



→ Hayley Rolfe
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Circular Economy - Beyond waste and resource recovery

Welcome

Acknowledgement & respect

GHD acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the land, water and sky throughout Australia on which we do business. We recognise their strength, diversity, resilience and deep connections to Country. We pay our respects to Elders of the past, present and future, as they hold the memories, knowledges and spirit of Australia. GHD is committed to learning from Aboriginal and Torres Strait Islander peoples in the work we do.



What is a Circular Economy?

A complete rethink of the linear economy

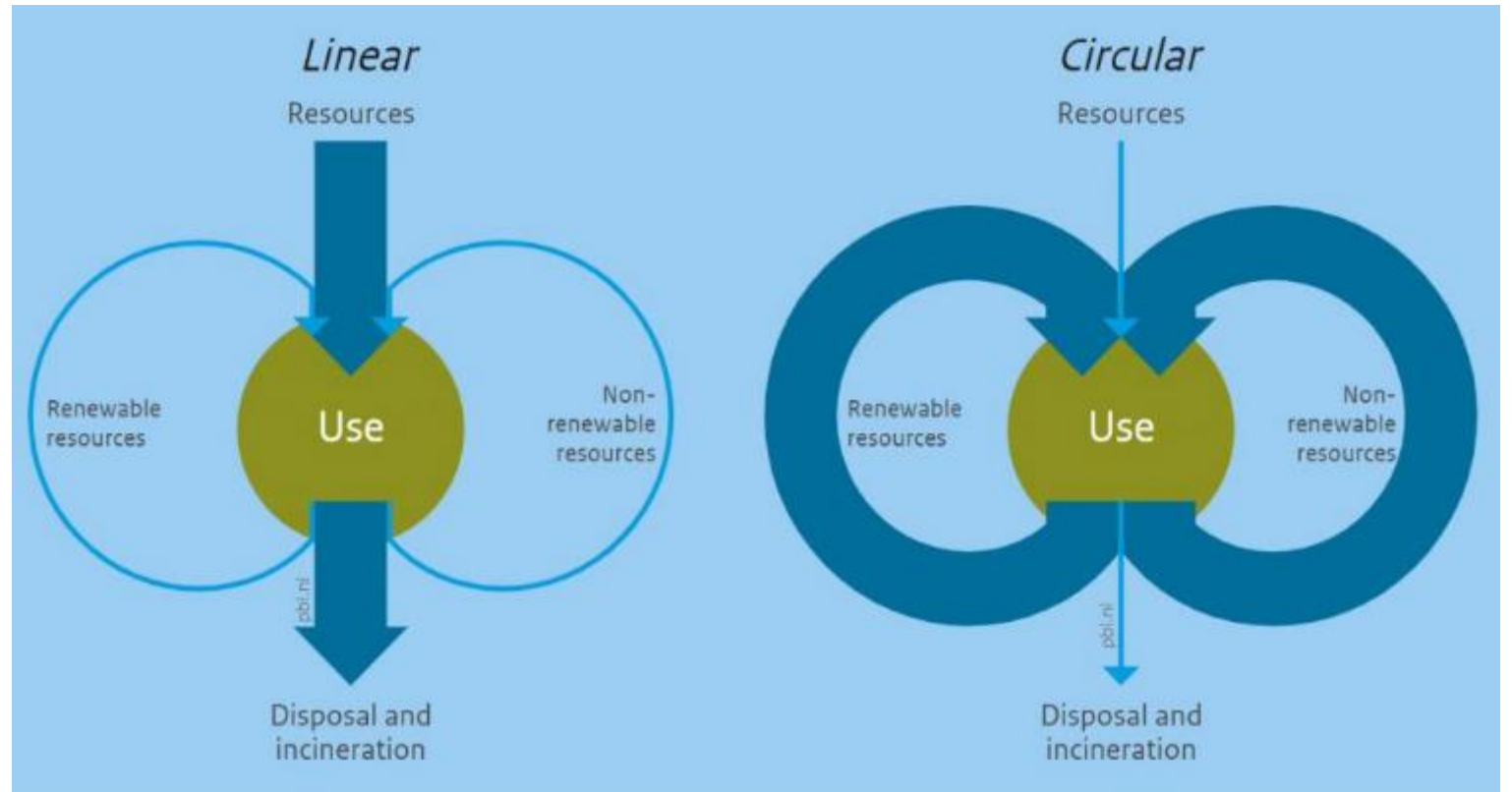
A new narrative about what we value

Decouples extraction from economic prosperity

Deliberately designs out waste and pollution

Keeps products and materials at their highest and best use

Regenerates natural systems



Circular Economy requires a shift in thinking...

Cowboys vs Astronauts

Earth as an unlimited frontier



Photo by [Bailey Alexander](#) on [Unsplash](#)

Earth as a spaceship



Photo by [NASA](#) on [Unsplash](#)

Global drivers for change



- Material extraction, carbon emissions and waste all projected to increase
- Resource scarcity and competition is growing
- Changing sustainability expectations – global finance community and society
- Technology and production efficiencies are not moving fast enough
- Workforce uncertainty
- Supply chains vulnerable to shocks
- Facilities increasingly vulnerable to climate extremes

Business as usual is no longer usual

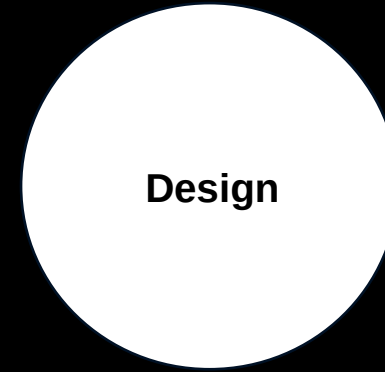
Customer drivers for change

- Decarbonisation targets/Scope 3 emission reporting
- Energy transition
- Increasing shareholder expectations for ESG performance
- Requirements to embed sustainability into projects and operations
- Ongoing requirement for Infrastructure Sustainability

We need to start doing

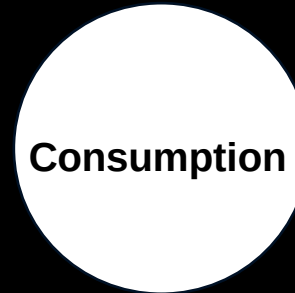
Circular Economy is not just about recycling

10 R's of the Circular Economy



Design

Refuse
Rethink
Reduce



Consumption

Reuse
Repair
Refurbish
Remanufacture
Repurpose



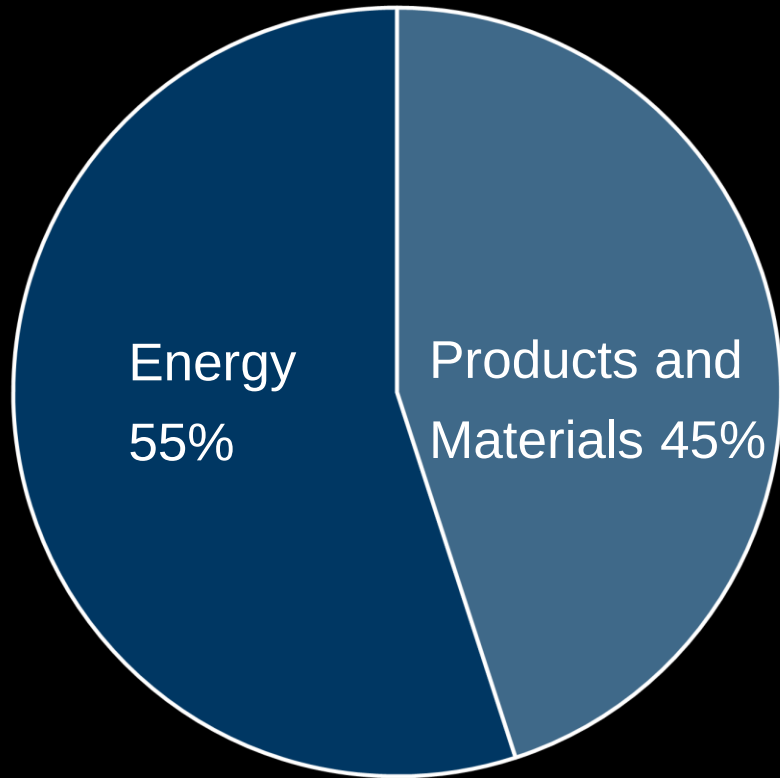
Return

Recycle
Recovery

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Net Zero and Circular Economy



Total Greenhouse Gas Emissions

Circular economy strategies can help reduce up to 45 % of product/material GHG emissions:

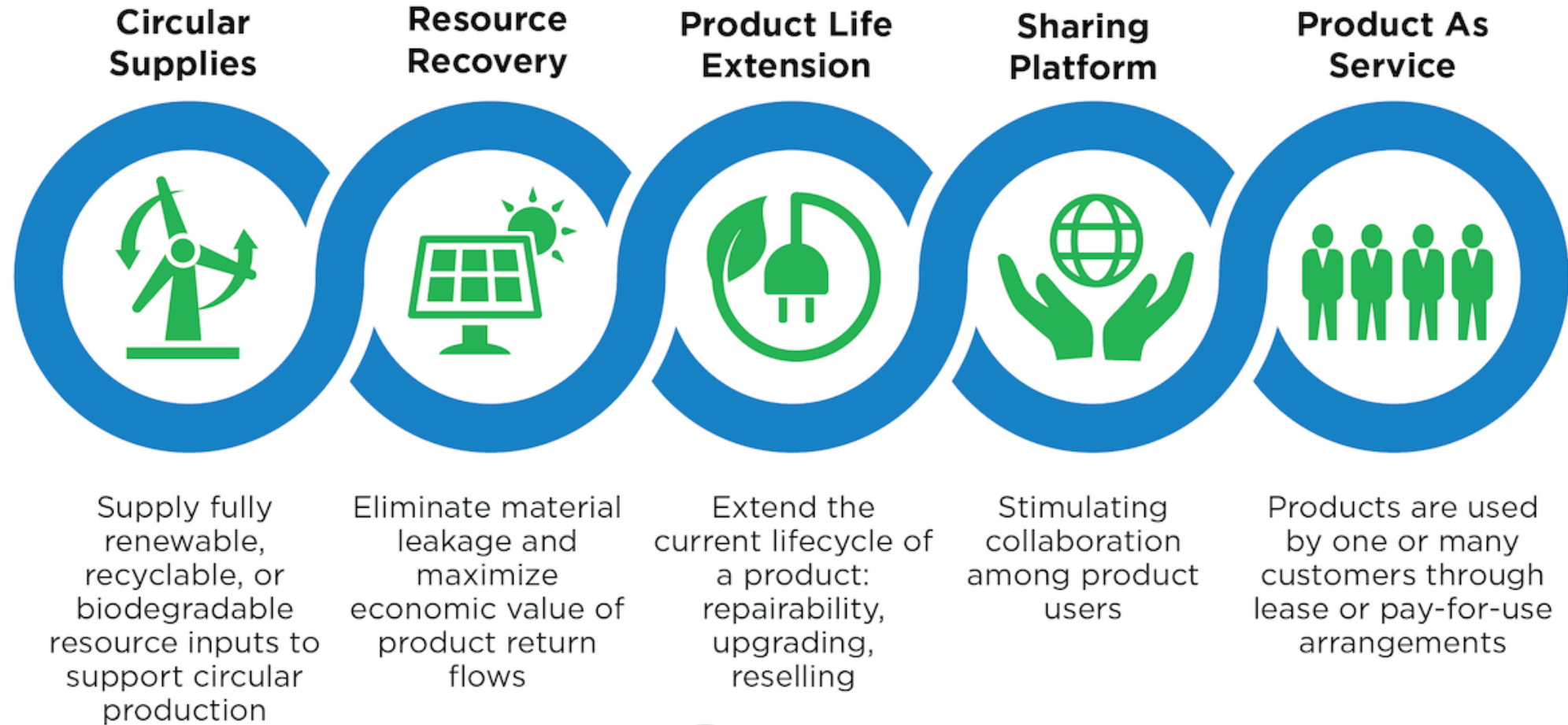
- Designing waste and pollution (including carbon) out of the supply chain
- Keeping products and materials in use to retain their embodied carbon and avoid the need for more extraction
- Regenerate natural systems to sequester carbon in soil and products

Material lifecycle impacts

CO₂e/tonne

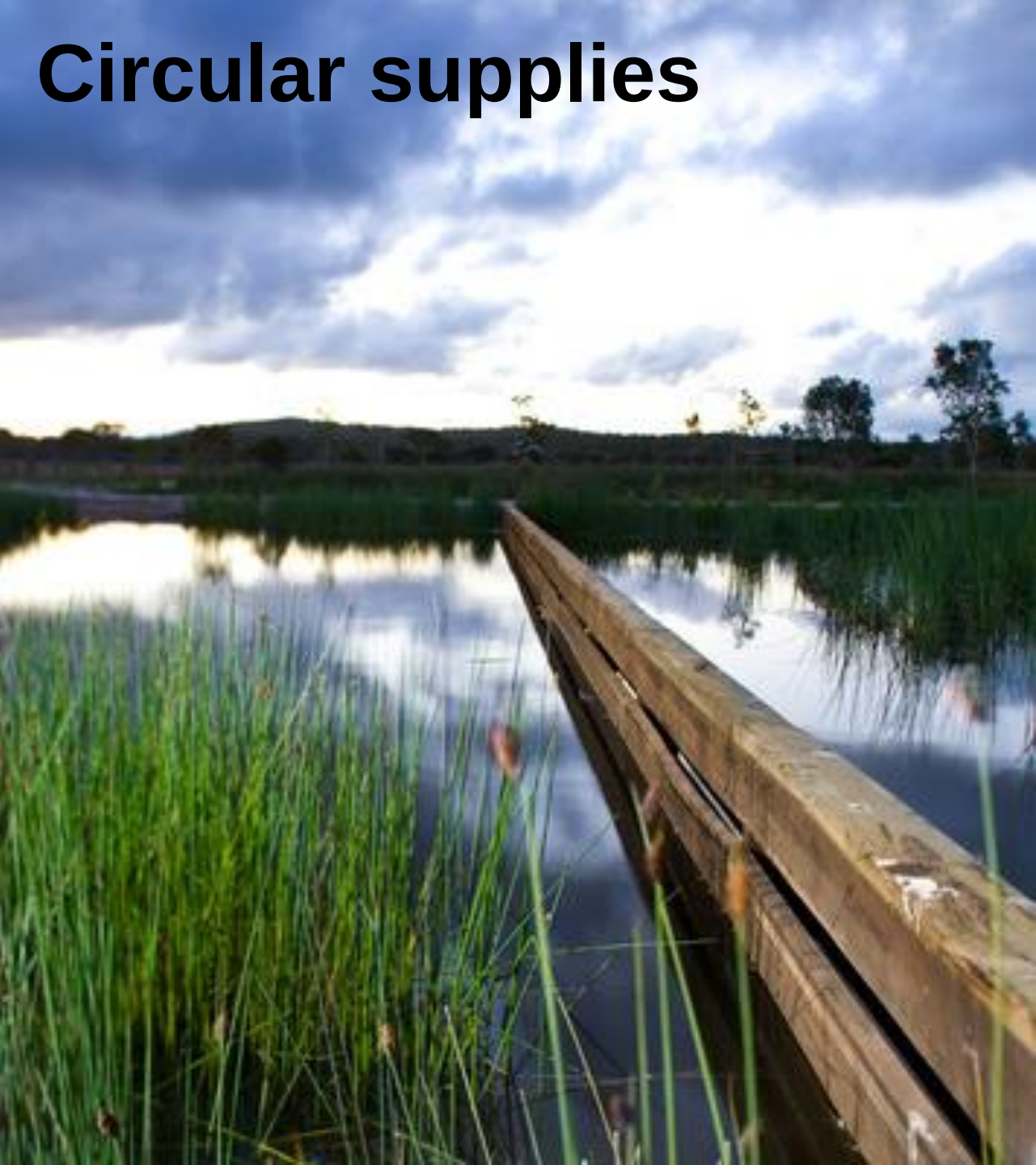
Material	Landfill Impact	Recycling Impact	Make new impact
Timber pallets	0.96	0.16	0.23
FOGO	0.31	0.17	0.11
Aluminium	0.01	0.46	18.2
Steel	0.13	1.2	1.5
PET	0.01	1.38	2.56
HDPE	0.01	0.93	2.00

Five Business Models of Circularity



@WRWCanada

Circular supplies

A photograph of a wooden plank extending from the foreground into a body of water. The water is calm, reflecting the sky and the surrounding greenery. In the foreground, there are tall green reeds. The background shows a line of trees and a cloudy sky.

Why Circular procurement?

- Reduce waste and pollution
- Increase demand for circular products
- Stimulate supply chain innovation
- Reduce demand for raw extracted products
- Make our communities more sustainable

Resource recovery

Use of recovered materials in construction

- Reduced embodied CO₂ in materials
- CO₂ and biodiversity protection benefits from avoided extraction
- Provides 'market pull' for recovered materials

Not as easy as it sounds – barriers

- Products must be fit for purpose
- Must meet engineering specifications
- Must avoid creating a new pollution problem
- Regulatory frameworks struggling to keep up

Are we circulating materials *at their highest value*?



Product Life Extension

Extending the life of a product reduces the need for (and the material footprint of) new products.

- **Build to last**
- **Keep reusing**
- **Repair**
- **Refurbish**
- **Pass on**



We need to look beyond the immediate purchase price and start to *consider the lifetime value* of products and materials.

Sharing platforms

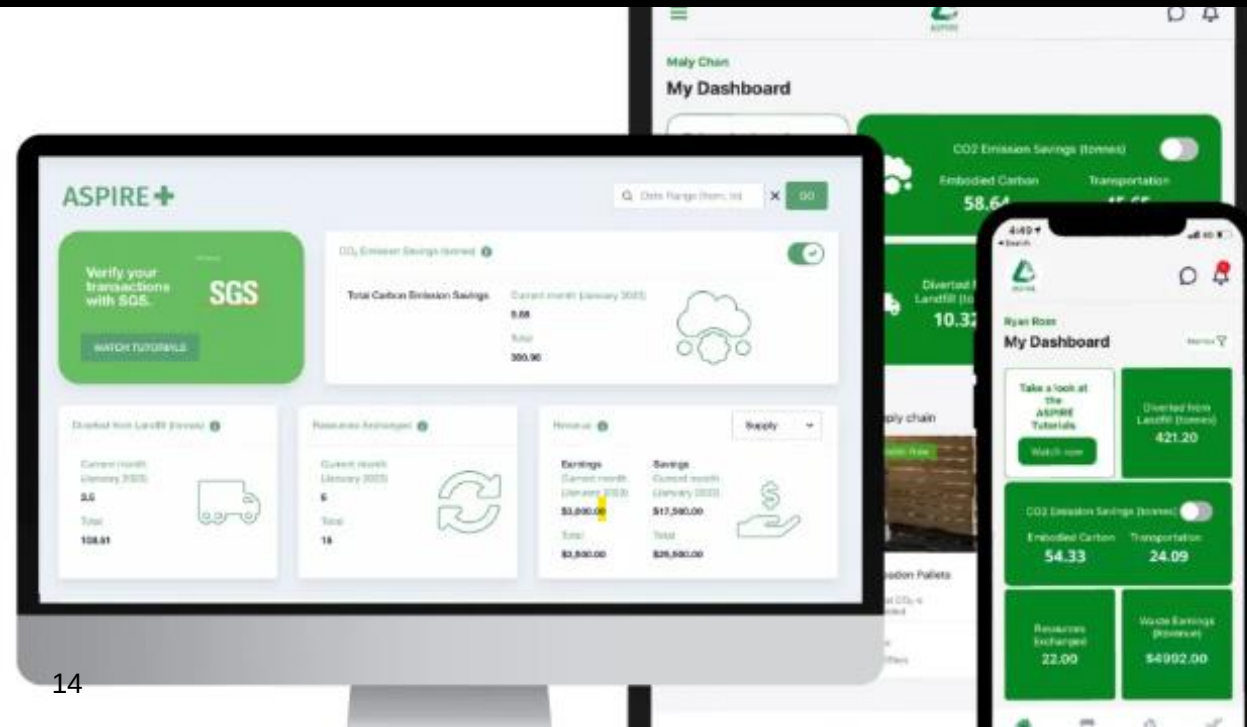
Example: Aspire

<https://aspimes.com>

Aspire is a digital tool that facilitates resource sharing between businesses across a region.

Resource sharing systems:

- Avoid the creation of waste and help to prevent downcycling
- They can be external - between different businesses; or internal - between different sections of a businesses or between sites
- They can include the community – think FB Marketplace, FoodBank, Circularity



Sharing system/Product as a service

Logistics and transport and packaging examples:

- Chep pallets
- Loscam fresh produce

2017 pallet survey (Deakin University) :

- 140 Million pallets in circulation
- Two thirds of all pallets part of a pool
- 85 % hardwood pallets
- Hardwood pallets require repair every 20-30 trips



Chep pallets

www.chep.com/

Chep pallet pooling system

- Distinctive blue colour allows for easy identification
- Quality construction allows for extended lifetime
- Pallets ordered and collected on demand
- Pallets can be tracked online to facilitate easy collection
- End user collections on request



Product as a service



Rolls Royce Jet Engines

Power by the hour:

- Revenues generated per engine flight hour
- Incentives to enhance maintenance, resource efficiency and product lifetime
- Drives continuous improvement and product lifetime

Revert:

- Retain ownership of high-value alloys
- Long-term agreements with manufacturers
- Job creation in material collection and processing
- Reduced demand for virgin material

Circular Economy vs Recycling

→ Comparing value propositions

Battery Storage Example

→ **Global demand for Li-ion batteries is expected to increase from 700 GWh in 2022 to 4.7 TWh by 2030**

McKinsey, 2023. *Battery 2030: Resilient, sustainable, and circular*



Battery recycling:

- Recoverable materials:
 - Lithium
 - Cobalt
 - Nickel
 - Manganese
 - Iron
 - Plastic casing
- Only 10 % of Australia's Li-ion batteries were recycled in 2021 – mostly overseas

The recycling business case is commodity driven which presents a double-edged problem. High commodity prices drive increased recycling but also leads manufacturers to reduce the volume of expensive materials – reducing the incentive to recycle.

The case for a circular economy battery system.

Manufacturer retains ownership and maintenance of battery:

– Incentives to

- design for disassembly
- design for extended/multiple lifetimes
- design for care and maintenance

– Benefits of retained ownership

- maintenance revenue
- retention of material value
- secure material supply chains
- avoid fluctuating commodity prices





*** Thank You**