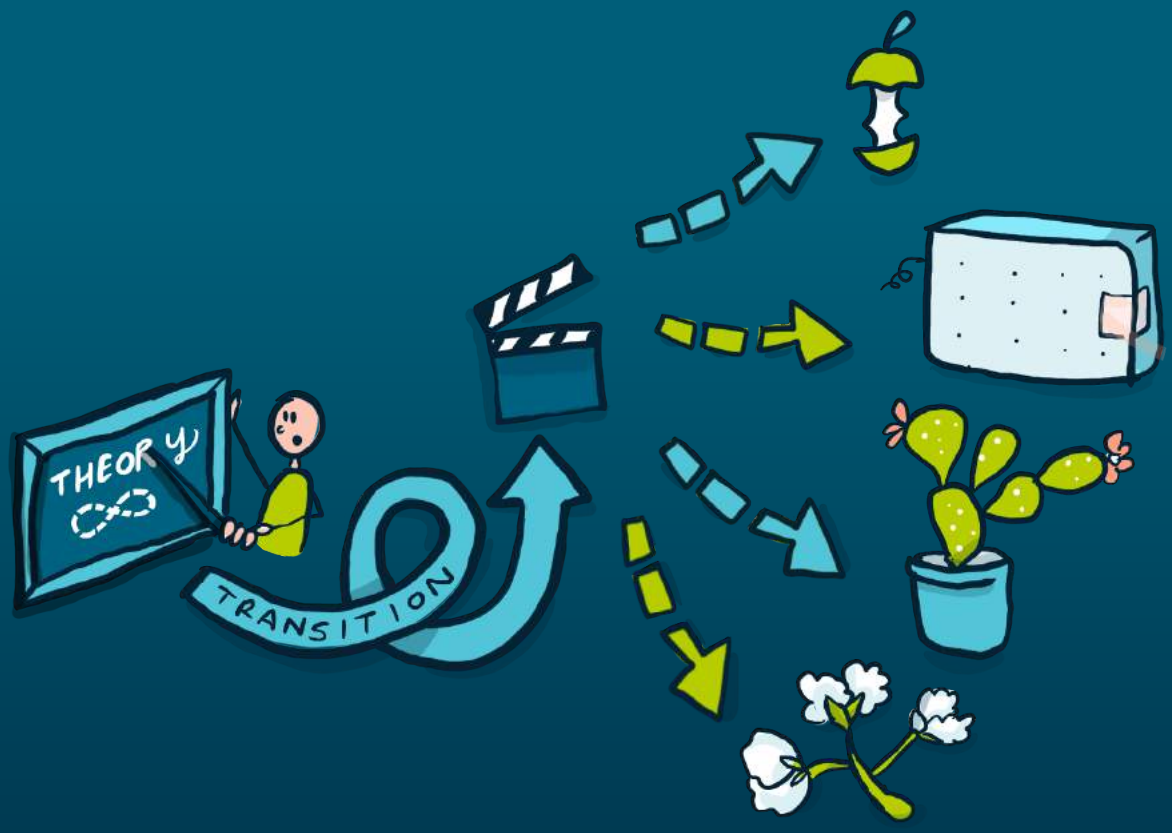
TRANSITION 2 ACTION



Queensland Government

This initiative is supported by the Queensland Government

Acknowledgment of Country

We acknowledge the first and continuing custodians of this country, Queensland, the ground upon which we collectively work, create, adventure, live and dream.

We recognise the continuing connection to lands, waters and communities. We pay respect to Aboriginal and Torres Strait Islander cultures; and to Elders past, present and future.

It's clear that the essence of the circular economy — understanding the interconnectedness of everything, and building cycles of continual regeneration — have long been found in Indigenous cultures.

There is much western organisations can learn from Indigenous businesses and communities, such as how to support relationships with living systems, transmit knowledge through generations, and think in systems for the long-term.

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coreo
TRANSITION 2 ACTION

TRANSITION 2 ACTION

SECTION 1

EXECUTIVE SUMMARY

Objectives & Impact

Executive Summary

TRANSITION TO ACTION (T2A)

Transition to Action (T2A) is a collaborative program between ourselves, Coreo, the Queensland Government's Department of Environment and Science (DES) and the local people of two Queensland regions, Goondiwindi and Cairns.

The primary objectives of T2A

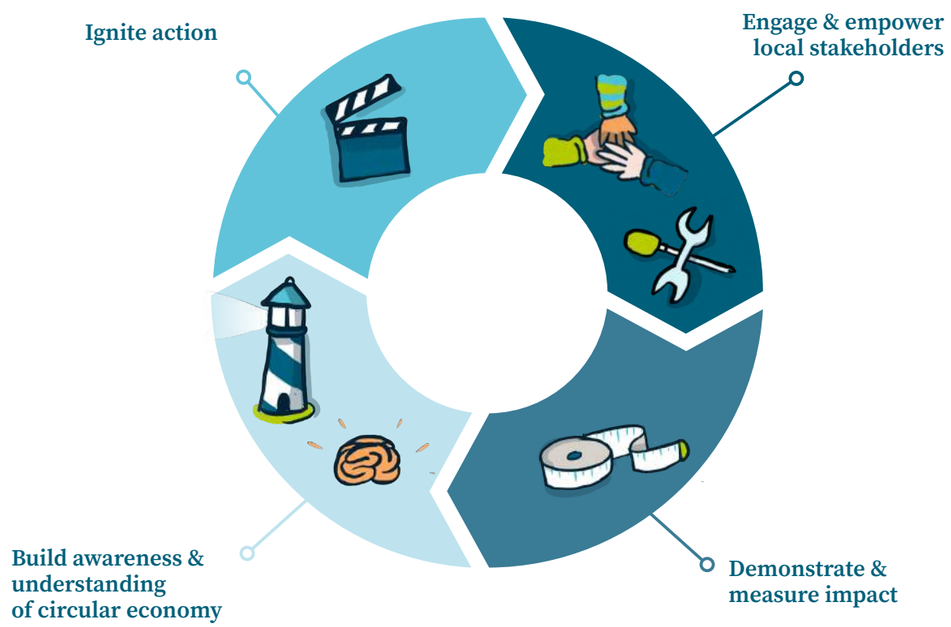
- Build awareness & understanding of the circular economy
- Ignite action
- Engage & empower local stakeholders
- Demonstrate & measure impact

The T2A journey began in December 2019 when we visited Cairns and Goondiwindi to listen and learn.

Through these conversations we were determined to understand the challenges people faced in their regions but equally we wanted to understand the strengths and opportunities. From these conversations, our team together with local stakeholders, identified and developed a suite of six initial project concepts, three in each region.

In February 2020, we travelled back to the regions to advance each project concept by creating key working groups, developing project outlines, assessing the viability, and defining how to measure the impact of each project. However, due to the sudden and devastating effects of COVID-19 on the tourism industry, two of our six projects were unable to continue as the key stakeholders had to focus their resources to the covid crises.

Figure 1. The primary objectives of T2A



From March 2020 until the present we have continued working with our key stakeholders to further develop four circular economy projects:

CIRCULAR COTTON

In collaboration with major Australian retailers, key industry bodies, a soil scientist, a local cotton farmer and local Goondiwindi businesses we have developed an alternative solution for end-of-life cotton garments. In this project we will divert cotton garments from landfill and direct their inherent value (carbon) back into the soil. Through scientific analysis we have confirmed that when the end-of-life cotton garments are applied to the soil they sequester carbon and improve overall soil health. In April 2021, 3000 end-of-life cotton garments will be returned to the soil on a cotton farm in Goondiwindi which will save 2,250 kgs of CO_2-e and validate this solution at a commercial scale.

INDIAN FIG

Through an innovative, strategic and future focused approach we are pioneering the development of a fast growing non-invasive cactus, *Opunita Ficus Indica* (Indian Fig), as a high value commodity for Queensland. Goondiwindi, like many other regional farming areas in Australia, is facing worsening conditions such as degrading soil quality, and prolonged drought. Sustainable crop diversification is needed.

With co-investment from the Department of Agriculture and Fisheries and collaboration with Woods Group and an Indian Fig specialist we have validated that the Indian Fig has a threshold for extreme conditions making it suitable to non-productive and marginal lands. It requires minimal inputs for cultivation and produces both a fruit and vegetable. Additional uses include a year round biomass energy source, pharmaceuticals, leather, cactus water, and stock feed.

COMMUNITY FOOD WASTE DIVERSION

In Goondiwindi, there is currently no solution in place for local businesses to avoid sending their food waste to landfill. Some may call this low hanging fruit but during our numerous visits to Goondiwindi this challenge was something that the businesses desperately wanted a solution for. Not only is there value in diverting food waste from landfill, there is also significant opportunity to build upon Goondiwindi's current infrastructure and strong social fabric. This project aims to implement a closed loop circular economy solution whereby food waste from local businesses will be collected, processed and used to create a higher value product for use by the Goondiwindi community.

MATTRESS RECYCLING

Mattresses, at their end of life, are currently treated as if they have no value with approximately 1.6 million being sent to landfill each year in Australia. Mattress recycling can reduce costs to councils, reduce environmental impact, create local jobs and capture the value of materials. Through the mattress recycling project we are working with Endeavour Foundation, a local social enterprise and a multinational brand to establish a mattress recycling facility in Cairns where we aim to recover the value from approximately 8,000 mattresses that are currently landfilled every year.

Each project's development pathway was unique, covering scientific analysis, business case formation, market validation, establishing strategic partnerships, gaining co-investment and developing pilot projects.

To measure the impact of T2A we engaged ROOY, a Brisbane based impact measurement company. ROOY has combined outcome-driven measurement with leading technology to create a platform that provides real-time impact dashboards.

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For T2A, ROOY measured the potential of each project to create jobs, reduce carbon emissions and increase knowledge of the circular economy, as well as the economic and environmental benefit to both the Goondiwindi and Cairns regions.

To view the live dashboard that will continue to display the real time impact of the T2A program **click here.**

The T2A program has delivered a direct positive impact for the local people, businesses and economies of Cairns and Goondiwindi.

Key highlights of the current and projected impact include:

In just eight short months we have engaged with more than 140 stakeholders directly and have reached close to 40,000 people through our T2A social media engagement. With every engagement we have built awareness and understanding of the circular economy and the opportunities it can provide. For the people engaged in the T2A program, 80% have stated that their behaviour has changed positively as a result of their newly garnered knowledge on the circular economy. The impacts of each project are testament to the value of programs like T2A that stimulate and develop sustainable regional economies.

Although the formal phase of T2A has now wrapped up the momentum that the Queensland Government catalysed will be continued. Coreo will continue to work with the local businesses who are driving these projects to dedicate time, resources, and expertise to ensure the impact is realised. Coreo will provide quarterly progress updates to the T2A steering committee to October 2021.

This report provides an overview of the journey to date; the engagement sparked; and each of the four projects. In addition, this report will also provide insight into the impact of the T2A program and each project's potential to create jobs, reduce carbon, and create value for regional Queensland communities.

From little things . . . big things grow.

We are excited about the opportunity each of these projects provide to scale up and support Australia's transition to a circular economy.

To see calculations please visit **live dashboard**

TRANSITION 2 ACTION

SECTION 2

WHAT IS THE CIRCULAR ECONOMY?

The Principles & Business Models

Circular Economy

The current economic system is linear - take, make, waste. Resources are extracted which are then transformed into products via the use of labour, energy, and capital, and then, soon after their use, these products are thrown away.

Every time a product ends up in landfill, not only are the physical resources that it is made up of lost, but also all of the time and energy that went into its creation and the value it could have thereafter.

In the linear economic model, communities are divided up and all elements separated out so as to focus on specific activities and achieve economies of scale - housing all in the residential area, factories in the industrial zone, food production in farms and so on - disconnecting the system and increasing negative externalities such as increased costs and carbon emissions from lengthy logistics networks.

In contrast, the circular economy is about integration so as to enable feedback loops and synergies. It is an economic model that is designed to be restorative and regenerative.

The model recognises the importance of the economy needing to work effectively at all scales – for large and small businesses, for organisations and individuals, globally and locally.

Transitioning to a circular economy does not only amount to adjustments aimed at reducing the negative impacts of the linear economy. Rather, it represents a systemic shift that builds long-term resilience, generates business and economic opportunities, and provides environmental and societal benefits.

The model distinguishes between technical and biological cycles.

Consumption happens only in biological cycles, where food and biologically-based materials (such as cotton or wood) are designed to feedback into the system through processes like composting and anaerobic digestion.

These cycles regenerate living systems, such as soil, which provide renewable resources for the economy. Technical cycles recover and restore products, components, and materials through strategies like reuse, repair, remanufacture or (in the last resort) recycling[1].

The circular economy concept isn't new, the practice of a circular economy is akin to how Indigenous peoples have lived in harmony with Country for millennia and also how our great grandparents lived with a strong emphasis on community, never wasting anything and building things to last.

The circular economy has **three guiding principles** and **five supporting business models** which provide a tangible and practical tool kit to achieve impact across social, economic and environmental realms.

Simply put, the circular economy is a new way of looking at the relationships between markets, customers and natural resources.

"The circular economy isn't about one manufacturer changing one product, it is about all of the interconnected companies and governments that form our infrastructure and economy coming together... it's about rethinking the operating system itself"

Dame Ellen MacArthur
Ellen MacArthur Foundation

Linear Model

Recycling

Circular Economy

1 https://www.ellenmacarthurfoundation.org/circular-economy/concept

THREE CIRCULAR ECONOMY PRINCIPLES

Design Out Waste & Pollution

Keeping products & materials at their highest value for as long as possible

Regenerating natural & social systems

FIVE BUSINESS MODELS

Resource Recovery

Leverage technology to recover and reuse resource outputs. Aim to eliminate material leakage and maximise economic value.

Circular supplies

Replace traditional material inputs with bio-based, renewable, or recovered materials. Reduce demand for virgin resource extraction in the long run.

Sharing platforms

Sharing of under-utilised products can reduce the demand for new products and their embedded raw materials.

Product life extension

Extend the life cycle of products and assets to ensure they remain economically useful.

Product to service

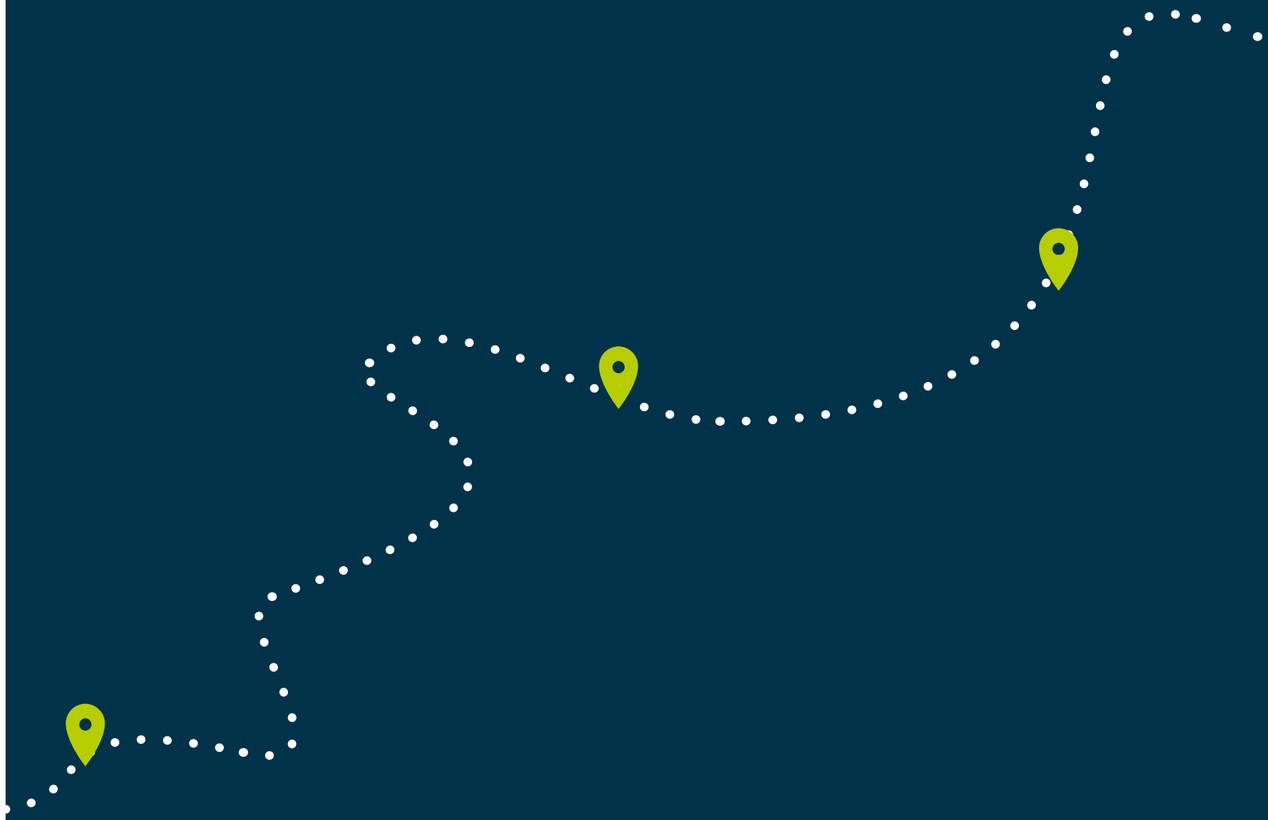
Customers use products through a lease or pay-for-use arrangement versus the conventional approach to ownership.

TRANSITION 2 ACTION

SECTION 3

THE JOURNEY

Where, why, what and who



Our Collective Journey

WHERE DID WE START?

Over the last three years, Coreo has been working with the Queensland Government's Department of Environment and Science (DES) to support the government's increased focus on the transition to a circular economy.

In 2018, we contributed to building Queensland Government's understanding of the impact and value from transitioning to a circular economy. In 2019, we co-designed and delivered the Circular Economy Lab[2], an initiative supported by DES, which was a unique multi-party co-innovation program that brought together 27 organisations in a pay-to-play model to co-create and commercialise circular economy solutions. Building from the success of the Circular Economy Lab.
Coreo was reengaged to deliver circular economy outcomes for regional Queensland communities.

Queensland's regional communities are facing tough challenges such as drought, digital access, unemployment and declining populations, however, these communities also benefit from having a strong social fabric and the ability to innovate and collaborate which are both key enablers of a circular economy. To select the regional communities and assure appropriate governance of the T2A program, a steering committee was established with members from multiple Queensland Government departments and two representatives from the Communities in Transition Program. Based on a range of quantitative and qualitative factors Cairns and Goondiwindi were selected as the pilot locations for the T2A program.

2 https://circularecolab.com/

WHY DID WE DO IT?

Because for three years we have been at the forefront of actioning the circular economy and from this experience we recognise the significant social, environmental, and economic value that it can provide.

But it's not easy. It takes time, investment, and courageous leadership. Fortunately for the T2A program, these were all things our stakeholders brought to the party.

The primary objectives of T2A were to:

- Build awareness & understanding of the circular economy
- Ignite action
- Engage & empower local stakeholders
- Demonstrate & measure impact

WHAT DID WE DO?

PHASE 1

Community engagement

First and foremost we listened to and learned from the communities. We know that to truly deliver meaningful outcomes we need to address real challenges and create relevant opportunities. In late 2019, during our first visit to Goondiwindi and Cairns we met with over 40 local stakeholders, from farmers to councils; universities; not for profits; local businesses small and large. We had many conversations over many cups of tea to understand what the key challenges were for each region; what people were frustrated with; and also what they were positive about. This engagement, coupled with extensive research regarding the unique contextual factors of each region, informed the development of the initial project opportunities. From this process 12 circular economy project opportunities were identified.

PHASE 2

Project refinement

We then evaluated the project opportunities against five key project criteria including each project's desirability, feasibility, viability, circularity and the use of circular economy business models. In addition, we also undertook further regional stakeholder engagement to identify system linkages, and the enablers and blockers of each project. From this evaluation our team, together with local stakeholders and the T2A steering committee, refined the list of project opportunities down to a suite of six project concepts, three in each region.

PHASE 3

Action stations

In February 2020, we travelled back to the regions to advance each project by creating key working groups, developing project outlines, assessing the viability, and defining how to measure the impact of each project. Although we intended to progress six projects, due to the sudden and devastating effects of COVID-19, two of the projects could not continue as they are related to tourism in Cairns.

From March 2020 until the present we have continued working with our key stakeholders to further develop four circular economy projects:

1. **Circular Cotton**
2. **Indian Fig**
3. **Community Food Waste diversion**
4. **Mattress Recycling**

Each project's development pathway has been unique, covering scientific analysis, business case formation, market validation, establishing strategic partnerships, gaining co-investment and developing pilot project implementation plans.

WHO DID WE MEET?

The list is long!

During the T2A program, we met personally (or virtually) with more than 140 stakeholders, everyone from Local, State and Federal government representatives, local businesses, from large multinationals to small mum and dad shops, farmers, not for profit organisations, Traditional Owners, universities, youth and schools.

We often say that in a circular economy you can't do it all and you can't do it alone so it was crucial for our team to ensure that everyone was taken along the journey.

WHAT'S NEXT?

Although the formal phase of T2A has now wrapped up the momentum that the Queensland Government catalysed will be continued.

All four projects are now either at the start up or pilot phase and Coreo will continue to work with the local businesses who are driving these projects to dedicate time, resources, and expertise to ensure the potential impact is realised. ROOY has committed to measuring the impact of the T2A program to October 2021. A quarterly progress update will be provided to the T2A steering committee to keep all parties up-to-date on the progress and impact of the projects.

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Our
Collective Journey

PHASE 1

Coreo meets Cairns
and Goondiwindi

WHAT DID WE DO?

February 2020

Created key working groups, developed project outlines, defined how to measure impact of each project

PHASE 2

Project
refinement

March 2020

Developed four circular economy projects

PHASE 3

Action Stations
Delivering four circular economy projects

WHAT'S NEXT?

**From little things...
big things grow.**

" well that was unexpected..."

In March we were ready to kick off our third visit to the regions when Covid19 stopped all travelling plans. We did a quick impact assessment of the six projects. Four projects were able to continue, albeit with some delay. In particular, our key stakeholders in Cairns were heavily impacted by Covid19 and this meant we could not continue with two of the envisaged projects.

TRANSITION 2 ACTION

SECTION 4

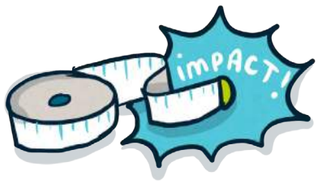
MEASURING IMPACT

Our partnership with ROOY

Measuring Impact

Impact measurement creates meaningful insights and provides accountability to investments.

To measure the impact of T2A we engaged ROOY, a Brisbane based impact measurement company. ROOY has combined outcome-driven measurement with leading technology to create a platform that provides real-time impact dashboards. For T2A, ROOY measured the potential of each project to provide meaningful outcomes for Queensland communities.



ROOY

WHY - ROOY

By providing insight into the financial and non-financial value that projects create, ROOY aims to enhance organisational decision-making and foster collective action on the world's most pressing challenges.

HOW - THE ROOY OFFERING

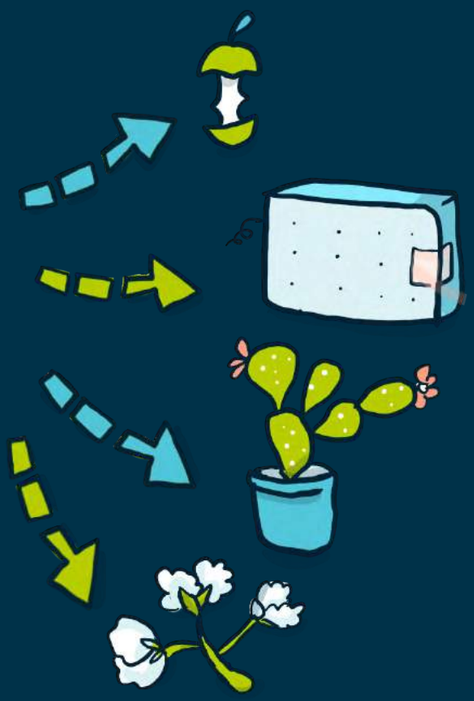
ROOY has combined outcome-driven measurement with leading technology to create a platform that provides leaders with real-time impact dashboards. Streamlined impact measurement and management enhances decision-making, drives staff engagement, facilitates impact-driven communication, attracts investment and much more.

In this report we will show the way the impact of the four projects will be measured over the next 12-18 months. These snapshots of the dashboard show where the impact will be generated once the projects have been realised.

To view the live dashboard that will continue to display the real time impact of the T2A program **click here.**

TRANSITION 2 ACTION

SECTION 5
PROJECTS



Project
Requirements

To ensure that the selected T2A projects have lasting economic, social, and environmental impact five key project requirements were established.

DESIRABLE

The project is supported and led by local stakeholders with a focus on delivering meaningful local outcomes.

FEASIBLE

The project can be delivered with the available resources, expertise, and investment.

VIABLE

The economics of the project provide a return on investment in a time frame that is palatable to the lead stakeholders.

CIRCULAR

That the project incorporates one or more of the three circular economy principles.

CIRCULAR BUSINESS MODELS

That the project applies at least two of the circular economy business models.

Circular
Cotton

Circular Cotton

CHALLENGE

Every year approximately 500,000 tonnes of textiles end up in Australia's landfills.

Fashion is becoming increasingly disposable, with almost a quarter of Australians admitting to throwing away clothes after just one wear[4]. Only a small portion of clothes are suitable for resale and although technology is being developed to recycle textiles these solutions alone are unlikely to curb the scale of the problem.

Finding a cradle to the grave solution could benefit soil health on cotton farms and potentially improve Australia's carbon poor soils[3].

MODELS & PRINCIPLES

OPPORTUNITY

Cotton is one of the primary agricultural industries in Goondiwindi providing the region with economic growth, jobs, and a sense of identity.

However, the cotton industry has not been without its challenges. An unpredictable climate with periods of drought and rising cost of production has seen innovation and tenacity drive efficiencies in the cotton industry.

On our first visit to Goondiwindi, we were introduced to Sam Coulton, who has been farming cotton for 40 years on his "Alcheringa" farm and is the owner of Goondiwindi Cotton, a fashion brand. Sam shared with us his story including his unwavering dedication to providing opportunities for the people of Goondiwindi and his capacity to pivot and diversify his business as needed to thrive and at times just survive.

Sam's community spirit, willingness to innovate, and his industry knowledge provided the perfect opportunity to link one end of a supply chain (cotton growing) with another end (waste textiles) to address two systemic challenges within our current linear economy whilst providing local opportunities for Goondiwindi.

KEY STAKEHOLDERS & THEIR ROLES

Goondiwindi Cotton
Key sponsor and participant of infield trial

Sam Coulton
Cotton Farmer Goondiwindi
Key sponsor and location for infield trial

Cotton Australia
Industry support and communication

Cotton Research & Development Corporation (CRDC)
Research and soil analysis

Two major Australian apparel and clothing companies
Supporting infield trial through the delivery of cotton garments

Care Goondiwindi
Deconstruction of garments to make them suitable for shredding

THE PROJECT

Through the Circular Cotton project, we are working on developing an alternative solution for end-of-life cotton garments, diverting them from landfill and directing their inherent value (carbon) back into the soil.

This may increase microbial activity and regenerate degraded soils thereby enabling better farming outcomes such as improved yields, soil health and water use efficiency. In addition to the direct environmental benefits of improving soil quality, the other positive impacts are expected to be a reduction in waste to landfill; increased awareness of how 100% cotton garments fit into circular business models for fashion, which could increase the use of Australian cotton by brands and retailers; and the opportunity to create jobs through the deconstruction of the cotton textiles.

After the initial project identification and supply chain mapping stage, there are three key phases to the Circular Cotton project. Phase 1 and 2 are being run in parallel and we expect phase 3 to kick off in April 2021.

> *"We should be responsible. We grow it here and we should be able to take it right back through the system and return it to the soils here. Cradle to the grave"*
>
> **Sam Coulton**
> "Alcheringa" Farm, Goondiwindi Cotton

dynamics

4 https://www.theguardian.com/fashion/2017/dec/06/landfill-
3 https://soe.environment.gov.au/theme/land/topic/soil-carbon-becomes-the-latest-fashion-victim-in-australias-throwaway-clothes-culture#:~:text=As%20Australian%20fast%2Dfashion%20booms,tossed%20more%20than%2010%20garments.

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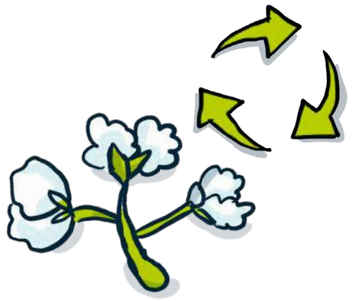
Circular Cotton



PHASE 1

Research & soil testing

One of Australia's leading soil scientists, Dr Oliver Knox, from the Cotton Research and Development Corporation (CRDC), volunteered his time to research what happens to different types and colours of cotton textiles when applied to Goondiwindi soil.

The research was carried out over 16 weeks from May 2020 assessing carbon sequestration and soil respiration, water retention, aggregate stability, effects on germination, effects from the dyes and microbial activity.

The research involved burying 2cm squares of cotton material swatches (cotton drill, polo knit, sweater knit and poly-cotton) in 40g of moist soil and incubating it at 20°C. The buried swatches were equivalent to burying between 400kg and 3 tonnes of material per hectare of farmland.

After eight weeks the preliminary findings demonstrated that burying cotton material increased the soil microbial activity fourfold compared to soil without cotton buried. It also demonstrated additional positive effects on the soil in terms of aggregate stability[5]. Furthermore, the addition of cotton to the soil was found to have no detrimental effect on germination as well as no detrimental effects from the dyes on soil biology. The project team is eagerly awaiting the 16-week results.

Check out the blogs of soil scientist Dr Oliver Knox[6], to get all the details of his research.

It is important to note that whilst these are positive results we understand that cotton does not perform as well as other soil ameliorants such as compost. This is due to the cotton fibres being primarily cellulose, which will break down to glucose which does not contribute as much nitrogen and phosphorus as other soil ameliorants. However, the shredded cotton can be mixed with other soil ameliorants to increase its valuable properties to the soil.

PHASE 2

Validate market interest and viability of the model

In addition to the soil science research, we engaged with key stakeholders in the Australian textile industry including clothing manufacturers, brand retailers, peak industry bodies and leading research institutions, to understand the market interest and viability of establishing the collection, return and shredding of the Circular Cotton project.

Through this engagement, the proposed model for the collection, return and shredding of cotton textiles will be facilitated through strategic partnerships with major brand retailers and social enterprises that operate op shops.

Currently, several major Australian brands, have partnerships with social enterprise run op shops. In these partnerships, customers are provided with an incentive to return their unwanted and end-of-life clothing to the op shops.

The intent of the Circular Cotton project is to build upon and fill gaps in the afore-mentioned model.

In the Circular Cotton project, we will offer social enterprise run op shops the opportunity to divert end-of-life cotton garments that are not fit for resale and that would otherwise be destined for landfill to create significant social and environmental value in Goondiwindi.

The economic viability of this approach will be assessed during the pilot trial in April/May 2021 and then compared to the current costs that major brands and social enterprises spend disposing of textiles in landfill.

PHASE 3

Infield pilot trial

Building from the positive lab research results the next phase of study is to test the breakdown of cotton in-field, where the soil is exposed to different (higher) temperatures and more microorganisms. One hectare of Sam Coulton's Goondiwindi farm will be dedicated to the trial.

The trial will utilise approximately 3000 waste cotton garments and is planned for April/May 2021.

In partnership with the Queensland Government's Procurement Department and a major national brand retailer, we have secured 3000 cotton garments (@ one ton of material) for the infield pilot.

The garments will be returned, deconstructed and shredded to then be applied to Sam's Goondiwindi cotton farm.

The garments returned to soil in this infield pilot will save 2,250kg CO_2-e, which is equivalent to 800 smartphones being charged every day for a year.

WHAT'S NEXT?

Building on the momentum and successful preliminary outcomes of the T2A Circular Cotton project we will continue to dedicate resourcing and investment to support the local project team to ensure this project reaches its full potential.

The project has already garnered significant interest from multinational apparel brands who are looking for solutions to their end-of-life cotton garments.

Closing the loop on waste cotton garments with a regional Queensland community at the heart of the solution will create significant positive social and environmental outcomes and support a more circular clothing industry.

5 https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052820.pdf
6 https://blog.une.edu.au/cottonhub/2020/08/17/soiled-and-degraded-the-fate-of-our-cotton-swatches/

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Circular
Cotton

IMPACT

By ROOY

60,000

Number of Garments Sold Annually

The number of garments sold by "Goondiwindi Cotton" brand annually.

Data

80,000ha

Land Use for Cotton

The size of land used to grow and cultivate cotton crops in the Goondiwindi region.

Data

4x

Boost to Soil Activity

The magnitude of increase to microbial activity of soil through cotton garments decomposition: a key indicator to soil health.

Indicator

Carbon Analysis

Waiting on final results from lab analysis on properties of cotton garments breaking down in soil as it relates to carbon.

Loading

7,800ML

Water for Cotton

The current total volume of water (Mega litres) used at "Alcheringa Farm" to produce current annual yield.

Data

2,250

Reduced CO2e (kgs)

Reduction in CO2 equivalents when compared to target of 3,000 cotton garments decomposing in landfills.

Outcome

These snapshots of the dashboard show where the impact will be generated over the next 12-18 months, once the project has been realised.

To see calculations please visit **live dashboard**

Indian
Fig Cactus

Cactus goes Full Circle

CHALLENGE

Goondiwindi, like many other regional farming areas in Australia, is facing worsening conditions such as degrading soil quality and prolonged drought.

This prolonged drought has created challenging environments for farmers, forcing many to reduce livestock numbers as the cost of animal feed has become prohibitive. This has significant flow-on impacts on business and the broader community, both financially and emotionally. In addition to the drought, virulent and noxious cactus species (such as the Harrisia cactus) are spreading to valuable arable land, further compounding agricultural challenges and increasing costs for farmers and governments.

MODELS & PRINCIPLES

OPPORTUNITY

Could the challenge be the opportunity?

This question was borne from a conversation with a passionate but desperate fifth generation Goondiwindi farmer who shared with us that on the one hand he couldn't get enough feed for his cattle because nothing would grow in the record drought conditions and on the other hand he couldn't stop the 'bloody cactus' from invading his arable land.

It struck us that there was a desperate need to create a longer-term focus on sustainable crop diversification and that the answer just might lie in cactus.

Through extensive research and engagement with the agricultural and academic community we identified that the *Opuntia Ficus Indica* (Indian Fig) cactus might just be 'the one'. The Indian Fig has a threshold for extreme conditions making it suitable to non-productive and marginal lands. It requires minimal inputs for cultivation and produces both a fruit and vegetable.

In addition to its resilience as a crop, Indian Fig is globally appreciated for its multiple purposes. The fruit and leaves (cladodes) are suitable for human consumption; are used in the cosmetic industry; as biomass for energy generation; and there is growing interest in its use for animal feed. In Brazil, a plantation of over 400,000 ha in the northeast region serves as a key component in supporting livestock production in the country's semi-arid regions.

KEY STAKEHOLDERS & THEIR ROLES

This project will be a collaboration between Woods Foods (Woods Group), Caroline Gouws a cactus specialist, Department of Agriculture and Fisheries (DAF) Food Pilot Plant at Coopers Plain and Coreo. Woods Group is an Australian, family-owned, agribusiness and are recognised as an industry leader in bringing new food products to market. They produce high-quality premium food ingredients, harnessing the nutritional benefits of Australian-grown pulses and sorghum.

Woods Group
Key sponsor and focus on product/processing development

Department of Agriculture and Fisheries (QLD)

Supporting research, product development and testing in Coopers Plain food plant

Caroline Gouws PhD
Primary researcher, contracted by Coreo

In June we were able to attract initial funding from the Department of Agriculture and Fisheries to employ PhD researcher Caroline Gouws, who has researched the Indian Fig over the past four years.

First direct employment as a result of the T2A program!

Throughout the Indian Fig project, we will continue to engage with the Macintyre Ag Alliance and members of the community.

THE PROJECT

The Indian Fig project is a longer term play and will focus on understanding the suitability and viability of developing products from the Indian Fig. This will include evaluating the nutritional content and beneficial health effects of the fruit and leaves for human and animal consumption. We will also assess how to introduce circularity through the whole value chain to further catalyse economic, environmental, and social outcomes.

Project objectives:

1. Develop a strategy to produce a trial product and understand the process/equipment/resources required
2. Understand the highest value products to be derived from the Indian Fig that are commercially viable (e.g. cactus water, health products, cosmetic products, animal feed, protein supplements)
3. Develop a suitable pilot product (lab-scale test) and research/test suitability of other products (animal feed, biomass)
4. Obtain consumer feedback (limited test)
5. Carry out a market scan
6. Build a business case and recommendations.

Fun Fact!

Did you know that there is no better plant at retarding a bushfire than the cactus! During a fire, a row of cactus plants can act as a barrier to flying embers and slow the speed of wind.

Queensland Government · Coreo · TRANSITION ACTIAN

Cactus goes Full Circle

The pilot project will be completed over three phases.

As it takes between two and three years before a Indian Fig bears fruit, we will source fruits and plants for the testing phase from Stanthorpe where Indian Fig is grown recreationally in the community. The Indian Fig fruits in summer (between December and February) and as such this will influence the timing of the product testing during phase 2. The DAF Food Pilot Plant in Coopers Plain will be used for the product testing and development.

PHASE 1

Project development phase
June – December 2020

Activities:

1. Further define pilot strategy and planning
2. Define scope for product testing and development
3. Design testing plan and cost planning
4. Continued research into highest value product to be derived from Indian Fig

Deliverables:
Defined scope for product development and testing, project plan with timelines and deliverables for phase 2.

PHASE 2

Testing phase
December – April 2021

Activities:

5. Sourcing of fruits and plants
6. Lab testing of cactus water and potential other products
7. Obtaining consumer feedback (limited test)

Deliverables:
Output report from product testing with recommendations on best processing methods.

PHASE 3

Market scan and final report
April – June 2021

Activities:

8. Market scan – demand and supply
9. Develop the business case for the processing and manufacturing of cactus water and other potential by products.

Deliverables:

Final report with key findings, high level business case and recommendations for next steps.

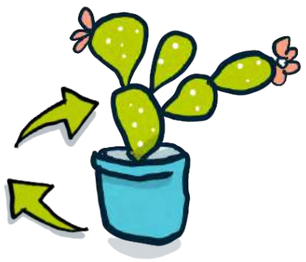
Education will be an important element of this project as Indian Fig is often considered taboo due to its close relation to the *Opuntia* spp. cactus that once plagued Australia.

However, the *Opuntia Ficus Indica* was removed from Queensland's invasive list in 1978, as it has never caused any problems to rural production, spreads slowly and is easily eradicated.

WHERE ARE WE?

Currently, we are in phase 1 of the project, with the team maximising the opportunity to research aspects of agronomy, the market for primary products, the scope of potential developed products, as well as numerous aspects relating to the business case of the opportunities available. This stage will establish the strategy for the proceeding stages of work.

The project is making good progress. We have had crop education and high-level planning workshops with the working group. Initial cactus samples were sourced from Stanthorpe and analysed with the project on track to deliver phase 1 by December 2020.



WHAT'S NEXT?

We will continue working with our key stakeholders to progress through phase two and three of the project including establishing testing plants, sourcing materials, establishing pilot farms, preliminary product development and market testing.

Cactus may be a viable way to tackle intensifying environmental and climatic threats to the local and global food supply. If successful, it will provide farmers with a profitable crop that is drought resistant, productive and requires low (if any) chemical interference or irrigation.

Although the DAF funding allowed us to contract a researcher for the project, the project is not fully funded at this stage. We are actively seeking additional funding and we have had positive interest from AgriFutures and Innovations Connections where we will be applying for funding to accelerate the success of the project.

Cactus goes
Full Circle

IMPACT

By ROOY

350mm
Average Rainfall for Growth
Opuntia ficus-indica can grow in areas with rainfall less than 350mm annually, and with mean temperatures of up to 40°C , making it suitable for growing in areas where other commercial crops are not viable.

4
Product Streams
The number of different product types and corresponding industries researched for commercial products: Fruit, Leaf, Cactus Flower and Cochineal Dye.

13t
Protein per Hectare (international)
The amount (tonnes) of protein generated annually per hectare of intensive cactus-leaf farmed land.

576,000ha
New Productive Land
The amount of marginal land that could become productive for use with Indian fig as a staple crop.

Loading

37x
Comparison with Wheat
How much greater the yield (per hectare) of intensive cactus leaf farming is compared with the yield of wheat per hectare in NSW.

100t
Yield per Hectare (international)
Tonnes of dry matter, per hectare, per year (t D.M. ha-1 yr-1) reported by Cactus-Leaf Intensive farms.

The impact measurements above show the opportunity of growing this crop in Australia.

To see calculations please visit **live dashboard**

Food Waste
Diversion

The Value of Food waste

CHALLENGE

The average Australian household sends roughly 4.9 kilograms of food waste to landfill each week.

Not only is this an enormous economic cost (estimated to be more than $20 billion per year)[7] it also has significant impacts on the environment and climate. Food waste in landfill produces methane, which is 21 times more potent than carbon dioxide. For every tonne of food waste in landfill, a tonne of CO_2-e greenhouse gas is generated. The Australian government has set clear targets to reduce food waste by 50% by 2030[8]. Designing out waste is an important part of this strategy, but equally important is understanding the value of food waste and how that value can be captured.

MODELS & PRINCIPLES

In Goondiwindi, there is currently no solution in place for local businesses to avoid sending their food waste to landfill and preliminary insights suggest that the businesses generate around 150-180 tonnes of food waste that is then sent to landfill each year.

Some may call this low hanging fruit but during our numerous visits to Goondiwindi this challenge was something that the community and business desperately wanted to create sustainable solutions to.

OPPORTUNITY

In a circular economy, all biological materials should operate in a closed loop whereby nutrient flows are returned to the natural system through composting, worm or larvae farming, anaerobic digestion, and dehydration.

Not only is there value in diverting food waste from landfill, there is also significant opportunity to build upon Goondiwindi's current infrastructure and strong social fabric.

7 https://www.foodbank.org.au/food-waste-facts-in-australia/?state=qld
8 https://www.environment.gov.au/system/files/resources/4683826b-5d9f-4e65-9344-a900060915b1/files/national-food-waste-strategy.pdf

KEY STAKEHOLDERS & THEIR ROLES

Goondiwindi Council
Key sponsor and council support
Local businesses
Participants in food waste diversion once set up
Farmers
Interested in material output for their farms
Local community
Engage and educate
E&E
Local waste contractor
Schools
Engage and educate

THE PROJECT

This project aims to implement a circular economy solution whereby food waste from local businesses will be diverted to create a higher value product. The intention is that this product will then be used in the local community or by local businesses. Through this project we are exploring several options including composting, worm farming, and carbon capture.

PHASE 1

Engagement

This project was kicked off with an initial workshop during our second visit to Goondiwindi. However, due to the impact of COVID-19, the Goondiwindi Regional Council asked us to put the project on hold in April. Council reached out to us in July to re-start the project and we returned to Goondiwindi in August. During our August visit we connected with a large number of local businesses including Coles, Food Works, and several local pubs.

There was strong positive feedback from the businesses we engaged with and all were keen to participate (bar the bakeries) in a food waste collection and management system. The only businesses that were not interested in participation were the bakeries who already have a system to manage their bakery waste through sending to local piggeries, family chooks, and worm farms.

PHASE 2

Options analysis

We are currently reviewing local options to collect and process food waste. E&E is the current waste provider for Goondiwindi and we have engaged them to understand the viability in offering a separate food waste collection to their customers. E&E have shared that they believe this to be viable but need to determine the current collection route e.g. how many businesses and the final location to take the food waste to for processing. To determine the most appropriate option for processing the food waste we are currently evaluating two options. The first option is a collaboration with a local farmer who is keen to implement a worm farm with the ultimate goal of selling the vermicast as a nutrient rich fertiliser to local farmers.

Vermicast is known to improve soil structure and its nutrients and reduce the need for chemical fertilisers.

PHASE 2

Continued...

The second option is a collaboration with Woods Group who are looking to create carbon from food and green waste through digestion to meet their large CO_2 requirements for their algae farm.

Goondiwindi Regional Council is supportive of this project as it fits within their Drought Resilience Plan to encourage agricultural initiatives that focus on improving natural resource management. They have identified that this project can assist in advancing the promotion of regenerative farming practices that will improve productivity and the natural environment.

WHAT'S NEXT?

We will continue to engage with key stakeholders in Goondiwindi to close the loop on food waste for the local businesses.

This will include developing the business case, including logistics, processing of the food waste and use of the output. The expected timing to deliver this will be the end of November 2020 with implementation of the solution proposed for Q1-Q2 2021.

IMPACT

By ROOY

75%
Businesses Interested in Food Waste Project
The percentage of the 55 businesses with food licenses in Goondiwindi who have indicated interest in the Food Waste Program.
Data

123,800kg
Total Food Waste Generated (kg)
The volume of food waste generated annually in Goondiwindi businesses who have indicated interest in the project.
Data

$143,500
Net $ Benefit of Composting
The value of this food waste if treated as compost and then sold to businesses.
Outcome

142,300kg
Reduced CO2 e from Composting
The reduced CO2 e (Carbon Dioxide Equivalents) (kg) emitted into the atmosphere through decaying organic food waste through composting rather than landfill.
Outcome

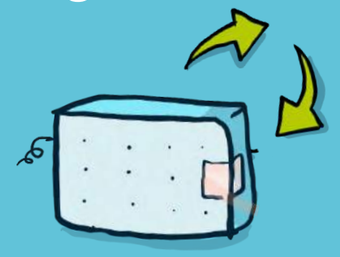
$151,700
Total $ Benefit Generated in Community
The total economic benefit of the program through the sale of composting, the saving of landfill expenses and the hours of work created for community members.
Outcome

$151,700
Total $ Benefit Generated in Community
The total economic benefit of the program through the sale of composting, the saving of landfill expenses and the hours of work created for community members.
Outcome

These snapshots of the dashboard show where the impact will be generated over the next 12-18 months, once the project has been realised.

To see calculations please visit **live dashboard**

Mattress Recycling



Mattress Recycling

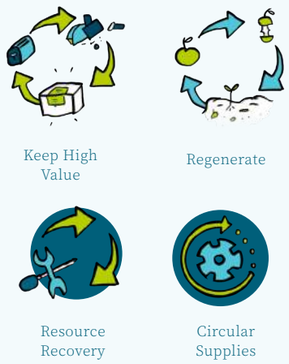
CHALLENGE

Globally, mattresses are a challenging waste stream to manage at the end-of-life, with the majority ending up in landfill.

Consumer behaviour has changed as mattresses used to be changed every 8-10 years but with ever more consumer choice, mattresses are now replaced much more frequently[9]. In Australia, approximately 1.6 million mattresses are sent to landfill each year. They are bulky and expensive to transport and take up a lot of space in landfill. Furthermore, there are valuable materials in mattresses that are worth returning to the productive economy.

During our second visit to Cairns in December 2019 we met with Cairns Regional Council who indicated they have a growing challenge with mattresses at their transfer stations.

MODELS & PRINCIPLES



On average, they are currently receiving 23 mattresses per day and are estimating that 8000 mattresses are disposed of in landfill each year. Furthermore, many mattresses are illegally dumped, which creates environmental hazards in waterways and parks, which is incredibly costly for the council to clean up.

Throughout Australia, several mattress recycling initiatives have started. The largest service is Soft Landing which works together with many suppliers such as IKEA, AH Beard and Harvey Norman. Currently, Soft Landing only has operations in NSW, ACT, VIC and SA, but no operations in Queensland.

OPPORTUNITY

Mattress recycling can reduce costs to Cairns Regional Council, reduce environmental impact, create local jobs and capture and retain the value of materials in the productive economy that would have otherwise been sent to landfill.

The majority of mattresses have four key materials; springs, foam, textile and felt. The metal springs are the most valuable component as they can easily be redirected and valued through scrap metal buyers. The foam can be washed, shredded and used in carpet underlay, yoga or playground mats and the textiles and felt can be used as cattle rub or for insulation.

KEY STAKEHOLDERS & THEIR ROLES

Endeavour Foundation
Provider of mattress recycling service

Cairns Regional Council
Location of pilot service

Multinational brand
Key sponsor to pilot customer mattress take back scheme

9 https://www.theguardian.com/environment/2020/feb/12/mattress-landfill-crisis-recycling-nightmare

THE PROJECT

Through the mattress recycling project we will work with Endeavour Foundation and a multinational brand to establish a mattress recycling facility in Cairns. Through this project we will focus on setting up the pilot scheme, initially with the multinational brand although Cairns Regional Council has also expressed an interest to work together with us to manage the mattresses that are delivered to their transfer stations.

PHASE 1

Stakeholder engagement

During our visits to Cairns in December 2019 and February 2020 we engaged with local stakeholders to explore their challenges around end-of-life mattresses. From this engagement we identified that local mattress retailers and hotels are also interested in participating in a mattress recycling project.

In addition to local stakeholder engagement in Cairns, our team explored national partnership opportunities with major brands looking to offer greater service to their customers. Through this process we have engaged with a multinational brand who sell mattresses throughout Australia and who is determined to offer their Queensland customers with a mattress take-back service.

In parallel to our engagement with local business and brands we also engaged solution partners and providers. Through this work our team was introduced to Endeavour Foundation. Endeavour Foundation is an independent for-purpose organisation with a large presence in Queensland. Their team in Innisfail has recently started a mattress recycling trial together with the Cassowary Regional Council.

The opportunity exists to scale the service that Endeavour Foundation has established, as it provides meaningful and variable employment for people with disability and provides an opportunity for their employees to develop useful work, life and social skills. The income derived from recycling the materials will be used to fund the operations and employ community members who have barriers to seeking traditional employment.

PHASE 2

Business case development & pilot implementation

In phase 2 we will work to formalise the partnership between Endeavour Foundation and the multinational brand and further develop the business case for the mattress take-back service and recycling facility.

The economic case for mattress recycling in North Queensland has been completed by Endeavour Foundation and has proven sustainable through their trial in Innisfail.

Fun Fact!

The carbon emissions of 1000 mattress in landfill, is equal to the emissions of five cars driven for one year

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PHASE 2

Continued...

Endeavour Foundation can recycle mattresses at a competitive market rate with an estimated cost of between $17 and $22 per mattress.

To support the identification of offtake partners for the materials extracted from the mattresses, Coreo worked with Endeavour Foundation and the Department of State Development, Tourism and Innovation to send a material inventory to 200 manufacturers across the region to determine the level of interest and suitability for these materials to be used in their local operations. At the time of writing this report we are still receiving responses from the manufacturers with various options being explored.

WHAT'S NEXT?

We will continue to support the formalisation of the partnership between Endeavour Foundation and the multinational brand, the finalisation of the business case and the provision of the site for mattress recycling.

The expected implementation of the Cairns recycling facility is proposed for Q2 2021 and after this time we expect that the project will be complete and that our support will no longer be required.

IMPACT By ROOY

8,000
Mattresses in Landfill Annually
The number of Mattresses that are being disposed of in Cairns Landfill Facilities every year.
Data

$62,000
Steel Thrown Away
The estimated second market value of the recoverable steel from mattresses disposed of in Cairns Landfill Facilities.
Data

6,000m3
Volume in landfill
The landfill volume taken up by mattresses surrendered to Cairns Landfill facilities.
Data

$202,976
Cost of Mattress Disposal
The current cost of mattress disposal in landfill, based on mass of materials, volume of materials, and emissions generated.
Outcome

$546,200
Funds from New Model
The positive funds generated through the sale of recycled assets, the corresponding spend in local communities, the reduction in emissions and volume of landfill.
Outcome

176t
CO2 e tonnes from Landfill
The amount of CO2 equivalent tonnes of emissions generated in the decomposition process of these mattresses.
Data

These snapshots of the dashboard show where the impact will be generated over the next 12-18 months, once the project has been realised.

To see calculations please visit **live dashboard**

Attitude of Gratitude

"The future is not some place we are going, but one we are creating. The paths are not to be found, but made. And the activity of making them changes both the maker and the destination." John H. Schaar

WE WANT TO TAKE A MOMENT TO SINCERELY THANK EVERYONE THAT BELIEVED IN AND SUPPORTS T2A.

In a circular economy, you can't do it all and you can't do it alone. We recognise that it takes courage to try something new and determination to carry on when a global pandemic hits - we couldn't have achieved anything without the support and generosity of spirit of the people of Cairns and Goondiwindi. Thank you.

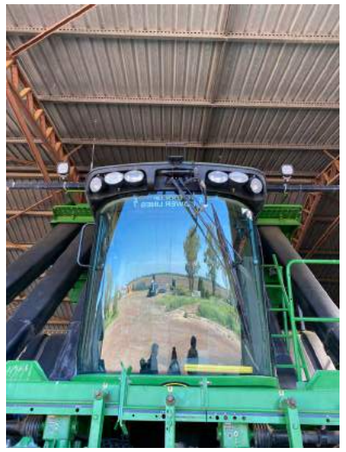
To the Queensland Government team (you know who you are) we are so proud to work alongside you in serving our beautiful state of Queensland. We promise that your investment in T2A will be the gift that keeps on giving (we'll make sure of it).

Thanks so much.

Coreo.

Ashleigh, Jaine, Marjon, Lindar, and Margit.

Projects in Photos



COREO IS A GLOBALLY RECOGNISED AND AWARDED COMPANY. WE ADVISE AND GUIDE INDUSTRY AND GOVERNMENT THROUGH THEIR CIRCULAR ECONOMY ASPIRATIONS AT BOTH A STRATEGIC AND OPERATIONAL LEVEL.

Our mission is to catalyse the global transition to a circular economy.

Recognising that the transition to a circular economy is systemic Coreo works on projects in key sectors of the global economy including mining; agriculture; education; tourism, construction, and property.

We prioritise working with clients and on projects that will have the greatest impact on the production and consumption of materials; the regeneration of our natural world; and the quality of human connections.

We offer our clients the opportunity to realise the value of transitioning towards a circular economy through action.

TRANSITION 2 ACTION