The Circular Economy

Symposium

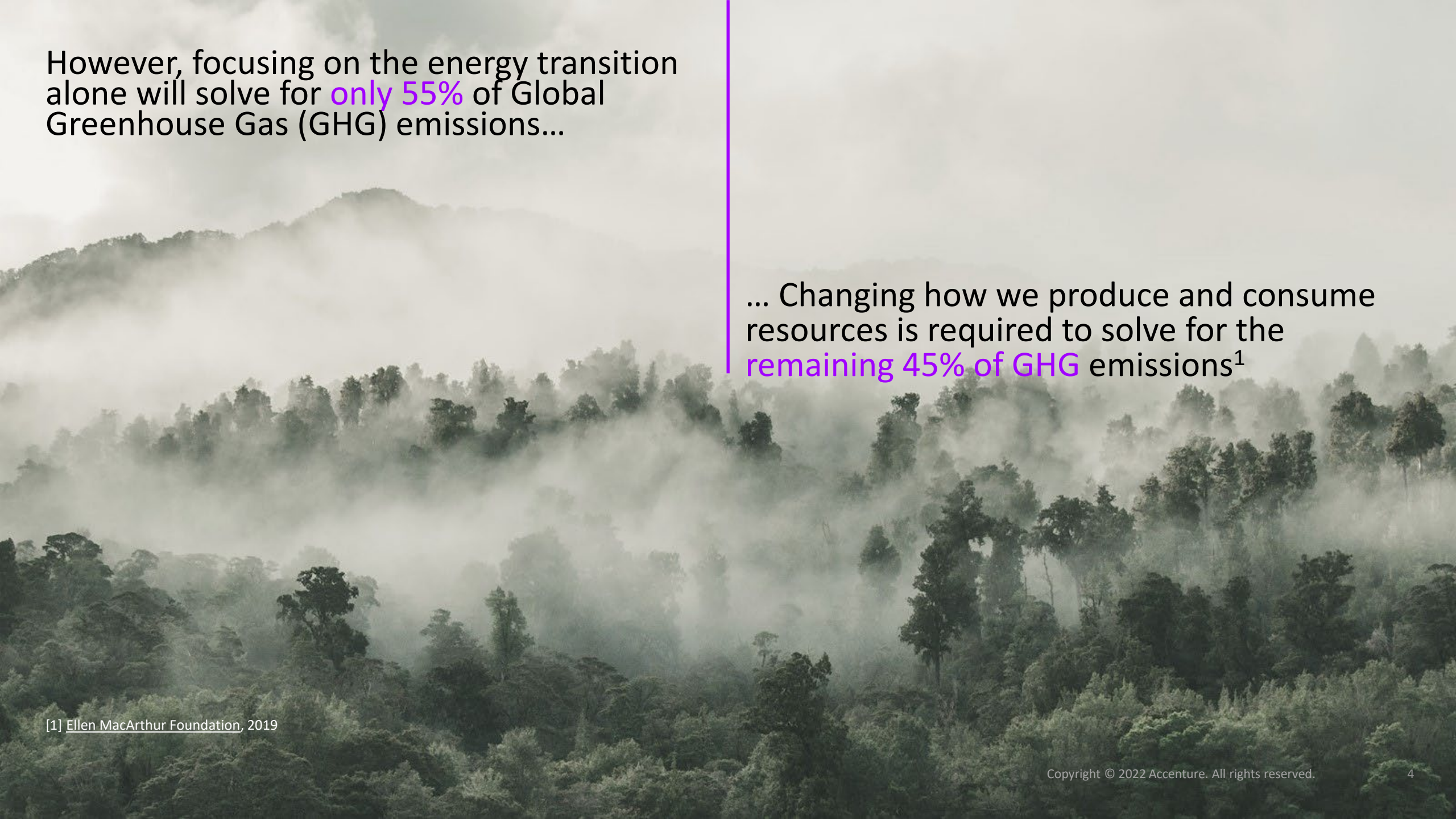
Turning Trash Into California's Next Innovation Boom

CalRecycle

01

The failing linear economy and the circular economy solution

We are all witnessing the effects of climate change when watching the news



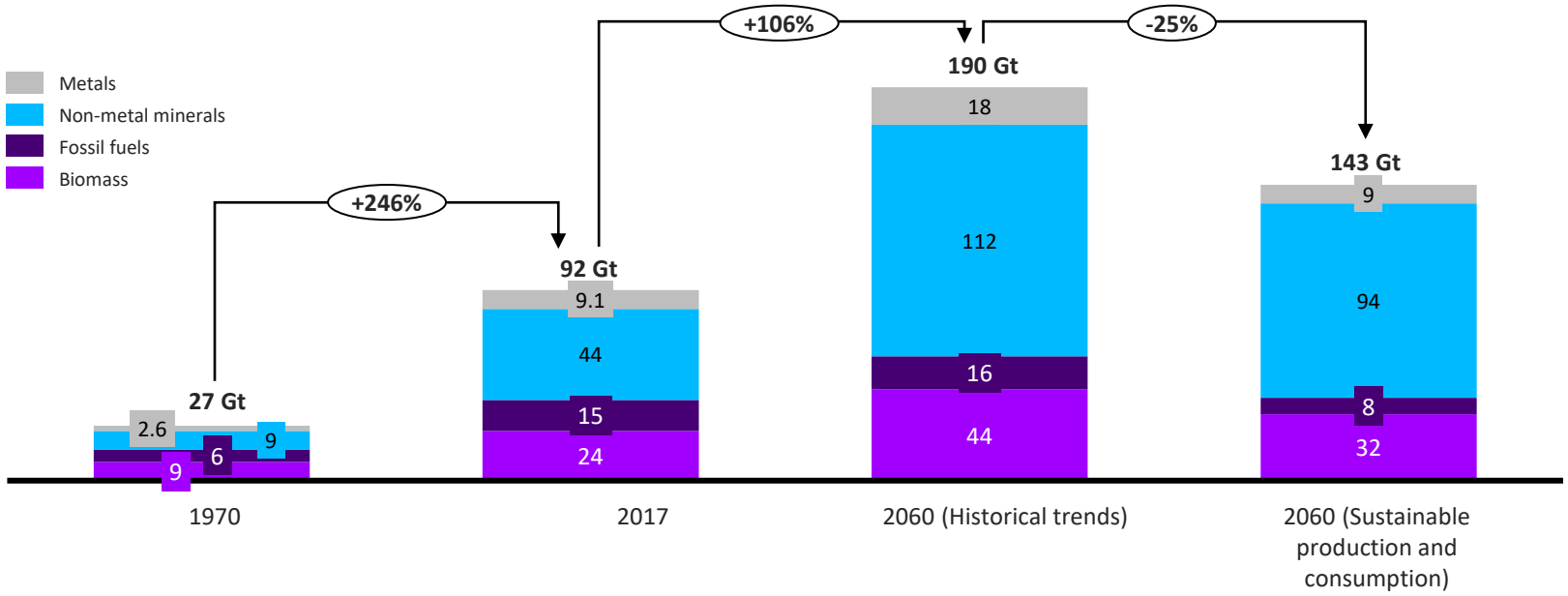
However, focusing on the energy transition alone will solve for only 55% of Global Greenhouse Gas (GHG) emissions…

… Changing how we produce and consume resources is required to solve for the remaining 45% of GHG emissions[1]

[1] Ellen MacArthur Foundation, 2019

Without decoupling growth from resource use we will more than exceed planetary boundaries by 2060

Global material extraction, four main material categories, 1970 – 2060 (e), Gigatons



UNEP research highlights

- Without action, resource use would more than double from current levels to 190 billion tons by 2060 - related impacts would exceed the planetary boundaries and endanger human well-being
- Concerted resource efficiency and sustainable resource-management measures can reduce resource extraction by 25%, significantly mitigate negative impacts by 2060

Key Risks

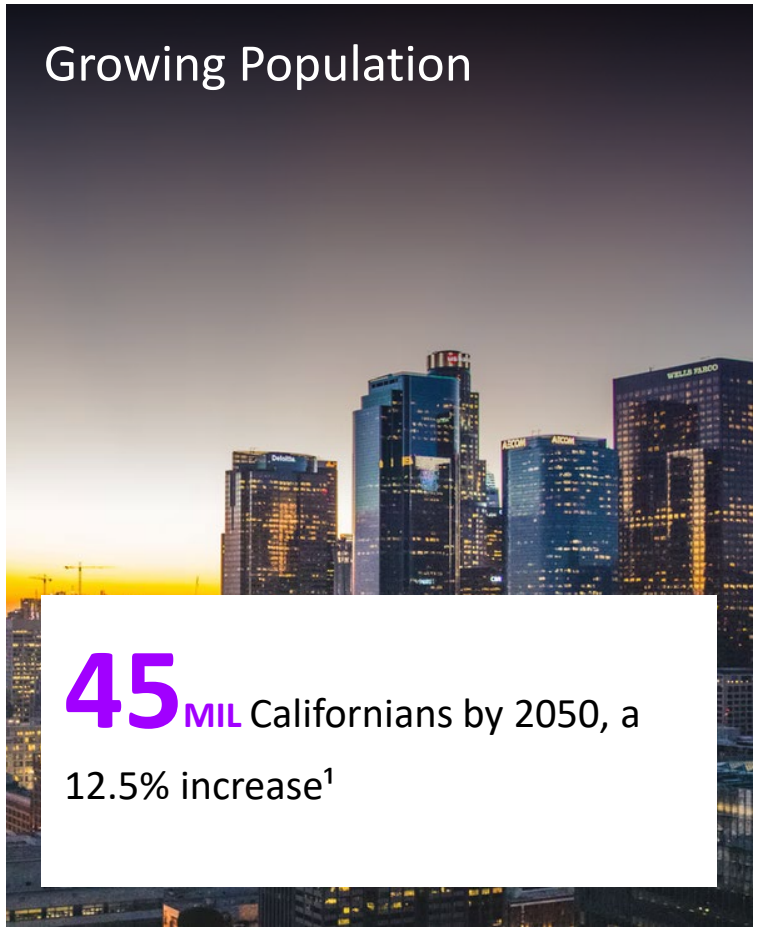
Worsening of pollution of air, water, soils and climate change trend

Extreme volatility in commodity markets

Economic and social risk of supply disruptions

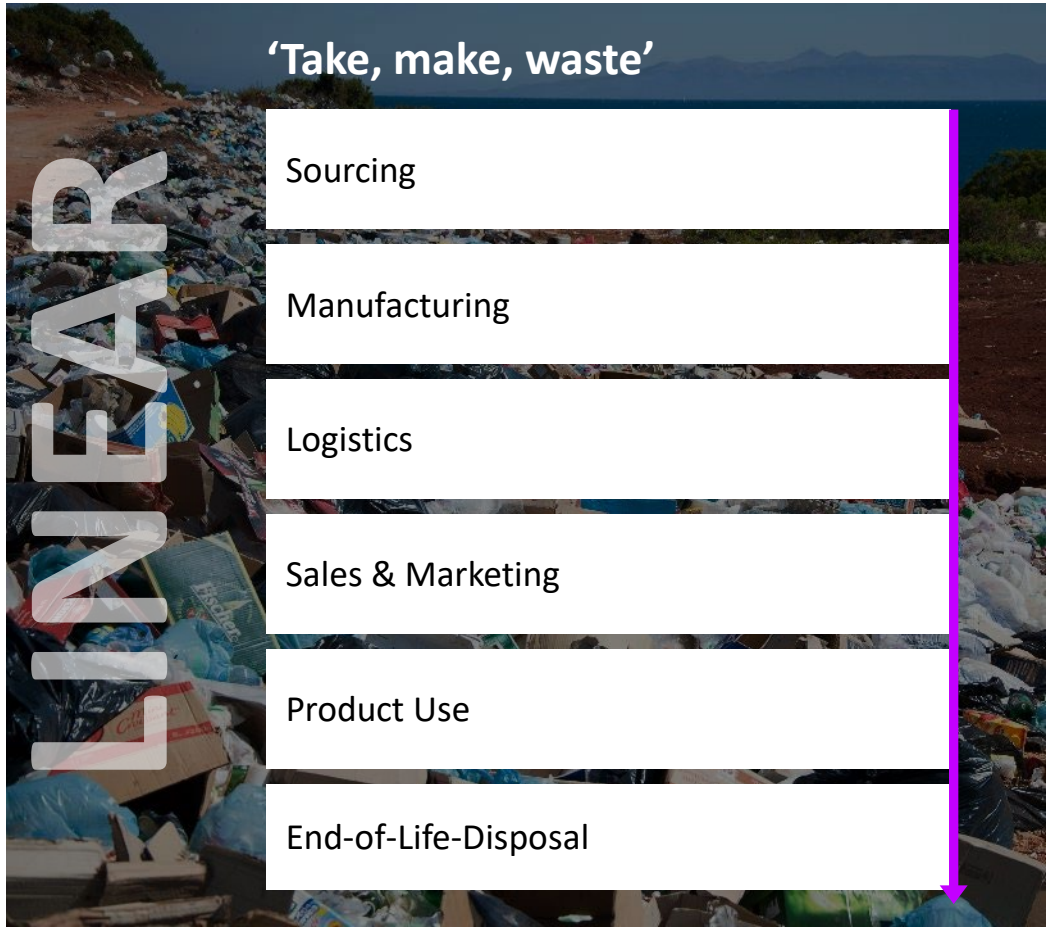
UNEP, Global resources outlook 2019 - Natural Resources for the Future We Want

This pressure will not be relieved in the face of certain demographic trends



[1] Public Policy Institute of California [2] US Environmental Protection Agency [3] Global footprint Network

Our linear economic system will not support solutions to our greatest global challenges



4 Types of Waste

Wasted resources
Use of material and energy that cannot be effectively regenerated over time, such as fossil energy and non-recyclable material

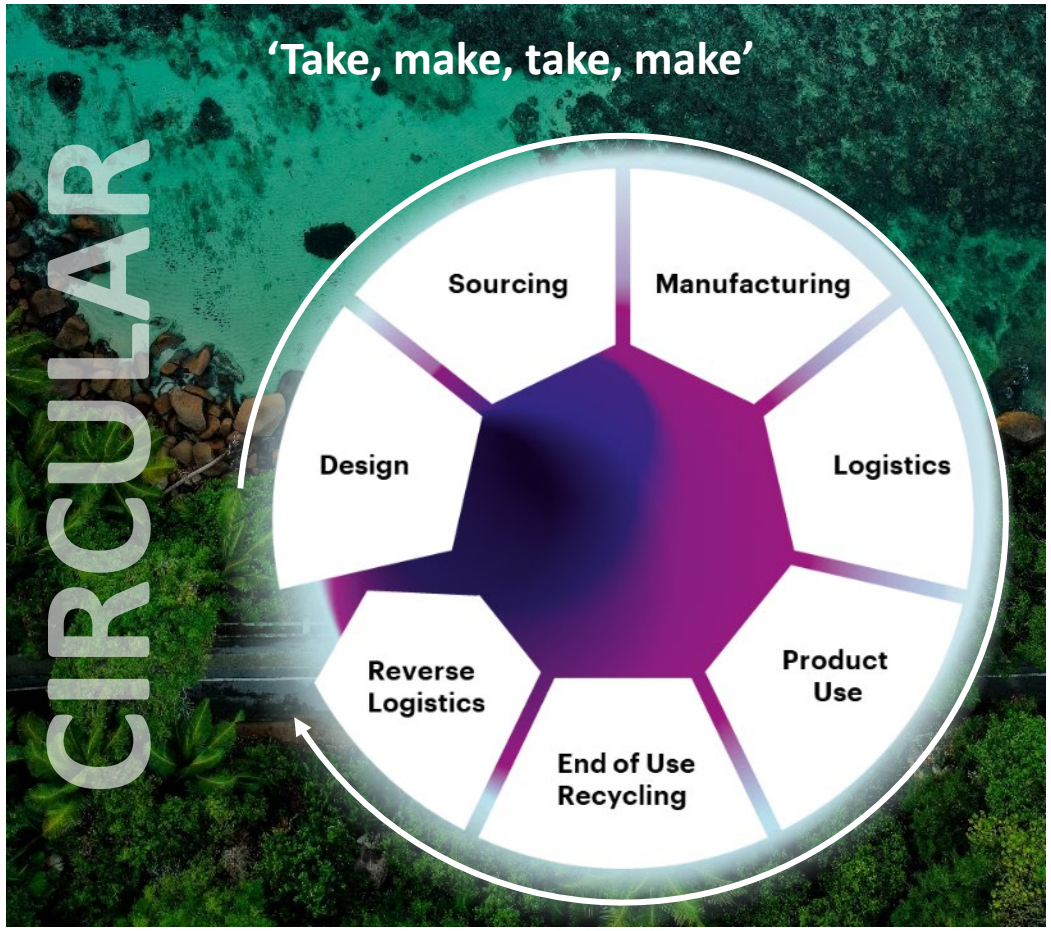
Wasted capacity
Products and assets that are not fully utilized across their useful life

Wasted lifecycles
Products reaching end of life prematurely due to poor design or lack of second life options

Wasted embedded value
Components, material and energy not recovered from waste streams

Source: The Circular Economy Handbook: Realizing the Circular Advantage, 2020

The circular economy transforms value chains to create waste-less and restorative systems



Key principles of the circular economy

Waste is **designed out** entirely – goal is to obtain **net positivity**

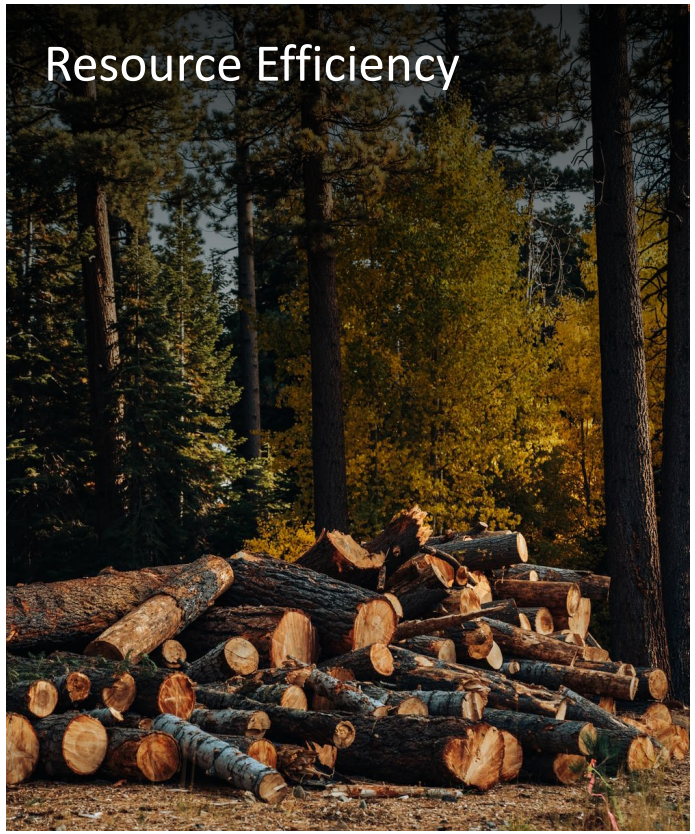
Materials are kept within productive use **for as long as possible**

When products reach end of use, they are **looped back into the system**

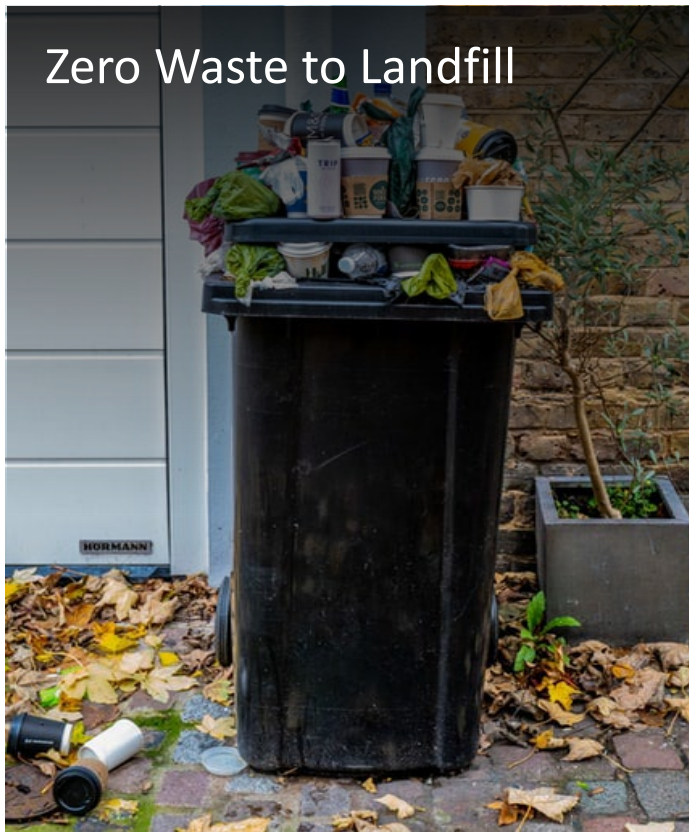
Growth is ultimately decoupled from the consumption of scarce and harmful resources

Source: The Circular Economy Handbook: Realizing the Circular Advantage, 2020

How is the circular economy different from other green concepts?



It goes beyond optimization – to continuous reuse and regeneration



It’s not just about avoiding the landfill… but eliminating and diverting it to high value reuse

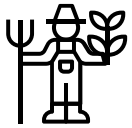
It’s a fundamental shift of the consumption-production model driven by a business case

Some of the most critical environmental challenges we face can be addressed by the circular economy

Major environmental challenges…

Metals and Mining generates around **10 billion tons** of waste annually, but demand is only rising

Globally only **14%** of plastic packaging is recycled



Farmers must produce **70%** more food by 2050 to feed the growing population

In 2019, an estimated **50 million tons** of e-waste was generated, only **20%** of which is recycled in a typical year

… are being addressed by circular innovation

Apple recovers valuable materials from its used products including **gold and aluminum alloys** for use in circuits and device bodies

The Coca Cola Company is investing in closed loop PET supplies as it introduces its **100% recycled bottles** in more countries

AeroFarms vertical farming facility is **390x more productive** per square foot than traditional agriculture methods

In 2016, **36% of the servers** Google deployed were remanufactured machines, and **~2 million units** were resold to secondary markets

Sources: The Circular Economy Handbook: Realizing the Circular Advantage, 2020

The circular economy also represents a significant opportunity for competitive advantage

$142
BILLION

Value at stake to be unlocked by the circular economy **in California by 2030***

Illustrative industry	Value at stake by 2030 (avg)*	
Information Communication and Technology	**$955 Million**	(3% AVG EBITDA)
Personal mobility	**$12 Billion**	(8.5% AVG EBITDA)
Fast Moving Consumer Goods	**$2 Billion**	(5.5% AVG EBITDA)

Labor generation through circularity

128K
Jobs created in CA if recycling rate of 75% was achieved by 2030[1]

9x
More jobs created from recycling and reuse centers than landfills[1]

23K
Job openings by 2028 for Reuse and Recyclable Material Collectors[2]

Source: *USDA Economic Research Service & USDOC Bureau of Economic Analysis
1. Eco-Cycle & US Bureau of Labor Statistics 2. Employment Development Department

…And it also means a significant reduction of harm to the environment

Linear future

With current use patterns of materials global demand for key materials will increase 2- to 4-fold.

Steel **x 2.3**
Plastic **x 4.2**
Aluminum **x 3.4**
Cement **x 1.7**

Even with 100% low-carbon energy by 2050, emissions far exceed carbon budget scenarios

Circular future

A more circular economy could **cut global emissions by more than 300 billion tons by 2100**

We could cut 2050 emissions from heavy industry by **56%** and the materials input to mobility falls by **75%**

In California,
A shift to a circular economy would lead to **Greenhouse gas reductions of 6 MMTCO2e annually**. This will require, among other efforts, recycling +27 M tons of material annually.

Sources: Completing the Picture – How the circular economy tackles climate change (2021, Ellen MacArthur Foundation)
Material economics, The Circular Economy – A powerful force for climate mitigation (2018)

The circular economy is gaining traction across all stakeholder groups

Leaders

Leaders across business, political and social realms are recognising the importance of the circular economy, and are speaking about it

Businesses

Companies are realizing the business imperative of the circular economy, and are defining circular strategies and ambitious targets

Consumers

Consumers are increasingly concerned about the sustainability of their purchases and have a preference for circular products

More than **50%** of consumers would **pay more for sustainable products** designed to be reused or recycled

Regulators

There is a shift towards prioritising the circular economy from a regulatory perspective – Governor Newsom signed several such bills in October of 2021

Source: The Circular Economy Handbook: Realizing the Circular Advantage, 2020

Businesses are setting ambitious circular strategies and targets

Ikea was the first company to target being 100% circular by 2030, to be achieved through circular product design and developing circular capabilities throughout the supply chain

All Timberland products are to be 100% circular and net positive by 2030, through circular design and material sourcing from regenerative agriculture suppliers

PepsiCo has targeted **100% locally recyclable, compostable, or biodegradable packaging** by 2025, as explained in their 2020 sustainability report

Nike's **Move to Zero** journey includes key **circular initiatives** such as powering facilities with **100 percent renewable energy by 2025** and diverting **99 percent** of all footwear manufacturing waste from landfills

H&M has set a target to become **100% Circular by 2030**, through sourcing sustainable materials and recycled feedstocks, and collecting at least **25k tons** of used clothing annually

Dell has established a set of **2030 'Moonshot Goals'**, which include circular commitments, such as for every product bought, an equivalent product will be reused or recycled

Source: The Circular Economy Handbook: Realizing the Circular Advantage, 2020

Accenture's View: Regulation at all levels of government must evolve to support the transition to circular

To move the transition to a circular economy forward, policymakers can address the following five areas

Material use and hierarchies

Policymakers should steer regulations toward practices that yield the **highest value use of scarce materials and waste.** Consistent application of priority frameworks will help ensure coherent policy measures.

Tax incentives for circular behavior

Policymakers should **review the impacts of taxation on resource efficiency** and, when possible, consider shifting taxation toward resource use. This can be accompanied by reductions in the taxation of labour.

Infrastructure investment

Policymakers should take a more **active role in prioritizing and facilitating investment** in circular economy infrastructure, as they would for other critical infrastructure.

Waste Definitions

Policymakers should **review all waste classifications and restrictions** in light of the new circular economy policy targets and latest technological possibilities.

Product quality and safety regulation

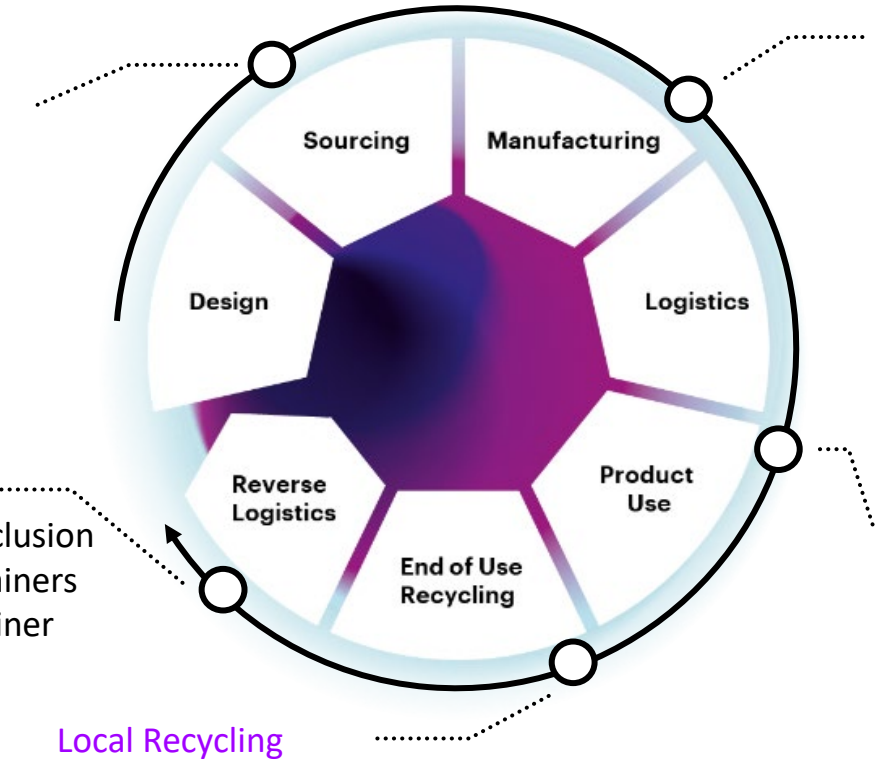
Policymakers should **clarify when secondary resources can be used** while continuing to guarantee quality and safety.

Source: The Circular Economy Handbook: Realizing the Circular Advantage, 2020

California bills reflect the global shift towards circular regulation

Designing for Next Life
AB 1201 - Prevents the inclusion of PFAs (slow degrading and harmful chemicals) in products labeled compostable

Increasing Reuse
AB 962 - Authorizes the inclusion of reusable beverage containers within the Beverage Container Recycling Program



Local Recycling
AB 881 - Excludes mixed plastic waste exports from recycling credit unless plastic waste meets certain conditions

Accurate Labeling
SB 343 - Requires products using the chasing arrows symbol to meet specific criteria to ensure recyclability in California
AB 1201 - Establishes new performance standards use of the label “compostable”

Reducing Waste
AB 1276 - Discourages distribution of single-use foodware accessories and condiments, except at the request of the consumer

Organics: Reducing methane and turning waste to resource

- Food waste accounts for **~17% of waste** in California
- **SB 1383**, signed by Governor Brown in 2016, **requires organics recycling** for most residences and businesses beginning in 2022
- The goal is to cut methane through a **75% reduction of organic waste** in non-recycled streams by 2025
- Additional food rescue, compost and biofuel

Circular economy policy

implementation and achievements vary significantly by region

Canada

Overview:
Introducing policy at national and regional level that encourage zero waste practices

Legislation:
Canada's Extended Producer Responsibility (EPR) and product stewardship programs, Ontario's Resource Recovery and Circular Economy Act

- ✓ Encompasses a system of resource recovery and waste reduction, manages products at their end-of-life
- ✓ Gives responsibility to provincial/territorial or municipal governments

USA

Overview:
Establishing state-led paths for funding waste management, to encourage zero waste practices

Legislation:

Extended Producer Responsibility (EPR) laws are on the docket in several states. New York's proposed Fashion Sustainability Act.

- ✓ EPR laws are a start on a structural solution to waste, though the approach differentiates per state/country
- ✓ Fashion Act would require groundbreaking levels of supply chain mapping for major retailers

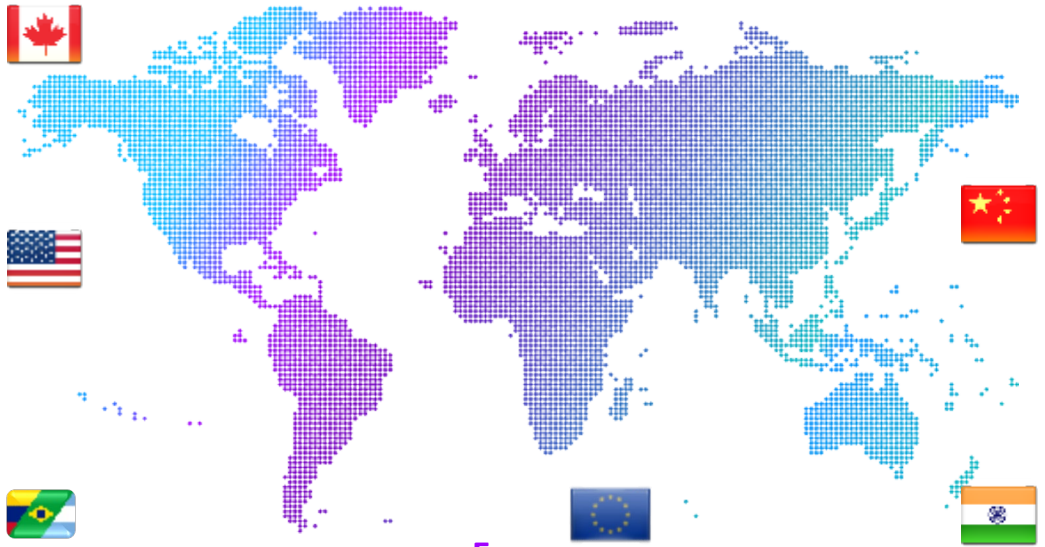
South America

Overview:
Creating a supranational policy framework to drive the circular economy in the Americas, since 2017

Initiative:

Circular Economy Forum of the Americas

- ✓ Inform about the opportunities of a circular economy – and how to integrate into policy



Europe

Overview:
Leading through shared multinational circular initiatives and goals, implemented by EU Member States in line with national priorities

Legislation:

Circular Economy Action Plan (as part of European Green Deal), revised Waste Directive (incl. EPR), Plastics Strategy, Chemical Strategy, EU Sustainable Product Initiative, Eco Design Directive, Green Consumption Pledge

- ✓ An integrated product policy framework implementing measures for the lifecycle of products and to tackle resource intensive sectors
- ✓ €1 trillion of total sustainable investments through Green Deal Investment Plan during 2020-2030
- ✓ Targets include +0.5% GDP and 700,000 new jobs by 2030

China

Overview:
Implementing strong national waste and resource efficiency laws, spurred by fear over plastics, electronic waste and air pollution, with a lack of waste infrastructure and enforcement capacity as the main barrier to implementation

Legislation:

China's 14th 5-year plan contains the Development Plan for the Circular Economy, which contains actions around recycling, remanufacturing, green product design, and renewable resources, including plans to:

- ✓ Produce 20mtons of recycled non-ferrous metals
- ✓ Increase resource productivity by 20% compared to 2020 levels
- ✓ Increase the output value of the resource recycling industry to RMB 5 trillion (US$773 billion)

India

Overview:
Dealing with commonly faced environmental challenges of post COVID-19 economic recovery

Initiative:

EU-India Joint Declaration on Resource Efficiency and Circular Economy

- ✓ Ensures the design, planning, implementation, promotion and dissemination of policies, strategies, technologies, business solutions and financing mechanisms for resource efficiency and a circular economy

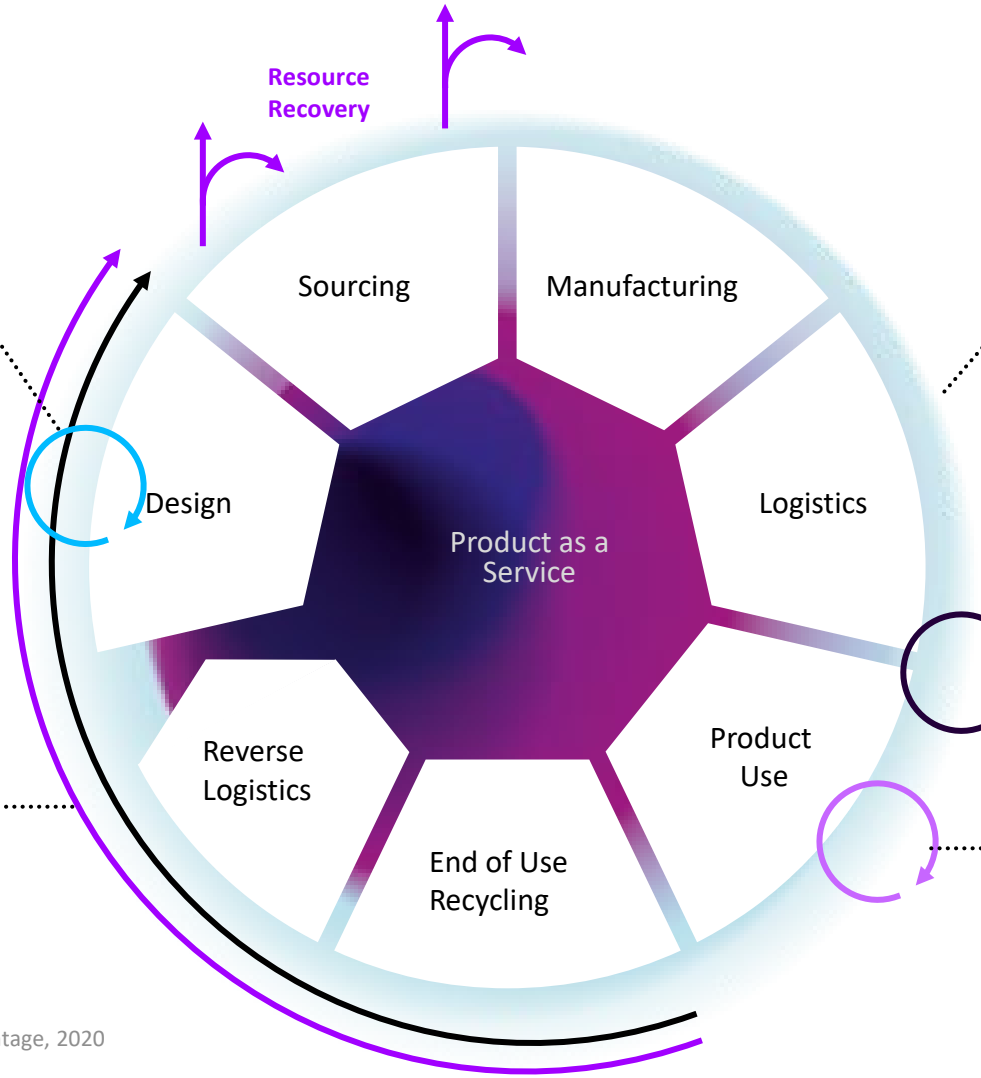
02

The circular economy foundations

The circular business models can be mapped across the value chain, focus on both production and consumption, and provide a proven framework for circular transformation

Circular Inputs:
Using renewable sources, bio-based materials and man-made materials, that are recycled or highly recyclable, to partially or completely eliminate waste

Resource Recovery:
Using the embedded materials or energy at the end of use of a product and recovering through collection, aggregation, and processing.



Product as a Service:
Retaining ownership of products and selling benefits through a service model

Product Use Extension:
Product's use extended through design considerations, repairs, reconditioning, upgrades, and resale for second-use.

Sharing Platforms:
Optimizes utilization rates of products and assets through shared ownership, access, and usage.

Source: The Circular Economy Handbook: Realizing the Circular Advantage, 2020

Circular Inputs

Cruz Foam

Cruz Foam, a startup based out of Santa Cruz, California, offers an innovative alternative to packaging material inputs.

Their innovation replaces polyethylene foams with 100% compostable "**biopolymer technology**" made from shrimp shells and other organic waste.

100%

Compostable material with ASTMD6400 and ASTMD6868 certifications

+ Serves as a fertilizer

3.4 M

Raised to scale up to meet the demands of its first major customer, Whirlpool.

Product as a Service

Philips

Philips offers healthcare products as a service, monitoring them remotely to predict maintenance and repair.

Philips lighting (now Signify) follows a similar business model, offering light-as-a-service

64%
of Philips' sales were comprised of green revenues

30%
the minimum % of recycled or refurbished parts in Philips circular healthcare

75%
increase in useful life of lamps through Philips/Signify's Light as a Service offering

Source: The Circular Economy Handbook: Realizing the Circular Advantage, 2020

Product Use Extension

Cear, an IT Asset Disposition company (ITAD) based out of Mather, California, offer services including electronic asset recovery, secure data destruction and remarketing of reparable assets.

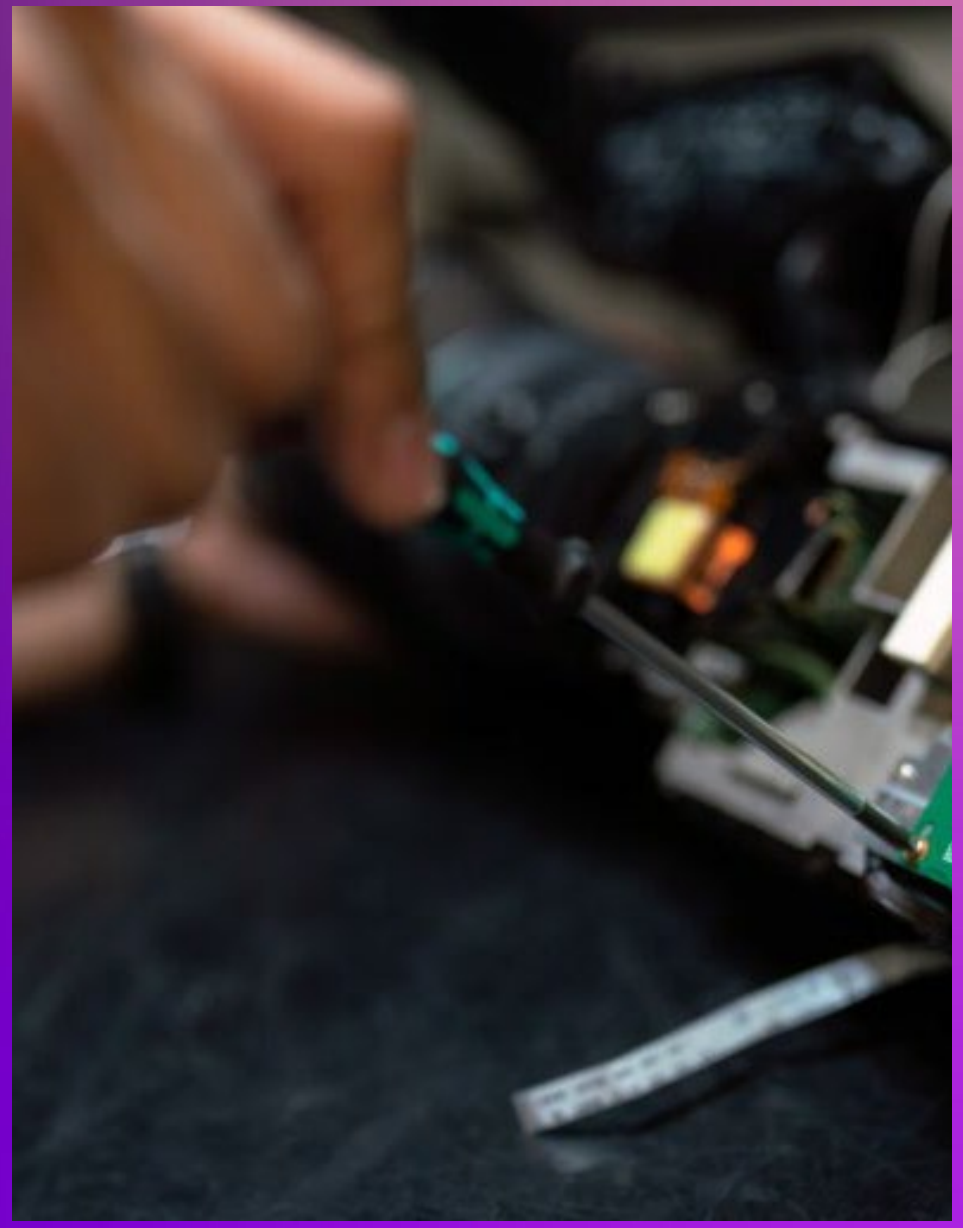
Their sustainable approach also breaks the end-of-life of electronics and applies circular approach in all company processes and services.

100%
of refined metal, plastics and glass are re-manufactured into new materials

+9.000
Tons of electronic waste recycled per year

+20
Tons of lithium batteries recycled

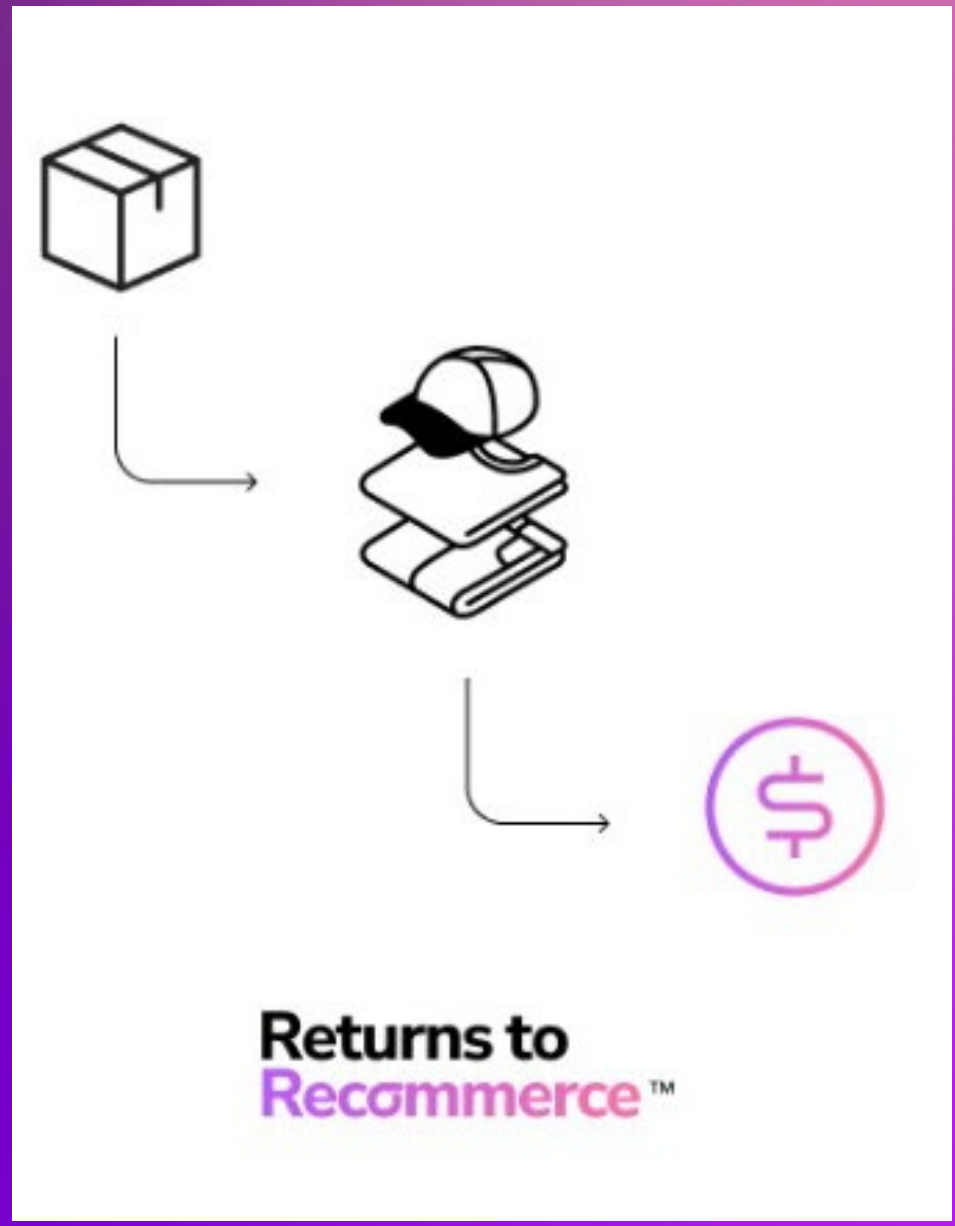
+80
Green jobs created



Sharing Platforms

Arrive

Arrive enables businesses to move away from today's 'take-make-waste' linear relationship with clothes by extending the lifetimes of clothing via resale and rental marketplaces.



3x
Resale projected to grow in 5 years

$77B
Projected for secondhand market in 2025

11X
Resale expected growth 11X faster than retail

Resource Recovery

Aquacycl

Aquacycl offers a sustainable approach to managing high-strength wastewater using BioElectrochemical Treatment Technology (BETT) and naturally existing bacteria to treat wastewater and generate direct electricity.

10x
Higher Biological Oxygen Demand (BOD) removal than other technologies

over 50%
Reduction in overall GHG emissions for treatment

over 20%
Reduction in wastewater management cost

Source: aquacycl.com

5 key enablers to reach a circular economy

Analysing 1500+ case studies, we need these 5 factors to reach the full potential of circular business models

Consumer Engagement

Re-shape what it means to consume to support evolving customer demands and to drive new behaviours

Design

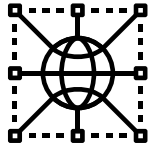
Plan for product clarity to enable longer use-cycles and end of use recovery

Reverse Logistics

Create takeback loops by managing the return and recovery of products back into the value chain

Ecosystems

Embrace the power of external engagement and build new networks to unlock circularity at scale



Disruptive Technologies

Accelerate with 4IR innovations to enable the smart use of resources and create new opportunities

Source: The Circular Economy Handbook: Realizing the Circular Advantage, 2020

The Opportunity

Establishing California as the clear leader of America's Circular Economy transition could accelerate impact at a massive scale

WHAT IF...

- Standardized ESG labelling on consumer products spread across the entire US?
- Single-use plastics were replaced by reusable and compostable alternatives?
- CalRecycle led the shift to a circular economy in the State of California?

THE CIRCULAR ECONOMY HANDBOOK

Thank you for having us!