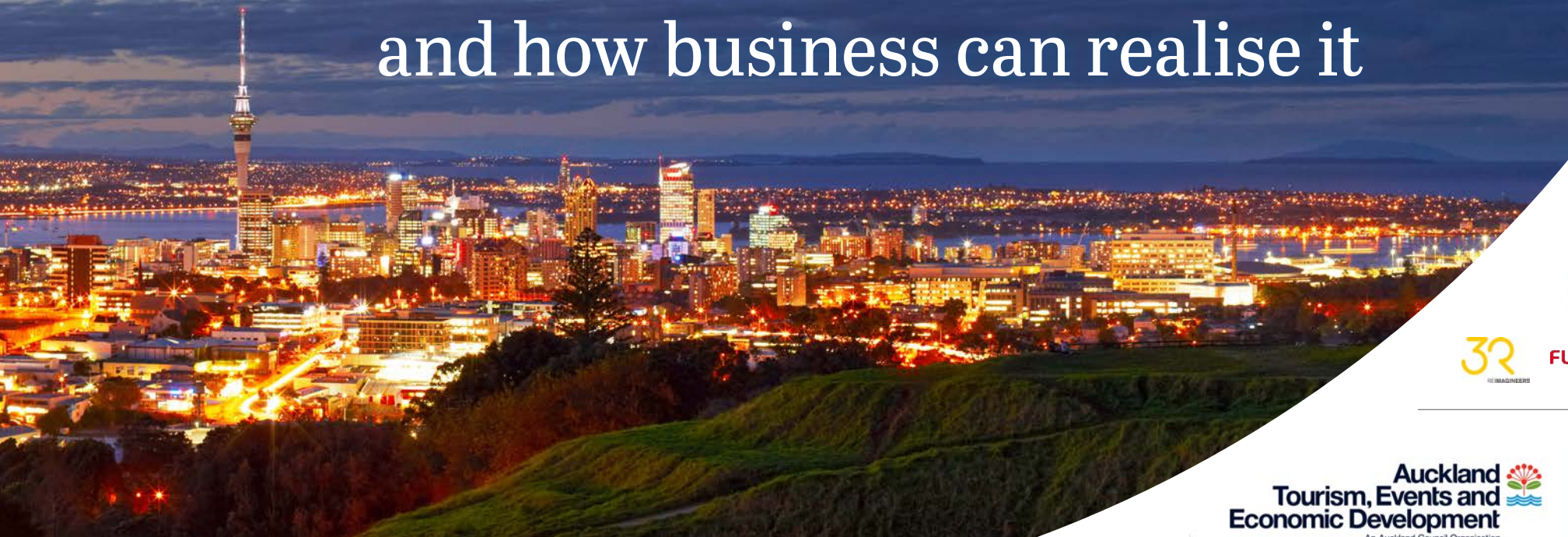


Photo: Chris McLennan



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Executive summary

Auckland could liberate up to \$8.8 billion in additional economic activity and reduce carbon emissions by 2,700 ktCO₂e in 2030 by shifting from the current linear take, make and waste model to a circular economy.

These are the results of a new study carried out by Sapere Research Group¹ working with the Sustainable Business Network (SBN), in partnership with Auckland Tourism, Events and Economic Development. The work was supported by Fuji Xerox NZ, Inzide Commercial, Junk Run, 3R Group and the Ministry for the Environment.

Modelling analysis across Auckland's economy has identified the potential contribution to the city's Gross Domestic Product as between \$6.3 - \$8.8 billion by 2030.

The analysis focuses on food, transport and the built environment. These three sectors have a significant input into Auckland's economy. They have also been identified by SBN's work in New Zealand and research overseas to be the sectors best positioned to make the transition to the circular economy. These sectors tend to include high waste, high cost and heavily polluting activities in the current linear economy model. The carbon reduction opportunity across them is identified as 2700 ktCO₂e in 2030.

A circular economy de-couples resource use from economic growth. Lifecycles of materials are maximised, usage optimised and at the end of life all materials are reutilised. It is restorative by design and underpinned by the use of renewable energy.

A circular economy goes beyond an improvement to the dominant linear economy. It is a viable replacement for it. Shifting to it would generate huge economic, environmental and societal benefits.

Applying circular economy thinking to Auckland will install environmental and economic resilience into the city. It will trigger a new era of business innovation. At the same time it will radically reduce the costs of our economic activity and the material inputs it requires.

¹ [A circular economy for Auckland - scoping the potential economic benefits](#), Sapere Research Group, April 2018

New business models like the shared economy, 'business as a service' and renewable technologies are already with us. The challenge now is to follow the world-leading countries and cities reshaping their economic operating systems to prepare them for where these models are taking us. Because the circular economy is inevitable. It is the only viable model with which we can successfully meet the needs of a growing population on a planet within our planetary boundaries.

In New Zealand we have the added opportunity to align and refine circular economy thinking through cooperation and collaboration with the business models and worldview of the country's indigenous people. Doing so successfully would lead to the development of a holistic economic mindset that would also assist to dissolve current cultural boundaries.

This report spells out the benefits of taking the lead, and how business can start to do that, by:

- connecting entire processes within our economic system through innovation
- establishing procurement processes that favour products and services with a circular economy approach
- actively working with non-government organisations, government ministries and others to promote the circular economy
- targeting investment to accelerate the transition to a circular economy
- sharing and supporting training in the circular economy
- working to inform and influence the government policies required to enable the transition

For these opportunities to be realised, we must think and work differently across the entire value chain. We must adopt new business models. It will not be easy, but it is necessary.

The trajectory is clear and momentum is building, now is the time for Auckland businesses to 'go circular'.



Photo credit: Todd Eyre Photography Ltd

Contents

Executive summary	3	SECTION TWO	A sector focus	31
Foreword	6	Auckland – becoming a circular city	Food	32
About this report	7	What’s already happening	Opportunities for business	34
Introduction	8	The benefits – boosting the economy while cutting carbon emissions	Key actions to catalyse change	35
SECTION ONE		Six key levers	Transport and Logistics	36
The circular economy	9	How to make it happen – the enabling factors	Opportunities for business	38
What’s in it for business?	12	Think and operate in systems.....	Key actions to catalyse change	40
Circularity at work	14	Reset procurement	Construction	41
Closing time for business as usual	15	Make circularity desirable	Opportunities for business	42
		Fund the transition	Key actions to catalyse change	44
		Share knowledge and develop skills capability	Conclusion	45
		Use data	Acknowledgements	46
		Set the rules to enable the transition		

Foreword

The way we do business worldwide is putting enormous stress on the environmental and societal systems upon which our markets and companies are entirely dependent.

Every year developed economies use between three and four times the amount of resources that are sustainable for the long term. If left unchecked, the environmental damage being done to our planet threatens to disrupt our global markets and economies.

This report, entitled 'The Circular Opportunity for Auckland and how business can realise it', by the Sustainable Business Network (SBN) with economic analysis by Sapere Research Group, is the first quantification of the potential business benefits of Auckland moving to a circular economy.

The report looks at the financial and carbon reduction benefits Auckland could gain from shifting from the current linear economy to a circular economy.

Sustainable development is a priority for all communities, cities and countries. For Auckland, and New Zealand, there is a very real need for all residents and businesses to make a contribution to becoming a lower carbon economy.

One of the ways this can be done is by transitioning Auckland to a circular economy: an economy which seeks to de-couple resource use from economic growth, keep resources in use for as long as possible, extract the maximum value from them, then recover and regenerate products and materials at the end of their use.

From an economic development perspective, the circular economy represents new business opportunities in growing global markets including new business models in transport, waste to value opportunities in the food sector and the re-use of construction materials.

The World Economic Forum states that the circular economy's potential for innovation, job creation and economic development is huge with estimates indicating a trillion-dollar opportunity on a world scale.

The new economic analysis outlined in this SBN report indicates Auckland could benefit from up to \$8.8 billion worth of additional economic activity a year by making the shift from the current linear take, make, waste model to a circular economy.

For Auckland businesses, pursuing process and product innovations that reflect circularity will create new forms of value, open up new markets and support sustainable growth by reducing reliance on finite resources.

Globally, countries such as Sweden, Scotland and Japan are leading the charge on shifting to a circular economy, the principles of which are being embraced by some of the world's biggest brands as well as the many local organisations referenced in this report.

Auckland, Tourism, Events and Economic Development (ATEED) is delighted to partner with SBN to develop an economic insights paper based on this comprehensive report.

Circular Economy: A new dynamic for Auckland Businesses provides economic perspectives on a circular economy.

Auckland with its innovative, entrepreneurial business culture has the opportunity to position itself as a circular economy city for the world. A co-ordinated approach is paramount, with central and local government, communities, businesses and individuals working closely to spearhead the impetus for this essential change.

Patrick McVeigh, General Manager,
*Business, Innovation and Skills –
Auckland Tourism, Events &
Economic Development (ATEED)*

About this report

This report provides an indication of the potential economic and carbon reduction benefits Auckland can realise from embracing the transition to a circular economy.

It is based on economic modelling by Sapere Research Group. It represents the first such analysis in a New Zealand context.

The report expands on the Sustainable Business Network (SBN)'s previous research into the key focus areas for enabling the transition to a circular economy.² Facilitated workshops and interviews with key stakeholders across sectors have been conducted to build on that knowledge and apply it to Auckland.

The report was developed by the Circular Economy Accelerator, a new team of business innovation experts created by SBN. The Circular Economy Accelerator's aim is to collaborate with New Zealand businesses, government and other groups to hasten the installation of a circular economy in New Zealand. To find out more go to circulareconomy.org.nz

² A systems innovation ongoing [programme of work commencing in 2014](#) involving multiple stakeholder interviews, surveys, workshops, events and projects to provide a deep

understanding of the current status of the Circular Economy in NZ and the key leverage points and opportunities to accelerate the transition to a more circular economy.

Introduction

In many ways the worldwide opportunities for New Zealand business have never been greater.

The global population continues to grow. Populations of emerging nations are increasingly procuring the goods and services of prosperity. But the current extractive economic model this is based on has become the major barrier to further progress. It is putting enormous stress on the environmental and social systems upon which our markets and businesses are entirely dependent.

Every year developed economies use between three and four times the amount of resources that are sustainable in the long term.³ If things don't change, we may find ourselves spending more time and effort fighting over the remaining resources than putting them to good use.

The way we use resources is incredibly wasteful. They are often used only briefly and then discarded. 1.3 billion tonnes of waste is generated worldwide every year. This is expected to increase to 2.2 billion tonnes per year by 2025.⁴ Just the financial and environmental costs of disposal are putting a brake on progress. We waste time and money dealing with waste. And by 2050 there could be more plastic by weight in the ocean than fish.⁵

The associated increase in greenhouse gases generated from industry, agriculture and transport is adversely impacting our climate, health and biosecurity.⁶ This is pushing costs up across the entire economy. It is also driving increased regulation and restrictions on businesses' licence to operate.

Left unchecked, the environmental damage being done to our planet threatens to disrupt our global markets and economies.

Our current economic model needs a fundamental redesign.

³ [Press Release](#) from Global Footprint Network, 2014
⁴ [World Bank Urban Development Series Report](#), Chapter 3 "Waste Generation"

⁵ [The New Plastics Economy: Rethinking the future of plastics](#), Ellen MacArthur Foundation, 2016

⁶ [Why climate change matters](#), Ministry for the Environment

Section One

The circular economy

At last, a compelling, prosperous,
business model for a low carbon future

A circular economy de-couples resource use from economic growth.

Lifecycles of materials are maximised, usage optimised and at the end of life all materials are reutilised. It is restorative by design and underpinned by the use of renewable energy. A circular economy goes beyond an improvement to the dominant linear ('take-make-waste') economy. It is a sustainable and viable alternative to it. It represents a system shift to a new global operating system, one that will generate sustainable economic, environmental and societal benefits.

The ‘butterfly diagram’ (right) is from the Ellen MacArthur Foundation, the leading global circular economy advocacy organisation. The graphic illustrates how materials flow through a circular system.

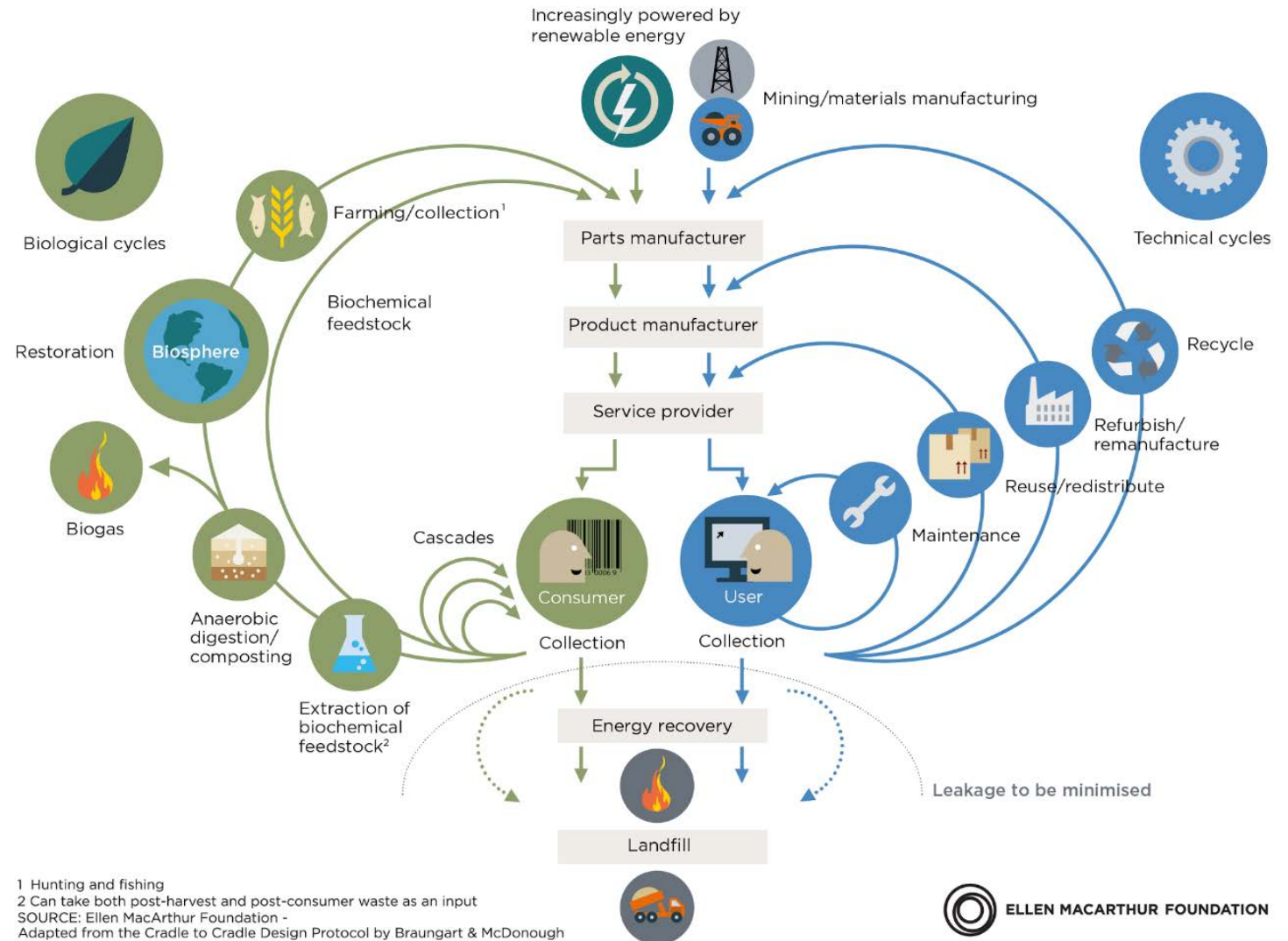
Resource value is maximised across the value chain and leakages in the system are minimised via feedback loops. Technical materials (e.g. manufactured products) are kept separate from biological materials (e.g. food) with the aim of keeping technical materials in continuous high value circulation and out of the biosphere, while biological materials can be used to regenerate nature (e.g. return to soil as compost).

Technical materials are fed back into the system through maintenance, reuse, remanufacture and recycling (which tends to be the lowest value option).

Figure 1: Outline of material flows in a circular economy

CIRCULAR ECONOMY - an industrial system that is restorative by design

Photo credit: Ellen MacArthur Foundation



**The circular economy
has been estimated to represent a
USD\$4.5 trillion economic opportunity
by 2030.⁷ It:**

- provides an innovation platform for new services and business models
- reduces costs by reducing the need for material inputs into the system
- optimises the use of assets via sharing economy platforms
- increases the lifecycles of products via repair and remanufacturing services
- develops and expands waste to value opportunities
- improves resilience by lessening the exposure to interruption and price shocks for virgin materials from overseas supply chains
- improves environmental outcomes, including reducing carbon emissions, pollution and waste
- restores natural capital such as soil and water quality
- drives better societal outcomes, such as generating new local employment

Crucially, it does all this and more within a coherent, comprehensive system design framework. This is the only way to ensure these processes are both self-sustaining and interlinked into an all-encompassing approach.

⁷ [The Circular Economy Could Unlock \\$4.5 trillion of Economic Growth](#), Accenture Strategy, September 2015

What's in it for business?

Circular economy thinking is already enabling some of the biggest business success stories, both here and abroad.



Photo credit: Yourdrive

Airbnb, Bookabach and Yourdrive are all examples of the sharing economy, which forms part of the overall circular economy. Airbnb has become the world's largest accommodation provider,⁸ without owning any property, by enabling underused private spare rooms and houses to be rented out. Bookabach and Yourdrive use the same model for holiday homes and cars.

eBay and Trade Me enable the extension of product lifecycles by facilitating the sale of second hand goods on a mass scale.

Circular economy thinking can also drive the use of emerging technologies like 3D printing, which provides an opportunity for distributed, small scale and on-demand manufacturing. For example, Auckland-based Reforge NZ is developing a new 3D

printing process that uses recycled plastic bottles. Its aim is to reduce waste and 3D printing material costs to help accelerate community-based digital manufacturing. It is currently in the process of setting up and running a pilot project.

Air New Zealand has been working with AUT to create 3D printed parts for aircraft interiors, providing significant cost savings.⁹

The Internet of Things enables automatic and remote monitoring of the efficiency of a resource during production, use and at the end of its use cycle. This means that all parts of the value chain can become more efficient. Once the time comes for a user to discard a product or asset, this can aid in the asset retrieval, so components can be reused.

⁸ [Facebook, Airbnb, Uber, and the unstoppable rise of the content non-generators](#), Independent, 2015

⁹ [Air New Zealand to 3D print its own aircraft interior parts](#), Press Release, February 2016



Photo credit: AlSCO

"For IKEA, becoming circular is a huge opportunity to innovate and find new ways to meet people's needs and dreams at home within the limits of the planet. By truly understanding people's needs, we can design relevant offers and meet customers' needs in new ways. We are just at the beginning, but are starting to test a range of solutions, including exploring new business models"

*Håkan Nordkvist,
Head of Sustainability Innovation, IKEA Group¹⁰*

- New value can be generated from material previously seen as waste.
- Repair and remanufacturing services have the potential to generate increased revenue as goods are kept in service for longer.
- Products that have been designed at the outset to have longer lifecycles provide a lever with which to disrupt existing markets.
- Optimised resource use can be facilitated by organisations retaining ownership of products and selling their use as a service.

¹⁰ [Engaging Customers in Shaping a Circular Society](#)
Håkan Nordkvist, Head of Sustainability Innovation, IKEA Group.

Circularity at work

LanzaTech, originating from Auckland, is developing gas fermentation technology for industrial waste gases. The sources include steel and alloy mills, municipal solid waste, organic industrial waste and agricultural waste. The technology creates high-value chemicals and gases. It has generated more than \$200m in investment to date.

Wishbone Design Studio uses recycled residential carpet for its Recycled Edition children's bikes. Innovations like this have fuelled growth of 25% annually and distribution in more than 40 countries. Wishbone Bikes is also disrupting the global toy market's 'throw away' culture by incorporating aspects like repairability and adaptability, where the bikes are adjustable to match the growth of a child.

Also provides a fully managed rental service for uniforms and repairs, reconditions and reuses them to maximise their lifecycle.

CHEP manufactures pallets, crates, and containers for businesses and rents them out through its pallet and container pooling service.

Green Spot Technologies is developing flour from apple waste.

Auckland Drum Sustainability Services provides a national collection, remanufacturing and reuse programme for bulk packaging drums. It collects and supplies reconditioned and remanufactured drums.

The Module Project is an emerging Auckland based company looking to disrupt the electronic goods sector. It is developing a wireless speaker, Decibel, designed to last a lifetime. All components are user upgradeable.



Photo source: *theproject*.

Oh Rent Me is an Auckland based company that allows you to rent designer clothing.

Yourdrive is enabling spare capacity in the car market to be accessed through private rental, generating revenue for the car owner and the company.

Philips Lighting offers a 'pay per lux' lighting service where customers pay for the amount of light (lux) they need and Philips retains control over the items it produces, enabling better maintenance, reconditioning and recovery.

Toast Ale in the UK makes brewing beer from surplus bread.

Adidas is one of the countless companies making products out of ocean plastic waste.

Caterpillar has established Cat Reman that recovers materials through technology and restores components to good-as-new condition.

Patagonia encourages customer repairs via its 'Worn Wear' initiative, driving customer loyalty.

MUD Jeans leases jeans for a monthly fee. After the lease period of one year, customers can switch them for another pair and continue leasing, return them for recycling or upcycling purposes, or keep them. The lease contract includes free unlimited repair services.

"Once we sell the benefits of the products instead of the products themselves, we begin to design for longevity, multiple reuse, and eventual recycling"

Frans van Houten, Chief Executive Officer and Chairman, Royal Philips¹¹

¹¹[Why we need a circular economy](#), blog by Frans van Houten, Chief Executive Officer of Philips, published by the World Economic Forum, January 2014

Closing time for business as usual

Successful business relies on responding early to emerging trends and needs.

New Zealand is relatively small and remote. If New Zealand businesses do not keep pace with the growing global movement towards a circular economy they will simply be left behind. This is likely to be experienced as increasing costs in raw materials, reduced demand from increasingly conscious consumers, and increased barriers to entry for overseas markets.

Knowing this, it is likely that the New Zealand government, like those around the world, will be compelled to make increasing aspects of the circular economy compulsory.

Businesses that act early on this will gain significant advantage.



Photo credit: Todd Eyre

Section Two

Auckland – becoming a circular city

More than one half of the world's people now live in cities. This is predicted to be 70% by 2050.¹² This means cities and the businesses that fuel their growth will be at the heart of the required economic redesign.

Photo credit: Chris McLennan

A circular city embeds the principles of a circular economy across all its functions. It establishes an urban system that is regenerative and restorative by design. The idea of waste is eliminated. Assets are kept at their highest levels of utility at all times. Digital technologies support processes where appropriate.

A circular city generates prosperity and economic resilience while separating value creation from the consumption of finite resources.¹³ The 21st century circular economy city is likely to become a global growth model, and a key target market for all kinds of goods and services.

It is too early to cite cities that have gone entirely circular. But there are a number of cities that are in transition. Amsterdam, Helsinki, Vancouver, London and Glasgow have all identified opportunities for a move towards a circular economy.

Auckland, like many leading cities across the world, is at the beginning of its journey towards circularity. The circular economy is the best methodology we have to secure economic prosperity that can keep pace with population growth while operating within our planetary boundaries.

Co-ordinated circular economy action at a city level is still in its infancy. But Auckland is well placed to take a lead. It has a well-proven innovative, entrepreneurial business culture and a highly connected community, including a vibrant and dynamic indigenous culture. We can learn much from the indigenous notion of stewardship (kaitiakitanga) and intergenerational thinking, which has strong links with restoring systems.

Auckland can achieve the benefits outlined in this report. It can go further, establishing itself as a model circular economy city.

To do this we must embark on an unprecedented level of co-operation and co-ordination, not only across business but communities, and central and local government.

Auckland generated 1.646 million tonnes of domestic and commercial waste in 2016. That's more than one tonne for every Aucklanders.¹⁴ This is likely to increase unless a new approach is taken. Estimates suggest we'll add 833,000 more people to Auckland in the coming decades, putting our population at 2.3 million by 2043.

The opportunities of a unique Māori (holistic) perspective

Māori have an important and unique world view (te ao Māori) in driving circular thinking and action in New Zealand.

Māori have a holistic understanding of our environment, and see the environment as an interconnected whole.

Māori express their connection with the environment through Kaitiakitanga (environmental guardianship) – a way of managing the environment. The Māori world view and Māori values, including tikanga (customary practice), whakapapa, manaakitanga (acts of giving and caring for) and kaitiakitanga, as well as their intergenerational approach are all congruent with Circular Economy thinking.

Harnessing this thinking and the unique and strong indigenous culture we have in NZ will help drive New Zealand's transition towards a circular economy.

¹² [Circular Economy in Cities: Evolving the model for a sustainable urban future](#), World Economic Forum, 2018

¹³ [Cities in the Circular Economy: An Initial Exploration](#), Ellen MacArthur Foundation, 2017

¹⁴ [Draft Auckland Council Waste and Minimisation Plan 2018](#)

What's already happening

There are many great examples of organisations already using circular economy thinking and ways of operating in New Zealand. There are also examples of established businesses that have adopted inherently circular models from the outset.

Product as a service

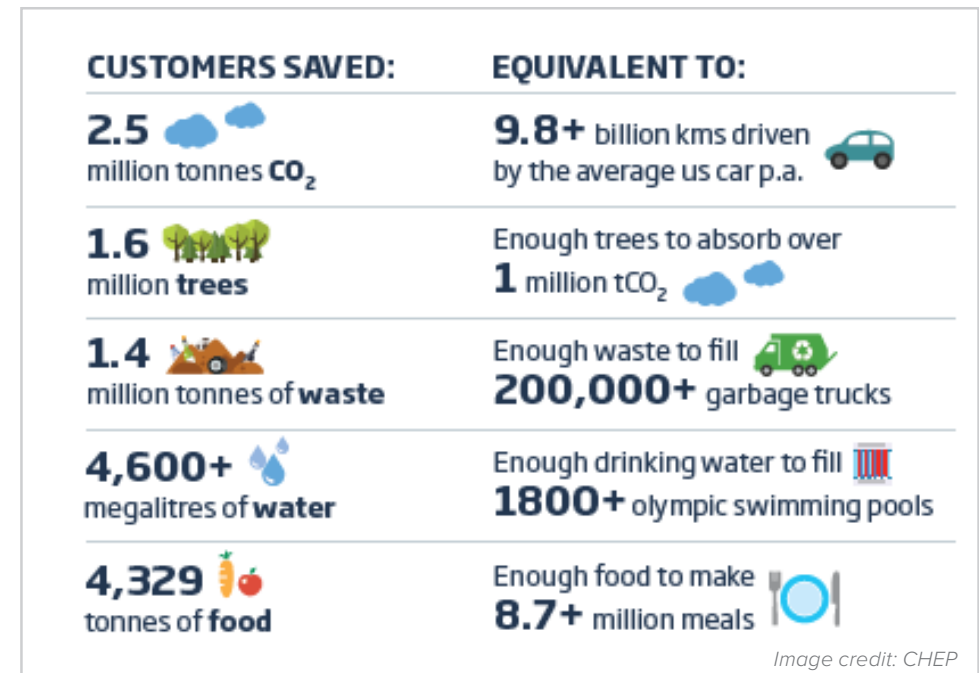
CHEP

What they do:

CHEP is a global provider of supply chain products and services for the consumer goods, fresh food, beverage, manufacturing and retail sectors. CHEP's pooling business model incorporates elements of both the circular and sharing economies. CHEP retains full ownership of equipment. It has been CEMARS certified since 2014. 100% of its timber is supplied from certified sources.

Benefits of a circular approach:

Each time CHEP's customers choose sharable and reusable options instead of one way packaging, carbon emissions are reduced, waste is avoided and raw materials are saved. See diagram for worldwide savings.



Maximising value and lifecycles via product stewardship

Inzide Commercial/ Interface Carpet Tiles

What they do:

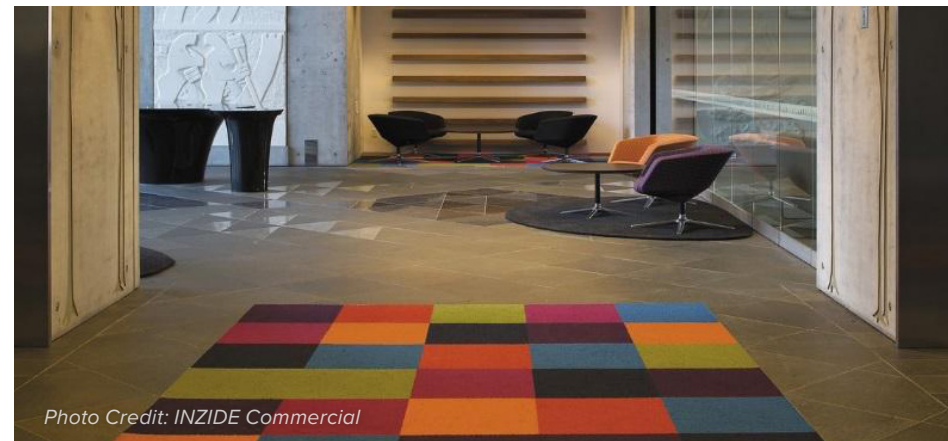
Inzide Commercial supplies sustainable flooring solutions for commercial interiors. Interface carpet tiles incorporate multiple circular economy attributes. Designs influenced by the randomness of nature allow for easy installation and replacement of individual tiles. The TacTiles technology eliminates the need for glue to connect the tiles to the floor.

At the end of their usable life, tiles are sent back to the manufacturing plant, stripped and remanufactured into new carpet tiles.

In New Zealand this happens via the Ministry for the Environment accredited Interface ReEntry Programme product stewardship scheme.

Benefits of a circular approach:

- Ease of installation and replacement of individual tiles.
- The ReEntry programme has diverted more than 44,000 cubic metres of carpet tiles from landfill (220 tonnes).



Envirocon

What they do:

Envirocon is a voluntary product stewardship scheme that involves Auckland's local cement organisations and the construction company Interbloc.

Envirocon provides a facility for waste concrete to be brought to Interbloc which uses the waste to build cement walls. Cement companies finish the

work and transport the waste to Envirocon, which transforms the waste cement into cement ready to use again in Interbloc's modular wall system.

Benefits of a circular approach:

- The programme aims to divert 80,000 tonnes of waste concrete and wastewater per year by 2022.
- It reduces truck movements by an estimated 1.4 million km per annum.

Auckland District Health Board

What they do:

The Auckland District Health Board is taking a leading role in reducing medical waste and redirecting non-hazardous plastic waste, aluminium and metal waste from landfill to recycling.

The DHB initially started recycling plastic tubing, oxygen masks and IV bags. The plastic collected is recycled in New Zealand to create playground outdoor matting. This is exported around the world.

Benefits of a circular approach:

- The hospital initiative has resulted in approximately 9,000 kg of plastic waste diverted from landfill.
- Approximately 2,300 kg of recyclable plastics and cardboard material is recycled every month as part of a recycling programme for home patients in partnership with Baxter Healthcare.
- The waste recycled as part of the home patient programme is equivalent to about 300 cubic metres (uncompacted) of landfill per year.

Fuji Xerox

What they do:

Fuji Xerox New Zealand promotes the reuse and recycling of its products through its Ministry for Environment (MfE) accredited Product Stewardship Scheme. This scheme is a free take-back service offered to all of its customers for machines, used parts and consumables, ensuring they are reused and responsibly recycled rather than sent to landfill.

Thanks to the scheme Fuji Xerox NZ has achieved a re-use and recycling rate of over 99.5% for returned equipment, which, when part of a lifecycle recycling programme, helps reduce the carbon footprint of a road by up to 23%.



Benefits of a circular approach:

- Fuji Xerox NZ's MfE accredited Product Stewardship scheme diverts on average 700 tonnes of waste from landfill annually.

Its products are designed for easy separation and disassembly, ensuring where possible machines and parts get a second chance at life as refurbished eco machines.

- By partnering with Close the Loop, Fuji Xerox NZ's toner is also given a second life in a product called TonerPave™.

TonerPave is a low carbon asphalt that is more durable than standard asphalt and helps to reduce the carbon footprint of a road by up to 23% over its lifecycle.

Resene

What they do:

The Resene PaintWise programme allows customers to return paint cans, regardless of whether they are empty or half full, to be recycled. The paint is then donated to community groups who use the paint to cover graffiti. Paint that cannot be donated is sent to solvent recovery so the ingredients can be used in other industries.

Resene has created PaintCrete which uses the recycled paint ingredients in concrete which in turn improves concrete quality.

Benefits of a circular approach:

- Resene has helped recycle 120,000kg of steel and repurpose 140,000 litres of partially used paint since the launch of its PaintWise programme in 2004.
- Over 300,000 packs have been collected from Resene ColorShops over the past 14 years.



Photo credit: 3R Group

Sharing economy

Yourdrive

What they do:

Yourdrive is a NZ based peer-to-peer car sharing platform that enables people to rent privately owned cars. Owners generate income from sharing their idle asset and renters gain access to a wide range of better value rental vehicles in dispersed locations. Over the last three years, Yourdrive has facilitated more than 4,000 journeys and currently has over 600 vehicles listed on the platform.

Benefits of a circular approach:

- Supporting the local economy. Since 2015, Yourdrive has paid out more than half a million dollars to Kiwi vehicle owners.
- Reducing car ownership. A survey of Yourdrive renters found that 75% had reduced their vehicle ownership after using Yourdrive.
- Increasing use of other sustainable transport modes. The same survey found that 68% of respondents increased their use of active-transport modes such as walking and cycling after using Yourdrive.

The Compost Collective

What they do:

The Compost Collective is a collaborative project aimed at increasing the number of Auckland households engaged in composting and organic waste reduction. The Collective operates ShareWaste.org.nz, an online platform to connect people who wish to recycle their kitchen scraps with their neighbours who are already composting, worm-farming or keeping chickens. In addition, they run composting workshops throughout the greater Auckland area.

Benefits of a circular approach:

- 14,969 people have been involved in the collective to date.

Cityhop

What they do:

Cityhop is a car sharing service that allows members to rent cars by the hour. Membership offers businesses an alternative option to purchasing a pool car. Packages include the call centre, insurance, petrol, on-road costs, fleet team and staff benefits. This saves companies transport and parking costs, creating efficiencies and eliminating administrative work.

Benefits of a circular approach:

- Reduced car ownership - 59% of Cityhop members have sold a car or delayed the purchase of their next car because of car sharing. Cityhop estimates 1,000 privately-owned vehicles have been removed from the road as a result of the service
- Reduced parking and street congestion
- Reduced carbon emissions
- Cityhop estimates it provides \$5,000,000 back to Auckland annually through the benefits of its car-sharing scheme



Photo credit: Cityhop

Resource recovery / Waste to value

EcoStock Supplies

What they do:

EcoStock Supplies collects food waste from food manufacturers, food distributors and food retailers. The company transforms it into high quality sustainable animal feed. Most of this food is in multiple layers of packaging. The company uses manual and mechanised means to separate the packaging and prevent it from contaminating the stock feed.

Benefits of a circular approach:

The initiative enables:

- Over 175 New Zealand businesses to divert 30,000 tonnes a year of industrial food waste from landfill.
- Over 2,000 tonnes of cardboard, plastic, metal and wood is recycled.

Junk Run

What they do:

Junk Run sends junk to a better place. Whether commercial, construction or residential inorganic waste, it all goes through the Junk Run collection and recycle/redistribution system. This results in 70% of all waste collected being diverted from landfill. Every job has real time data collection and analysis, enabling the provision of detailed waste reports to help companies promote their own sustainability message and goals.

Benefits of a circular approach:

- 8007 cubic metres of waste diverted from landfill in the last 12 months.
- Examples of diversion include refrigeration panels from an Auckland commercial defit being utilised by a Waikato mushroom farm and industrial kitchen equipment used as community facilities.

Critical Design NZ

What they do:

Critical Design is a community-based organisation in Mount Roskill, Auckland, constructing high-value furniture out of local waste. It provides low-income students with resources and instruction on how to design and create. The revenue earned is distributed among its members.

Benefits of a circular approach:

- Creating high-value furniture products out of waste.
- Diverting recyclables from being sent abroad or to landfill.



Offcut

What they do:

Offcut produces hats made from off-cuts of fabric from a clothing manufacturer. This fabric would traditionally be disposed to landfill. With every hat purchased, Offcut plants a tree via one of its partner organisations.

Benefits of a circular approach:

- Reduction of waste to landfill from the fabric manufacturing industry.
- Offcut has produced approximately 1,500 hats, which equates to about 225kg of fabric diverted from landfill.

Helensville Community Recycling Centre

What they do:

The Helensville Community Recycling Centre is one of 12 waste collecting centres that are members of Auckland Council's Resource Recovery Network. Once sorted, any items that can be reused or upcycled are cleaned and sold at the centre's shop. The centre also hosts sewing nights, where volunteers use waste fabric to create reusable bags.

Benefits of a circular approach:

- Between July 2017 and February 2018 Helensville Community Recycling Centre processed 393,732 kg of waste with 73% diverted from landfill.
- Approximately 250,000 kg of this waste is recycled and 40,000 kg is resold.
- Anything that isn't sold is donated to local charities.

Resource Rescue

What they do:

Resource Rescue recovers whiteware from Auckland's Inorganic Recovery Project, either repairing appliances for reuse, or recovering parts to be used in the repair of other appliances.

Benefits of a circular approach:

- 30 tonnes of appliances diverted from landfill
- 870 appliances refurbished/recovered
- \$200,000 generated in revenue



Green Gorilla

What they do:

Green Gorilla provides recycling and waste minimisation services, skips and bins, and waste management solutions for Auckland. The company's focus is to maximise recycling and diversion from landfill. This helps its customers achieve their own sustainability initiatives.

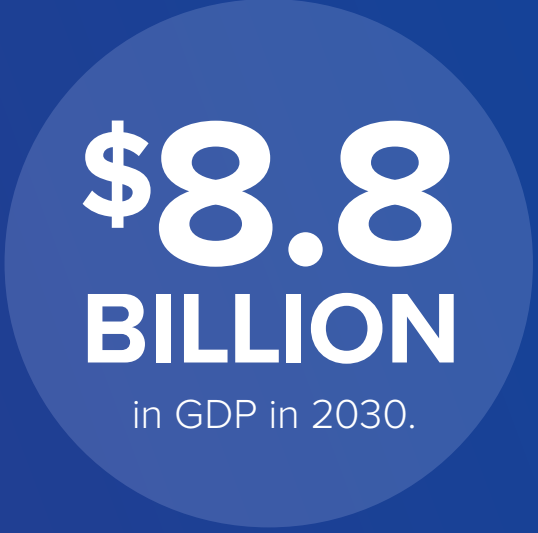
Green Gorilla's 2.7ha waste processing facility in Onehunga is dedicated to the recycling and processing of waste material. Initiatives include the recycling of waste plasterboard into gypsum for the agricultural sector, and the chipping of waste timber into biofuel for Golden Bay Cement as a replacement for coal.

Benefits of a circular approach:

- The Green Gorilla Waste Processing Facility diverts approximately 75% of collected construction waste from landfill.

The benefits – boosting the economy while cutting carbon emissions

Economic analysis indicates the economic potential for Auckland's transition to a circular economy could be up to an additional



\$8.8
BILLION
in GDP in 2030.

The initial analysis draws on research from overseas and applies it to the Auckland economy. This methodology suggests the opportunity ranges from \$0.8-\$8.8 billion. Further analysis of specific opportunities in Auckland, drawing on local data across just three sectors indicates a range of \$6.3-\$8.8 billion benefit to the economy – towards the upper end of the initial estimation.

The analysis also indicates that by transitioning to a circular economy the city could reduce carbon emissions (embodied and generated) by around 2,700 ktCO₂e in 2030 across the food, transport and the built environment sectors.

Six key levers

Previous analysis of the circular economy in New Zealand has been completed by the Sustainable Business Network. This identified six key drivers to overcome the barriers to this transition. They are:

Design for a circular economy rather than retrofit solutions.

It is fundamental that product and systems design incorporates 'circular' thinking, and avoids locking in linear pathways, from the outset. This means that, for example, products need to be designed for longevity, incorporating the ability to repair, upgrade, reuse and disassemble so at the end of life precious materials can be harvested and reutilised.

Businesses should look to partner with system thinkers and academic research institutions to refine and apply circular economy thinking to their sector.

Generate demand for circular economy solutions.

While pioneering organisations are gaining early mover advantage, current consumer demand for circular solutions is not sufficient to compel many organisations to change their

existing linear offerings. It is imperative that increased effort is made to make longevity, upgrading, repair and reuse a preferred choice among buyers. From a business-to-business perspective, 'end of life' solutions and a focus on 'whole of life' costs as opposed to initial cost need to be core parts of procurement policies.

As well as actively and creatively promoting the circular economy within their own sectors, businesses should support the continuing role for non-government organisations to raise awareness on issues in the current economic system and promote circular economy solutions.

Develop the infrastructure required to support a circular economy.

Even if a product is designed for circular economy product stewardship, New Zealand's geographically dispersed and relatively small population means the infrastructure for making this possible does not always exist.

Businesses should invest in co-operating and collaborating with other organisations to create the necessary infrastructure.

Adopt new circular business models.

In particular, business models that move the customer away from ownership are crucial. In 'product as a service' business models the manufacturer retains ownership of the product while in use with the customer. In the sharing economy business model, underutilised assets (e.g. cars) are shared, further encouraging customers to rethink the need for 'ownership'.

Harness new technology, including 3D printing, Internet of Things and Artificial Intelligence.

Fast emerging technology is creating new opportunities to facilitate the shift to the circular economy. The internet has helped to enable the sharing economy. The emergence of 3D

printing is facilitating local production to order, as opposed to mass production for prospective orders. In addition, 3D printing has the ability to prolong product life cycles with printed spare parts. A better understanding of how organisations can incorporate such technology into their businesses is key to gaining the scale required to realise the benefits.

Develop the required enabling policy.

Understanding and implementing the right policies is crucial to achieving a circular economy. The linear economy still dominates. Appropriate new rules will be required to at least level the playing field and mainstream this transition.

How to make it happen – the enabling factors

Analysis of the Sustainable Business Network's work to date, together with a workshop and interviews with stakeholders across Auckland's economy, indicate the following thinking and actions are fundamental across sectors to enable the transition to a circular economy.

Think and operate in systems

A fundamental approach businesses need to adopt, quickly, is to both think and operate in 'systems', based on an applying an understanding of the relationships between a system's constituent parts and the way they work within larger structures.

"Think like a system, act like an entrepreneur."

*Rowan Conway,
RSA, London¹⁵*

We need to redesign how materials flow through the city. This can only be done successfully if the whole system is considered. Co-ordination and collaboration is required. Potential unintended consequences need to be avoided and waste across the system needs to be eliminated, not just moved up or down the value chain. A systems approach recognises that no one organisation has the power to shift a system, let alone an economy. This approach creates the platform and necessity to purposefully collaborate to develop circular solutions.

A good example of a systems approach in action is the way Air New Zealand's catering partner LSG Sky Chefs and the Ministry for Primary Industries worked together on inflight waste¹⁶

The initiative has enabled 40 Air New Zealand inflight products, that were previously sent to landfill for biosecurity reasons, to be reclassified. They can now be reused on future flights if removed from aircraft sealed and untouched. The initiative is expected to be able to reuse 150 tonnes of products a year.

¹⁵ [From Design Thinking to Systems Change: How to invest in innovation for social impact](#), RSA, 2017

¹⁶ [Air New Zealand leads the way with inflight waste](#). Press Release, October 2017

Reset procurement

The way organisations procure goods and services profoundly influences the marketplace.

Procurement criteria need to evolve. They must enable more circular solutions to be competitive by demonstrating their value. The focus of procurement should be on whole of life costs, rather than just initial purchase cost. This would mean solutions with longer life cycles could compete more effectively with solutions with less longevity but lower initial costs.

End of life solutions must play a greater role. If the supplier doesn't provide any end of life solutions, the customer often bears the cost of disposal. On the other hand, putting responsibility for end of life on the supplier puts responsibility where it is most effective.

It provides the motivation and incentives for suppliers and manufacturers to design out waste in the product, or design feedback loops that maximise the value of the materials.

Sustainable procurement, or smart procurement, is the emerging best practice. It reimagines the purpose of procurement as delivering value for the whole organisation, embedded within society and environment. It's not just about securing goods and services at minimal cost. It's about mitigating risks, uncovering inefficiencies, contributing to brand and messaging, and building collaborations with suppliers to drive innovation.

If properly mandated, procurement teams can contribute to the circular economy in various ways. They can buy fewer, better and longer lasting products. They can use services instead of products wherever possible. They can tender and contract on outcomes rather than outputs. They can showcase the organisation's values through careful choice of suppliers and continuing procurement-led innovations.

- The quality of the furniture Vero selected during a refurbishment 18 years ago enabled Junk Run to reallocate 98.4% of it to communities in need rather than landfill when it came to changing it.
- Auckland Council is a procurer of \$4 billion worth of goods and services each year. This makes it an obvious candidate for championing progressive, mature approaches to procurement that progress us towards a circular economy.
- Fuji Xerox and Interface products are specifically designed for recovery, reuse and, ultimately, to be recycled at the end of life.

Make circularity desirable

Demand for more circular solutions needs to be stimulated.

A product may have a long life cycle, repairability and full supplier-provided end-of-life solutions. But it won't sell unless its core function is at least as good as its linear competitors and its proposition resonates with customers.

Businesses providing circular solutions should harness successful communication and marketing techniques for their circular economy related messages and make circularity *desirable*.

Imagine if the hugely influential Apple brand had embraced circularity as part of its design ethos. It would mean incorporating more modular design elements to facilitate upgrades of elements of an iPhone, such as the camera, rather than encouraging the replacement of the whole phone (as per the modular [Fairphone](#)). The electronic device sector would have a very different landscape to the one we see now.

Utilising an association with sport is a route that resonates with mass markets. Auckland has recently seen how the Volvo Ocean Race's visit to Auckland provided a communication platform for the issue of plastic in seas.

Adidas harnessed the global popularity and influence of the Real Madrid and Bayern Munich football teams to promote its range of sports equipment made from waste plastic in collaboration with Parley.

Identifying and harnessing the influencers in Auckland across sport, the arts and media could help make circularity desirable.

The recently launched 'Bags Not' campaign to encourage shoppers not to use plastic bags utilises the likes of Dick Frizzell and Jaquie Brown to communicate the message.

Fund the transition

Investment and funding signals to business still often favour adherence to the linear economy.

We need to level the playing field and access targeted investment for circular solutions.

Existing ways of doing that include the Waste Minimisation Fund (national), Waste Levy funds distributed by Auckland Council (Waste Minimisation and Innovation Fund), and Callaghan Innovation. In March 2018 the Ministry for the Environment began requesting applicants to the Waste Minimisation Fund highlight how their projects accelerate New Zealand towards becoming a circular economy.

There is also a major role for impact investing. This where investments are made on the basis of social and environmental outcomes as well as financial gains. Ensuring this investment sector continues to grow and Auckland entrepreneurs can access such investments is crucial. Organisations such as Ākina Foundation and the Icehouse have a key role to play in this.

Share knowledge and develop skills capability

A circular approach is new to many organisations. Couple this with rapid advancements in technology, and a knowledge and skills gap exists.

Simple methods of bridging this gap include platforms for sharing knowledge and case studies. The Going Circular category of the 2017 NZI Sustainable Business Network Awards, sponsored by Auckland Council, is an example of both. In its first year it attracted the highest number of entries of any category in the 15-year history of the awards. The online platform and regular learning and networking events of the Circular Economy Accelerator are other examples of ways to bridge the knowledge gap.

Engaging with programmers will leverage new digital technology. This could take a 'hackathon' approach. This is where programmers and other experts tackle specific challenges in limited timescales. This could be facilitated through collaboration with education institutions already engaging businesses such as Unitec's Tech Futures Lab and Auckland University's Centre for

Innovation and Entrepreneurship. An example is the Auckland Climathon weekend, involving Vector.¹⁷

An open source approach can enable common knowledge platforms from which businesses can innovate. For example, the sharing economy requires new types of insurance or leases to accommodate multiple, rather than single, users. An open source template would mean innovation can occur through the user experience, avoiding unnecessary administration.

Platforms like backofanapkin.co.nz and Simmonds Stewart are used by start-ups and can provide inspiration for how simple and accessible shared templates can be.

¹⁷ [Auckland Climathon 2017](#), Vector, October 2017

Use data

Making data influential and actionable is central to advancing the circular economy in Auckland.

Businesses need accurate data around material flows and losses of value to incentivise and enable investment in the circular economy. How much of a particular material is being wasted, when is it happening and what is its value?

An open source platform that collects waste data from organisations would be a starting point for making better collective decisions around waste. This could then be used to help map material flows through the city.

There are several companies here in NZ exploring the use of the Internet of Things, combined with artificial intelligence and/or Blockchain technology. The [Cacophony Project](#) in Akaroa has built a prototype for identifying and killing predators to assist with the Department of Conservation's national target to become Pest Free by 2050.

[Litterati](#) is a platform that turns crowd-sourced Instagram photos of litter into GPS data points, identifying problem items and locations to help influence companies to eliminate them.

Set the rules to enable the transition

Appropriate national policy can ensure the benefits of a circular economy can be achieved sooner rather than later.

A fundamental fiscal measure that is often first cited by businesses is an increase in the Waste Levy. An analysis of the effect of possible changes to the waste disposal levy last year indicated that increasing the levy from \$10 per tonne to \$140 per tonne could deliver up to \$500m in net benefits to the economy each year and create up to 9,000 jobs.¹⁸

Banning or severely restricting the most troublesome materials, like micro beads or single use plastics, could help to focus innovation on circular economy solutions. Compulsory product stewardship for certain sectors could have a similar effect.

Other fiscal measures, such as a change in the GST structure for

circular products, would also be very influential. The European Commission, for example, is considering changes in tax laws to allow lower or zero VAT [GST] rates for products with recycled content. This is intended to boost the demand for recycled materials.

A comprehensive analysis across sectors to determine priority areas and the sector specific issues would be required.

¹⁸ [A Wasted Opportunity: Using the waste disposal levy to create economic & environmental advantage for Aotearoa, Eunomia, 2017](#)

A sector focus

Three key sectors have been selected for high level analysis based on their significance to Auckland and ripeness for transitioning to a circular economy.

1. Food

**2. Transport
and logistics**

3. Construction



Food

The Food and Beverage sector constitutes approximately 4% of Auckland's GDP.¹⁹

Food waste in the city represents a significant proportion of the organic waste, representing around 19% of total waste to landfill by weight in 2016 – 137,000 tonnes from domestic waste and 168,000 tonnes from commercial sources. It is the largest contributor to greenhouse gas emissions of all waste materials sent to landfill.²⁰

One third of food produced for human consumption is lost or wasted globally, which amounts to about 1.3 billion tons per year.²¹

Food is lost or wasted throughout the supply chain, from initial agricultural production down to final household consumption. This represents an inefficient use of land, water, energy and other inputs as well as unnecessarily increasing costs and greenhouse gas emissions.

It presents an enormous opportunity for transitioning to a circular economy.



Photo credit: Todd Eyre

¹⁹ [Overview of Food and Beverage Sector of Auckland](#), ATEED

²⁰ [Draft Auckland Waste Management and Minimisation Plan](#), Auckland Council, 2018

²¹ [Key facts on food loss and waste you should know!](#) Food and Agriculture Organization of the United Nations

Current status

There are already some noteworthy waste solutions happening in Auckland.

Designing out food loss and waste is continually a constant concern for growers, manufacturers and retailers. But there is limited evidence of co-ordinated collaborative approaches across the value chain to tackle the systemic barriers to a circular economy in food.

This would go beyond cutting waste in one organisation by just passing it up or down the value chain, into a circular economy approach to the sector as a whole.

- Commercial organic collection services, such as the one offered by We Compost and the extension of domestic food waste collections by Auckland Council are returning nutrients to the soil.
- Significant proportions of commercial food waste are being processed into animal feed by companies like EcoStock, or rendered into tallow and other products.
- The commercialisation of 'ugly fruit' (fresh produce still fine to consume but with visual defects) is a welcome addition to our supermarket shelves.
- Reducing post-consumer waste is being addressed by the Love Food Hate Waste campaign.
- Household food waste collection services are being rolled out by Auckland Council.
- Proactive community-based action is being facilitated by the likes of The Compost Collective.
- Biogas from Auckland's waste water is being used to power the Mangere and Rosedale treatment plants. The plants aim to be electricity neutral by 2025.²²
- Green Spot Technologies converts fruit and vegetable by-products into high value-added food products.
- Greater amounts of non-sellable edible food waste, previously being sent to landfill, are being distributed by the burgeoning food rescue sector with Kiwi Harvest being the key charity organisation in Auckland. Of course the growth of the sector further illustrates the waste issues within the food system.

²² [Watercare plans to run treatment plants on biogas.](#) Bernard Orsman, NZ Herald, February 2016

Opportunities for business

A systemic cross value chain approach

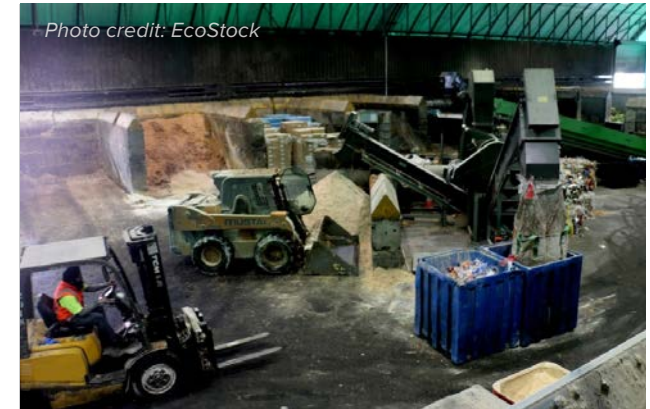
Courtauld 2025 is a UK-based voluntary agreement to make food and drink production and consumption more sustainable.²³ It is an example of what could be instigated in Auckland. At its heart is a 10-year commitment to identify priorities, develop solutions and implement changes at scale. Such an approach would simultaneously address demand management, specification, shelf life and customer behaviour.

Anaerobic digestion

This is a series of biological processes in which microorganisms break down biodegradable material in the absence of oxygen. Anaerobic digestion (AD) food waste plants have the potential to produce energy through biogas and fertiliser, and to operate at greater scale and scope than windrow composting facilities.

Windrow facilities are long rows of raw organic matter turned mechanically and manually.

AD plants can process a wider range of food waste like meat, which cannot be composted or used as feedstock. EcoStock has conducted a successful AD plant pilot in conjunction with Scion in Auckland.



Hospitality sector

A focus on Auckland's hospitality sector could prove fertile ground for circular economy gains. The business case for reducing food waste in hotels, for example, is compelling. On average hotels across 15 countries saved \$7 for every \$1 invested with 70% getting their money back in a year.²⁴

²³ [The Courtauld Commitment 2025](#), The Waste and Resources Action Programme (WRAP)

²⁴ [The Business Case For Reducing Food Loss And Waste: Hotels, Wrap, March 2017](#)

Food packaging

Packaging is a major feature of the food and beverage sector. It provides major opportunities to reduce food loss and waste. However, the current use of plastic packaging creates waste and environmental damage. Initiatives exist to increase the recyclability of packaging and reduce the use of single use plastic bags. But they only scratch the surface of what has become a major global issue.

The global packaging supply chain and regulators need to work to change this system. A new approach is required to rethink the entire manner in which materials are used within our economy.

The New Plastics Economy administered by the Ellen MacArthur Foundation (EMF) includes a plastics protocol, commitments from global brands and a systems approach to achieving those commitments. Working with EMF will be an opportunity for Auckland and New Zealand to deliver substantive change on this across the Asia Pacific region.

Key actions to catalyse change

1. Systems approach for the food sector involving the whole value chain
2. Investigation of benefits of Anaerobic Digestion plants
3. Implementing the global New Plastics Economy initiative in New Zealand to begin systemically tackling the issues associated with plastic packaging

Transport and Logistics

Auckland's transport and logistics sector contributes \$4,031m to Auckland's GDP, approximately 5%²⁵ But the transport system is high carbon, inefficient and unhealthy, similar to many large and growing cities worldwide.

Road transport is the largest contributor to Auckland's carbon footprint at 36% (2016).²⁶ In 2017 the economic productivity loss impact of congestion in Auckland was estimated at \$1.3 billion. Air pollution from motor vehicle use was estimated to contribute to 126 premature deaths in Auckland in 2006, with an overall social cost of \$446 million.²⁷

Vehicle ownership per capita in NZ is the highest in the OECD and rising. There are now approximately 770 vehicles per 1,000 people²⁸ and there are high levels of driver-only vehicle use, accounting for about 77% of peak hour trips in Auckland.²⁹



Photo credit: Todd Eyre

²⁵ [Industry Insights: Transport, Logistics, and Distribution](#), Westpac Institutional Bank, 2015

²⁶ [Auckland's Greenhouse Gas Inventory to 2015](#), Shanju Xie, October 2017

²⁷ [Benefits from Auckland Road Decongestion](#), NZIER, July 2017

²⁸ [2013 Census QuickStats about transport and communications](#), StatsNZ, 2013

²⁹ [Facts & Figures about automobile use in New Zealand](#), NZTA

Global research has indicated that a typical European car is parked for 92% of the time,³⁰ a figure that is likely to be similar in New Zealand. Regarding freight, New Zealand logistics company Freighthub estimates that on average nine out of every 20 trucks are running empty in NZ (i.e. 55% capacity).³¹

The Auckland transport and logistics sector is well positioned for a transition to a circular economy

From a transport perspective, there has been some meaningful progress in Auckland over the last decade, especially since unification created the Super City. But it has started from a very low base. The city has a vision of an integrated and low carbon transport system, and a clear strategy, but progress is slower than needed, especially given population growth. There are good examples of progress to increased circularity, but there are constraints in investment and limitations in policy settings and incentives.

However, the recent draft Government Policy Statement on Land Transport, and the latest Auckland Transport Alignment Project package provide the opportunity for a step change.³²

Infrastructure

Currently major transport infrastructure assets are generally designed with a whole-of-life cost focus, and so built for long life. There is inevitably some trade-off between upfront cost and the need for ongoing maintenance. Action is underway to address the high rates of construction and demolition waste from transport projects (including road building and maintenance).

The last decade has seen significant progress in public and active transport infrastructure. The Northern Busway, rail electrification and separated cycle-ways are all good examples. The City Rail Link and other planned developments will continue to improve the situation. But these networks are incomplete, and very significant ongoing investment is needed to accelerate the shift away from private car use. This will only be economical in areas with sufficient population density to enable public transport to be provided cost-effectively.

The New Zealand vehicle fleet

The average life of our private vehicle fleet has increased over recent years and is now 14 years.³³ This is positive from an asset use optimisation perspective, but there are negative implications for fuel efficiency, carbon reduction, and local air pollution. Typically there are high rates of recycling of our vehicles at end of life.

New transport technologies and business models are already emerging in Auckland, including electric vehicles of all kinds, shared use car and bicycle schemes, and artificially intelligent fleet traffic management.

³⁰ [Driving and parking patterns of European car drivers - a mobility survey](#), Joint Research Centre, 2012

³¹ [Future Freight Scenarios Study](#), Ministry of Transport, November 2014

³² [Government Policy Statement on Land Transport](#), Ministry of Transport, April 2018

³³ [Monthly Electric and Hybrid Light Vehicle Tables](#), Ministry of Transport, April 2018

Opportunities for business

A circular economy transport system maximises use of assets; uses renewable, low carbon energy; and has an end-of-life system that prioritises re-use or recycling of transport assets.

A 2017 OECD report³⁴ into the opportunities for shared mobility in Auckland estimated that carbon emissions and congestion would be halved if all private car trips were replaced with shared modes. It also noted the opportunity offered by a strategic approach using shared transport services on 'first mile, last mile' journey segments, connected with rapid transit nodes.

For Auckland this means:

- moving away from high levels of vehicle ownership³⁵ and sole occupancy vehicle use³⁶
- shifting to public transport, active transport, and shared use of private vehicles
- reducing the need for transport, for example through the use of ICT, and higher-density and centralised land-use developments
- ensuring that transport systems are powered by renewable energy, primarily through electric vehicles and supporting infrastructure

The rapid development of new technologies and innovative business models like mobility-as-a-service provides great opportunity for a shift to a circular-based transport system.

New materials and energy technologies are making a positive difference to Auckland's transport system. The shift to electrification of transport is underway, with modest uptake rates for electric vehicles,³⁷ including light vehicles and e-bikes. There is also increasing provision of charging infrastructure.

³⁴ [Shared Mobility Simulations for Auckland](#), International Transport Forum, November 2017

³⁵ [Monthly Electric and Hybrid Light Vehicle Tables](#), Ministry of Transport, April 2018

³⁶ [Data and Spreadsheets - Household Travel Survey](#), Ministry of Transport, 2003-14

³⁷ [Monthly electric and hybrid light vehicle registrations](#), Ministry of Transport, April 2018

- New lightweight materials are increasingly used in vehicle components, improving material use efficiency and in-use fuel efficiency.
- Integrated digital ticketing like AT Hop, with associated reduced fares, is facilitating public transport uptake.
- The new RideMate app, in Auckland,³⁸ a collaboration between NZTA, Auckland Council and Auckland Transport, offers users real-time information on different journey options.
- Traffic flow optimisation technology is contributing to more efficient use of the road network.
- Ride share apps like Smart Travel and Chariot offer potential to better utilise private vehicles. But, so far, ride share uptake is low, illustrated by the limited use of T2/T3 lanes by light vehicles and the persistently high rates of sole occupancy vehicle use.
- Car share pioneers like CityHop,³⁹ peer-to-peer car rental platforms like Yourdrive and bike share companies like NextBike and Onzo are all appearing on Auckland's streets, although scale is modest.
- The TNX freight matching platform technology used by Coda Group⁴⁰ is an example of how freight vehicles can be better utilised.
- Waste Management has opened New Zealand's first workshop dedicated to converting diesel trucks into electric vehicles.⁴¹

These examples offer promise. But uncertainties and challenges remain across the areas of policy, infrastructure, technology, and consumer acceptance. These include overcoming an embedded mindset of private vehicle ownership and many decades of inadequate investment in public transport.

The Sapere report suggests emissions from the road transport sector can be reduced by 40% by 2030, allowing for rebound effects. This assumes a range of circular economy opportunities are implemented, including car and ride sharing, material evolution, electric vehicles, systems integration and autonomous vehicles.

³⁸ [Mobility as a Service \(MaaS\) – the new revolution](#), NZTA
³⁹ [Car sharing](#), City of Sydney
⁴⁰ [TNX brings fresh technology to the New Zealand supply chain](#), Coda Group, August 2017

⁴¹ [New Zealand's first truck conversion workshop opens in Auckland](#), Waste Management, 2017

Key actions to catalyse change

A systemic shift to a ‘circular-based’ transport system will require deep collaboration between the public and private sectors.

Central and local government will have the key role. It is they who must provide an enabling policy environment and lead investment in and development of infrastructure. Businesses can directly and indirectly support the development of required policies and infrastructure. They also have a key role as producers. It is they who will develop ‘circular-based’ transport solutions to exploit new opportunities. They can also play a key role by prioritising the procurement of transport services in line with the circular economy.

Re-think your fleet management:

Replace some vehicle needs with shared vehicle and/or mobility as a service, fleet bicycles or e-bikes; provide alternative benefits to allocated vehicles; accelerate electrification of the residual vehicle fleet; and use biofuels during the transition.

Encourage sustainable commuting by providing alternative benefits to free or subsidised parking.

Support freight and delivery operators introducing services with low carbon features.

Construction

Auckland's construction sector represents \$4,194m, 5% of Auckland's GDP.⁴² Construction and demolition waste also represents Auckland's largest single waste stream, at around 40% of total weight going to landfill.⁴³ This doesn't include the greater quantities of rubble and concrete that go to cleanfill (uncontaminated sites where natural materials are deposited) and managed fill sites.

This is coupled with the ongoing growth of the sector due to consistent population growth. This means there is an obvious need and opportunity for the sector to move towards greater circularity.

However, circular economy principles at a systemic level have yet to gain traction across the sector. Instead the focus is on initial price and speed of construction, alongside

the bespoke nature of builds, particularly in housing. There are also a large number of small firms and contractors involved.

That said, there are some 'end of life' solutions. Green Gorilla has its own construction waste materials recycling facility. Diversion services are offered by the likes of Junk Run and Trow Group, re-distributing materials to communities instead of into landfill. There is also some

evidence that more coordination is happening across parts of the system to achieve more circular outcomes. Increasing use of 'integrated fit outs' for commercial buildings, allowing tenants to influence the fit out at the design stage, rather than retrofitting into a pre-designed and constructed space, being an example.



Photo Credit: Gareth Cooke/Subzero Images

⁴² [Auckland Growth Monitor](#), Auckland Tourism, Events, and Economic Development, October 2017

⁴³ [Draft Auckland Waste Management and Minimisation Plan 2018](#)

Opportunities for business

There is a need to change the fundamental way that we design and build in Auckland.

Buildings need to be designed and built through a circular lens to not only minimise waste and associated costs but to maximise value over the whole life cycle of the building.

From a designer perspective this will require advising the client on the benefits of a circular approach, considering the life cycle of buildings, the different 'layers' of the building and aligning appropriate circular design strategies. It will mean incorporating ease of maintenance and upgrades, as well as allowing for flexibility and deconstruction.⁴⁴

Material selection is crucial and designer specifications should include the supplier providing end of life solutions. Reuse opportunities need to be a factor in selecting materials.

From a client perspective, the key elements are understanding and recognising the benefits of a circular approach and 'resetting procurement' so it takes a whole of life view on investment.

Increasingly we are seeing signs that such disruption to the construction sector is coming. But there remains a need to increase incentives for minimising waste in the sector, and provide a more supportive platform for greater circular innovation. A significant increase in the waste levy and a requirement for waste plans to be submitted and monitored as part of the building consents process are two ways in which that could be rapidly achieved.

Prefabricated housing

Manufacturing homes off-site places the building process within a centralised system rather than spread across building sites. This can reduce waste, incentivise greater standardisation and enable efficiencies that reduce overall costs.⁴⁵ 3D printing may also offer opportunities in this area.⁴⁶ Those opportunities need to be balanced against the risk of low quality prefabricated homes being disposed of and replaced on relative short life cycles.

Problematic materials

Timber used in construction is required to be chemically treated in New Zealand. This means secondary use for off-cuts and deconstructed timber is severely limited. A different approach to ensuring durability of timber could unlock significant value and enable a reduction in landfill from the sector.

⁴⁴ [Top Tips for Embedding Circular Economy Principles in the Construction Industry.](#) The Green Construction Board

⁴⁵ [Why Prefab? PREFABNZ](#)
⁴⁶ [This House Can Be 3D Printed for \\$4,000.](#) Adele Peters, March 2018

New ecolabels for construction waste services

A lack of transparency about what happens to waste has been cited as a barrier to greater diversion from landfill. The New Zealand Ecolabelling Trust is researching and developing a specification for best practice construction and demolition waste services.

The intention is to build on work already done in this area. Criteria are being developed to meet the requirements of Green Star and other third party verifications. An ecolabel will provide confidence in good construction and demolition waste management practice and encourage innovation in the sector.

Product stewardship

A number of Ministry for the Environment accredited Product Stewardship schemes operate within the construction sector.

- 260,000 tonnes of waste concrete is generated in New Zealand each year. Envirocon enables wet waste concrete to be turned into a modular wall system, Interbloc.
- Resene's Paintwise scheme provides unwanted paint and paint packaging recovery services and education to minimise the impact of paint wastes on the environment.
- The Interface Re-entry programme converts old carpet to new carpet.

Housing construction

A 'Designing Out Waste' study found that in the construction of an average Auckland house selling for \$828,000, \$100,000 of the budget is wasted. This includes \$31,000 of materials, as well as labour inefficiencies like repeating incorrect work. An average of 2,000kg of timber waste and 700kg of plasterboard waste occurs in a typical house build. Typically 10% of ordered building materials are unused and disposed of as waste.

This is driven by:

- lack of awareness of waste
- lack of responsibility
- lack of consideration for waste minimisation in the design
- over-ordering
- methods of work resulting in offcuts
- mistakes

Key actions to catalyse change

Getting the most from building deconstruction

The Sustainable Business Network and AUT recently produced Activating Deconstruction and Reuse - reducing deconstruction and demolition waste.

This report outlines six key opportunities for enabling greater levels of deconstruction rather than demolition and for extracting greater value from buildings at the end of their life. This is based on effectively utilising the upper parts of the waste management hierarchy - reduce, reuse and recycle. Develop a network of outlets to distribute materials

1. Provide space to sort, both onsite and offsite at centralised facilities.
2. Establish product stewardship schemes for materials.
3. Make waste management plans compulsory and monitor for compliance.
4. Build in time to allow for deconstruction and associated activities.
5. Increase the Waste Levy to make waste diversion from landfill activities more competitive.

Civil construction

Civil construction provides a more immediate 'end of pipe' solution for some demolition waste streams, most obviously increasing the amount of recycled concrete that can be used in roading.

Short term

1. Provide an incentive for diverting construction waste from landfill via a significant increase in the Waste Levy
2. Stipulate waste plans as part of the consent process
3. Increase the specification for the percentage of recycled materials that can be used in road building

Longer term

1. Incorporate circular economy principles in building design and processes
2. Move to more off-site, standardised construction methods
3. Address key current waste streams, identify the causes of the problem and instigate appropriate plans to resolve e.g. the chemical treatment of timber

Conclusion

This report is an important step down a path that Auckland is already on.

New Zealand's biggest city must make the journey to a circular economy as soon as possible if it is to continue as a competitive business hub. That voyage is inevitable; all that is yet to be seen is the pace at which we make it.

Thankfully, the benefits of making this transition are as clear and obvious as the fact that it will occur. And New Zealand has the competitive advantage of a vibrant indigenous business culture to inform and inspire this transition.

The benefits are mounting up, but so are the costs of not proceeding.

There is already a lot of good work happening in this area. But what Auckland needs now to accelerate its move into a circular economy is a systemic, whole economy approach to coordinate, stimulate and, if necessary, regulate this work.

Businesses not already on or considering the transition need to start now.

Deeper study and analysis will be necessary. But the \$8.8 billion opportunity identified in this report can be realised. Businesses that move first and fastest are those most likely to gain a greater share of the prize.

Acknowledgements

Thank you to the partners and contributors of this report.

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Funding Partner

Auckland Tourism, Events and Economic Development (ATEED)

Funding Support Partners

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Disclaimer

This report has been produced by a team at the Circular Economy Accelerator (part of the Sustainable Business Network) by building on existing work analysing contributions from stakeholders listed in the acknowledgements. Their participation does not necessarily equate to endorsement of the report's contents or conclusions.

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