WASTE, RECYCLING & THE CIRCULAR ECONOMY

Moving Beyond Take, Make, Waste

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The Linear Model: Take → Make → Dispose



- Built on the assumption of infinite cheap resources
- Every product designed to be discarded, not recovered or reused
- The system creates waste as a feature

Waste: The Scale of the Problem

2.1 Bn t

municipal solid waste
generated globally, 2023

3.8 Bn t

projected global waste
by 2050 — up 81%

33%

of all waste not managed
environmentally safely

$361 Bn

true annual cost of waste
incl. pollution & health

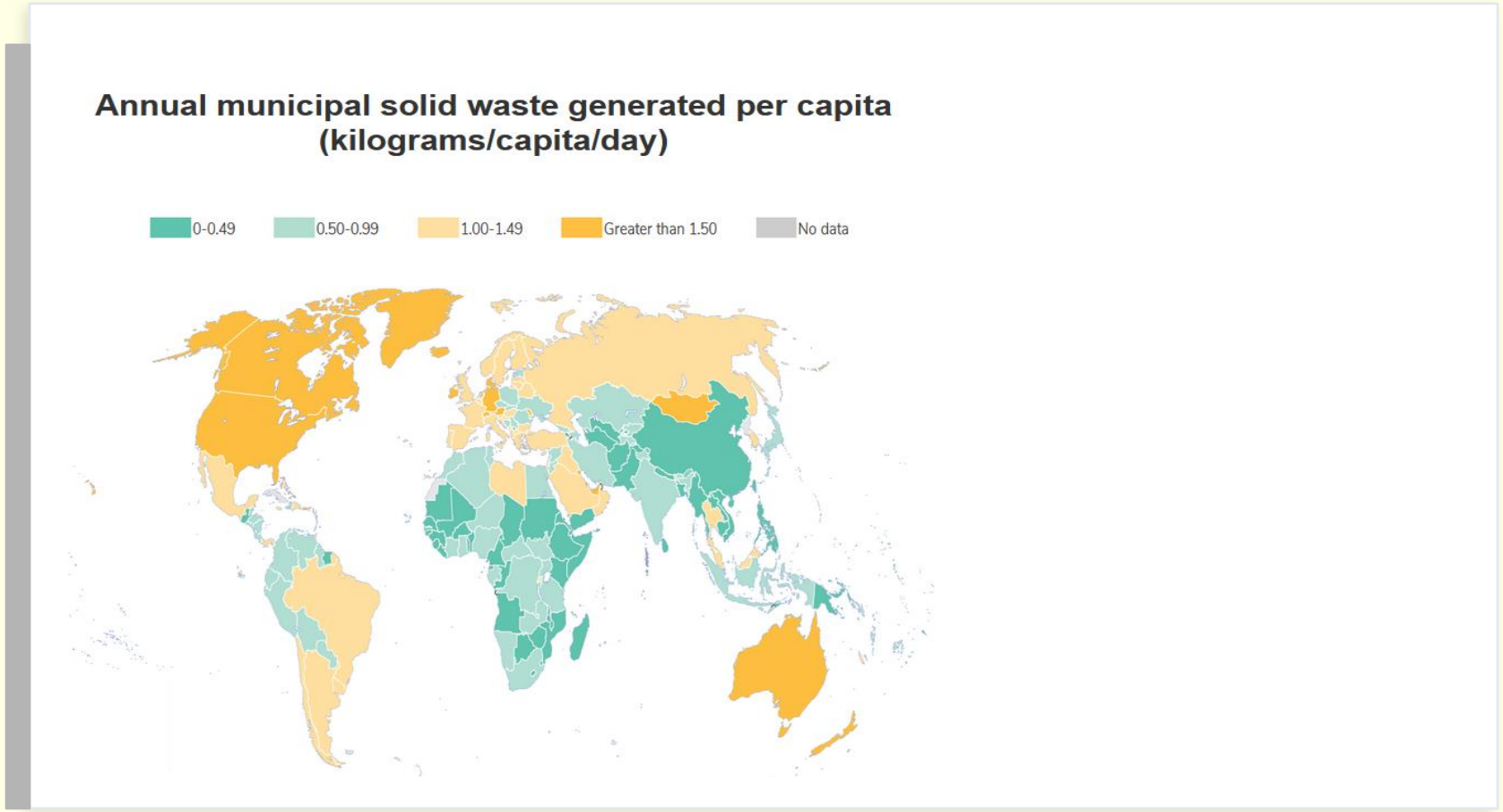
$640 Bn

projected annual cost
by 2050 if nothing changes

34%

high-income countries share
of waste (only 16% of population)

Waste: The Scale of the Problem



World Bank What a Waste 2.0

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Recycling: What It Does Well & Where It Fails

✓ What Recycling Does Well

- Diverts materials from landfill
- Aluminium recycling uses 95% less energy than virgin production
- Recycled steel uses 60% less energy than virgin steel
- Creates jobs in collection, sorting and processing
- Reduces pressure on virgin resource extraction

✗ The Hard Numbers

- Only ~20% of waste is recycled globally — 80% dumped or landfilled
- E-waste: only 22.3% formally recycled in 2022
- Textiles: only 0.3% of fibres come from recycled garments
- Plastic: less than 10% of all plastic ever produced has been recycled

Most products are not designed to be recycled - they are forced through a system they were never meant for

World Bank What a Waste 2.0

RECYCLING

Why Recycling Alone Cannot Solve the Problem

Downcycling

Most recycling degrades material quality with each cycle. You cannot recycle your way back to virgin material. Paper becomes cardboard becomes waste.

Contamination

Mixed and contaminated waste streams make large volumes unrecyclable. A single non-recyclable item can ruin an entire batch of otherwise recoverable material.

Economics

Recycled materials frequently cannot compete on price with cheap virgin materials — especially when raw material extraction is subsidised.

Design Failure

Most products were never designed to be recycled. Multi-material products, adhesives, coatings and mixed plastics make disassembly impossible at scale.

Infrastructure Gap

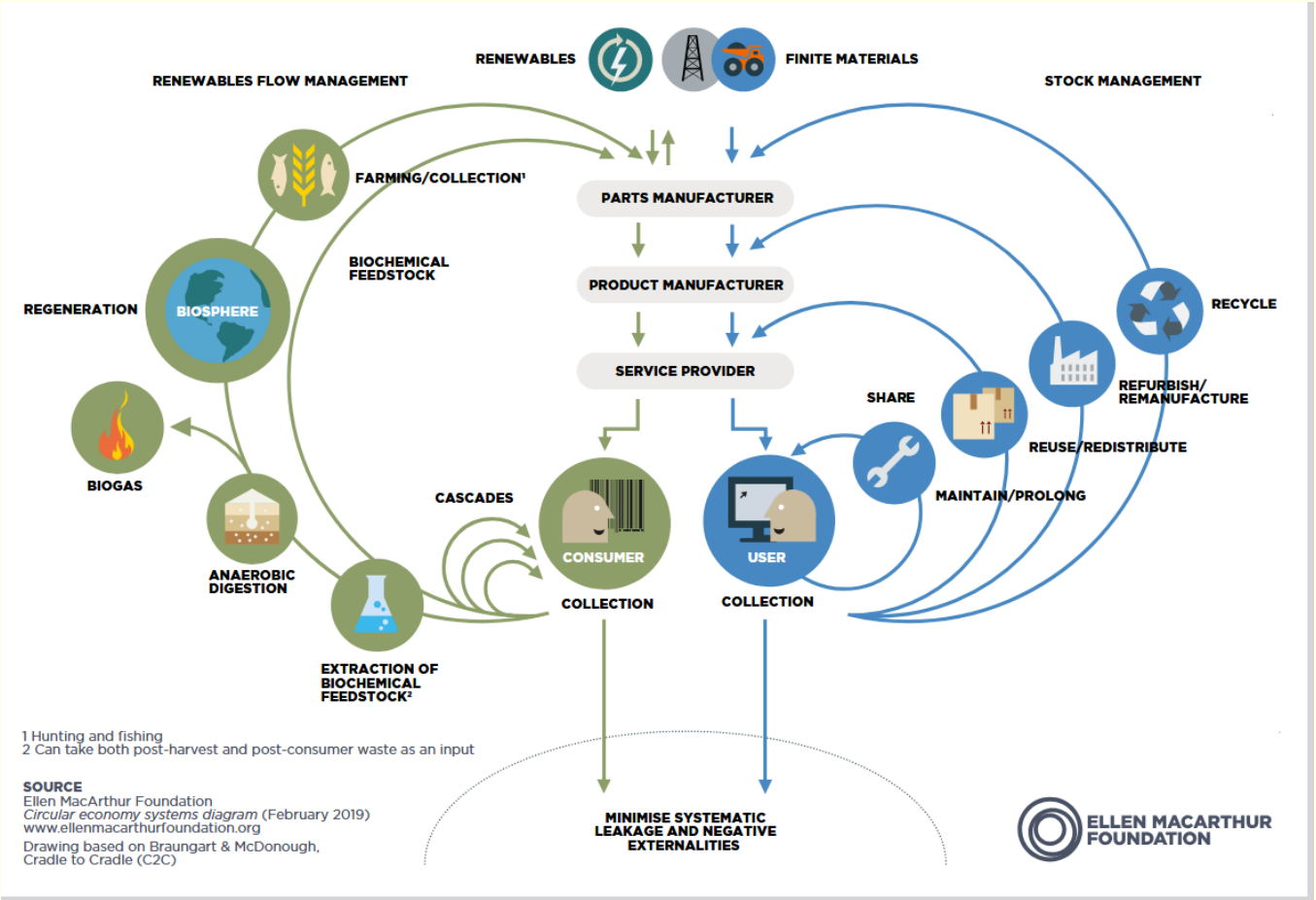
Low and middle income countries lack the collection and processing infrastructure. Over 90% of waste in low-income countries is mismanaged.

The Fundamental Limit

Even perfect 100% recycling would not solve overproduction or overconsumption. Recycling is a downstream fix to an upstream design failure.

What Is the Circular Economy?

- Eliminate Waste and pollution
- Circulate products and materials (at their highest value)
- Regenerate

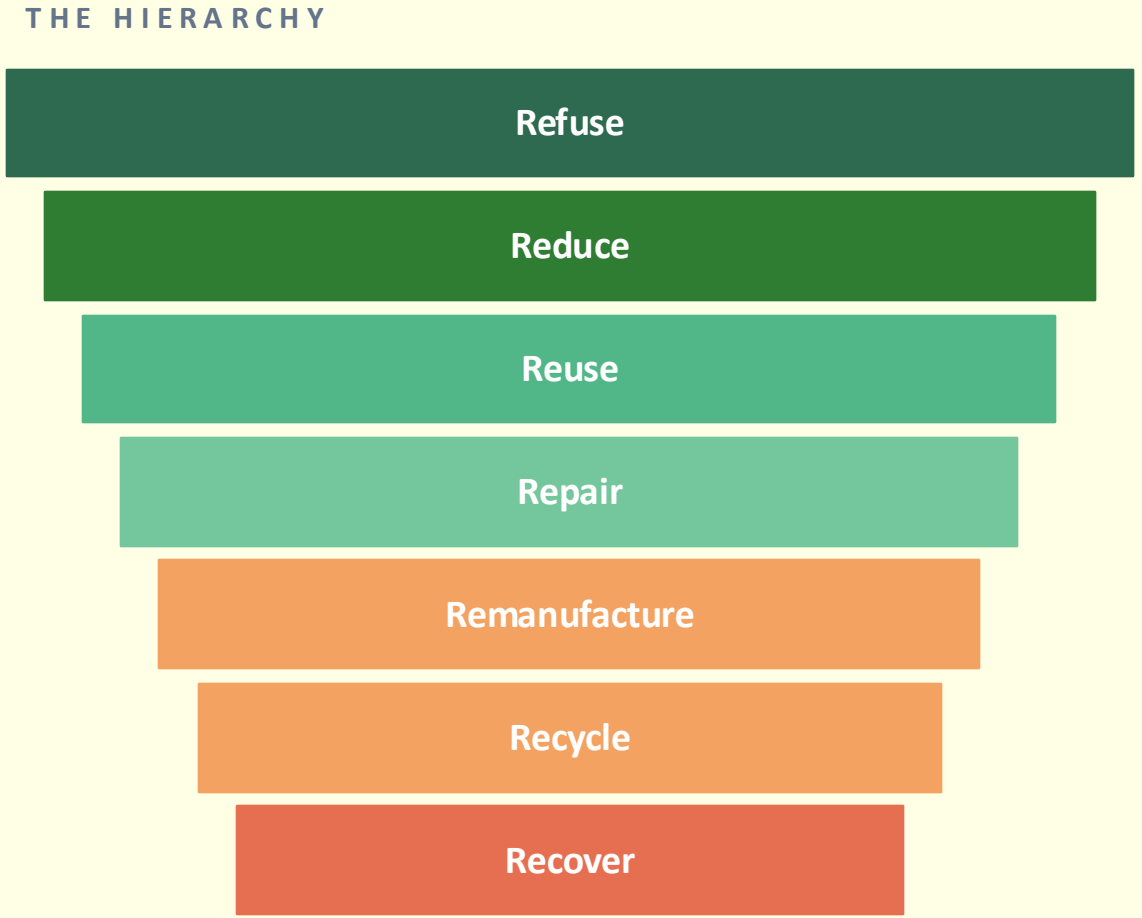


Ellen MacArthur Foundation's 3 principles: Design out waste · Keep materials in use · Regenerate natural systems

What Is the Circular Economy?

A system designed to eliminate waste - not manage it

- Shifts the question from "how do we dispose of this?" to "how do we make sure this never needs disposing of?"
- Recycling is the last resort — circular economy starts at the design stage
- Manufacturer retains ownership and is incentivised to make things last
- New revenue streams: rental, resale, remanufacturing, repair



Ellen MacArthur Foundation's 3 principles: Design out waste · Keep materials in use · Regenerate natural systems

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The Scale of the Circular Opportunity

-50% GHG

Reduction on GHGs

-34% Municipal waste

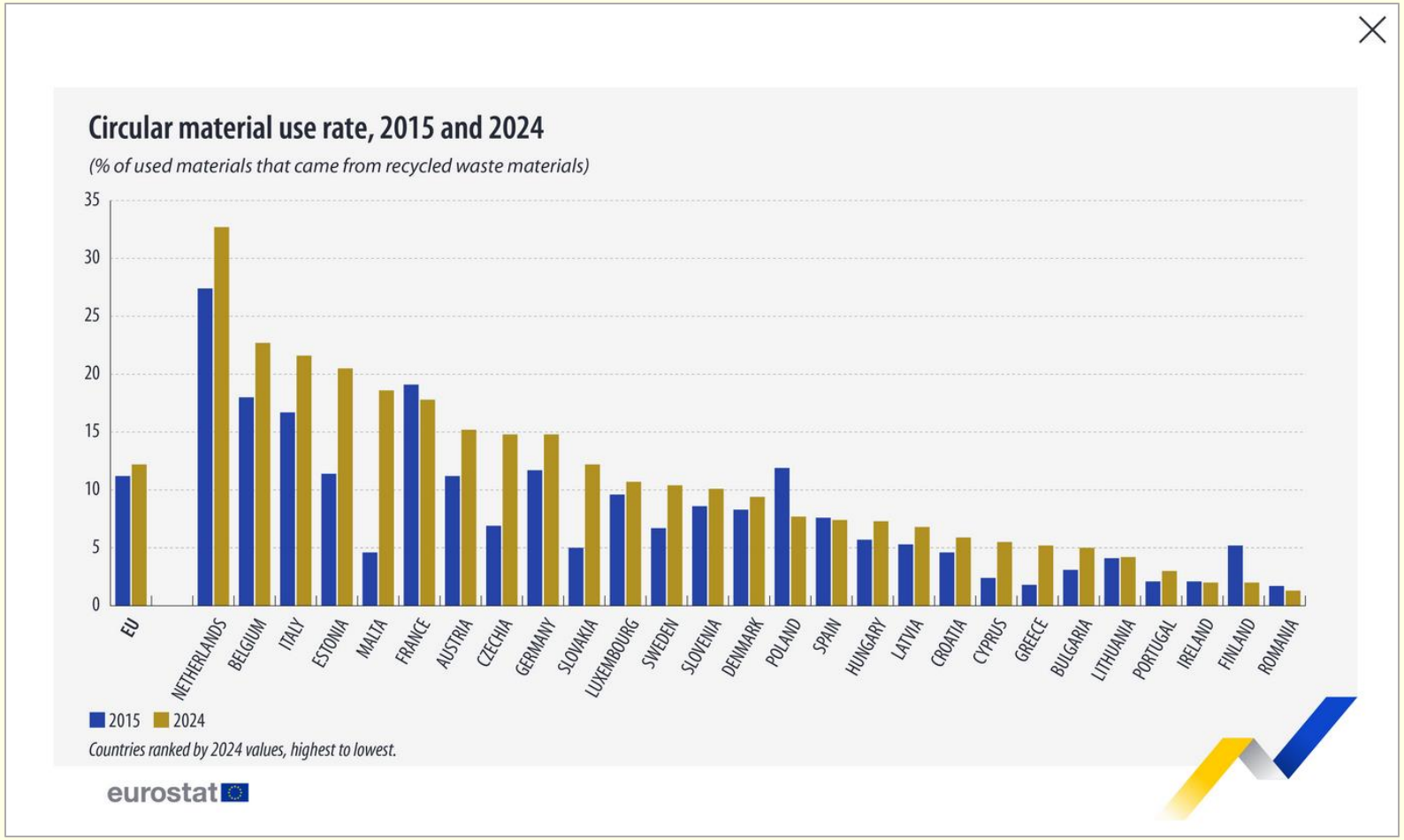
By 2030 when compared with 2020

2.5 M

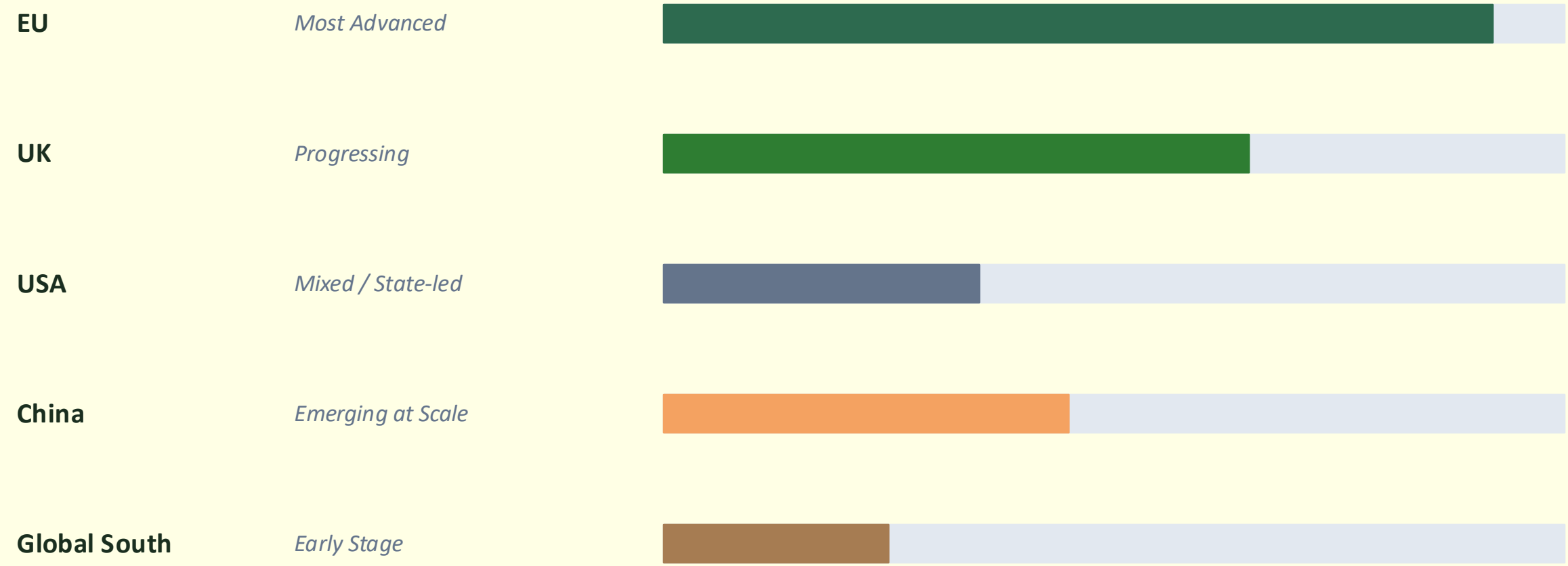
new jobs in EU by 2030
in repair, reuse, recycling

- EU circularity rate today: only 12% — target is 24% by 2030
- Manufacturing firms spend ~40% of costs on raw materials - circular loops cut this significantly
- Could reduce total municipal waste generation by 34% by 2030 compared to 2020
- +0.5% increase in EU GDP by 2030 from circular measures

How far are countries in Circular economy?



The Regulatory Landscape: Where the World Stands



Multinational business might be looking at the highest standards to ensure compliance

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Regulation in Practice: Key Dates & Targets

Already in force	EU single-use plastics ban · UK Plastic Packaging Tax (£200/t) · EU Packaging EPR · EU End-of-Life Vehicles Directive (95% recyclable)
2025	EU: 55% municipal waste recycling & 65% packaging recycling targets · EU: separate textile waste collection mandatory · UK Pa ckaging EPR invoices begin (Oct 2025)
2026	**EU ban on destroying unsold clothing & footwear (ESPR**) · EU Packaging Waste Regulation applies · EU anti-greenwashing rules · UK CMA greenwashing fines up to 10% of turnover
2027	**UK Deposit Return Scheme** launches (Oct 2027) — plastic bottles & cans, England / NI / Scotland · EU DRS mandated across all member states by 2029 (PPWR)
2028–30	EU Textile EPR schemes fully operational (Apr 2028) · EU food waste: -10% in manufacturing, -30% per capita in restaurants/retail vs 2020 · EU Digital Product Passport for fashion
2035	EU: 65% municipal waste recycling & landfill reduced to 10% · EU ban on new petrol/diesel car sales (agreed 2023)

Sources: European Commission · House of Commons Library (Mar 2026) ·

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REGULATION · EU

EU End-of-Life Vehicles Directive

WHAT IS IT?

The ELV Directive requires that 95% of the weight of a vehicle must be recyclable or recoverable, with at least 85% through material recycling. A new proposed regulation (2023) will go further, requiring minimum recycled content in new vehicles and full Digital Passports for every component.

WHY IT MATTERS

Cars are one of the most material-intensive consumer products. The directive forces automotive manufacturers to design for disassembly from the outset. The 2035 ban on new petrol and diesel car sales sits on top of this, requiring the entire industry to redesign its product and business model within a decade.

SECTORS AFFECTED

Entire automotive sector — manufacturers (OEMs), component suppliers, dealerships, leasing companies, fleet operators, scrapyards and recyclers. Affects every stage from design through to end-of-life collection.

WHAT BUSINESSES MUST DO

Design new vehicles with disassembly and material recovery in mind. Register with authorised treatment facilities. Provide free take-back for end-of-life vehicles. Track and report material flows. Prepare for Digital Product Passports on vehicle components under the 2023 proposed regulation.

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REGULATION · EU

EU: 55% Municipal Waste Recycling & Mandatory Textile Collection

WHAT IS IT?

Two major milestones land in 2025. First, **EU member states must achieve a 55% recycling rate** for municipal solid waste (up from ~48% average). Second, **all EU member states must have separate textile waste collection systems** in place from January 2025 — textiles can no longer go into general waste.

WHY IT MATTERS

The textile collection mandate is a structural shift. For the first time, fashion waste is treated as a distinct material stream, separate from household rubbish. This creates the infrastructure for extended producer responsibility in fashion.

SECTORS AFFECTED

Municipal waste: all sectors generating waste. Textile collection: fashion brands, retailers, e-commerce platforms, laundries, hotels, rental services. Any company placing textiles on the EU market now has obligations to contribute to collection infrastructure.

WHAT BUSINESSES MUST DO

Fashion brands must register with national textile EPR systems (or their own schemes). Retailers must provide or contribute to in-store take-back or designated collection points. Municipalities must have separate textile bins in place. Brands must begin tracking and reporting textile volumes placed on market annually.

REGULATION · EU / UK

Anti-Greenwashing Rules: EU ECGT & UK CMA Enforcement

WHAT IS IT?

From 2026, two major anti-greenwashing frameworks take effect simultaneously. The EU's Empowering Consumers for the Green Transition Directive (ECGT) bans vague environmental claims like "eco-friendly", "green" or "sustainable" without substantiated evidence. In the UK, the Competition and Markets Authority (CMA) gains powers under the DMCA 2024 to fine businesses up to 10% of global turnover for misleading environmental claims.

WHY IT MATTERS

Greenwashing has been rampant across retail, fashion, food and hospitality. Terms like "sustainable collection", "eco", "carbon neutral" and "green" have been used freely without independent verification. These rules make that illegal and the fines are existential in scale. A company with £1bn turnover could face a £100m fine. This forces authenticity into sustainability communications.

SECTORS AFFECTED

All consumer-facing industries making environmental claims; fashion, food, retail, hospitality, automotive, financial services, energy. Both product claims and corporate sustainability communications are in scope. Companies operating in both EU and UK markets face double exposure.

WHAT BUSINESSES MUST DO

Audit all marketing materials, product labels, websites and annual reports for unsubstantiated environmental claims. Remove or substantiate every "green" claim with verifiable evidence. Implement legal review process before any sustainability communication is published. Train marketing, legal and sustainability teams on the new rules together.

REGULATION · EU

Ban on Destroying Unsold Clothing & Footwear (ESPR)

WHAT IS IT?

From 2026, the EU's Ecodesign for Sustainable Products Regulation (ESPR) **bans large companies from destroying unsold textiles, clothing and footwear**. Companies must instead donate, repair, reuse or recycle unsold stock.

WHY IT MATTERS

The fashion industry routinely destroyed unsold stock to protect brand value and avoid discounting .This practice is now illegal for large businesses and will extend to smaller ones in subsequent years. It forces a fundamental rethink of production volumes, forecasting and inventory management

SECTORS AFFECTED

Fashion brands, apparel retailers, luxury goods companies, sportswear, footwear. Initially applies to large companies (500+ employees / €150m+ turnover). Will extend to medium enterprises in following years. Also covers importers of textiles into the EU market.

WHAT BUSINESSES MUST DO

Stop all destruction of unsold clothing and footwear immediately (large companies). Establish partnerships with charities, redistribution platforms, repair networks and recyclers. Redesign production planning to reduce overstock. Document and report all disposal routes for unsold inventory. Consider resale, rental or take-back programmes as outlets for excess stock.

REGULATION · EU

EU Right to Repair Directive

WHAT IS IT?

Applicable from July 2026 - The directive gives consumers the legal right to request that manufacturers repair certain products, even outside the standard warranty period. Manufacturers cannot use software locks, previous third-party repairs or other obstacles to deny a repair without a legitimate reason.

WHY IT MATTERS

Before this law, manufacturers routinely designed products that were difficult or impossible to repair - using proprietary screws, glued components, software locks and limited spare part availability. This forced consumers to buy new products rather than fix old ones. The directive makes non-repairability a legal defect, extends the warranty by 12 months when a consumer chooses repair over replacement, and by 2027 will create a pan-EU online platform connecting consumers with repairers. It is a direct challenge to the throwaway model.

SECTORS AFFECTED

Manufacturers of: washing machines, washer-dryers, dishwashers, refrigerators, electronic displays, vacuum cleaners, servers, mobile phones, tablets, e-bikes and e-scooters. Also affects importers, authorised representatives and distributors. UK businesses selling into the EU are also in scope.

WHAT BUSINESSES MUST DO

Manufacturers must offer to repair listed products within a reasonable time and at a reasonable price. Must publish indicative repair prices on their website. Must supply spare parts and tools to independent repairers. Repairers should consider registering on the EU online repair platform (live 2027) for consumer visibility.

REGULATION · EU

EU Textile Extended Producer Responsibility (EPR)

WHAT IS IT?

By April 2028, all 27 EU member states must have operational **Extended Producer Responsibility schemes for textiles**. Brands and importers placing textiles on EU markets must pay fees based on the weight of products sold, fund collection and sorting infrastructure, and report annual volumes. From 2029, obligations extend to micro-enterprises.

WHY IT MATTERS

EPR makes fashion brands financially responsible for what happens to their garments after sale, for the first time in most EU countries. Brands can no longer rely on the absence of legislation in certain markets. It creates a direct financial link between how much a brand sells and how much it must pay to deal with the waste.

SECTORS AFFECTED

All fashion brands, textile retailers, sportswear companies, home textiles, workwear, and importers of clothing into the EU. Even brands headquartered outside the EU must register if they sell into EU markets. Fast fashion brands, with the highest volumes , will face the highest fees.

WHAT BUSINESSES MUST DO

Register with national Producer Responsibility Organisations (PROs) in each EU market. Submit annual declarations of textiles placed on market. Pay weight-based EPR fees. Design products with recyclability in mind, some schemes use eco-modulation, rewarding recyclable designs with lower fees. Build take-back and repair programmes ahead of mandatory requirements.

REGULATION · EU

EU Digital Product Passport for Textiles

WHAT IS IT?

By 2030, every textile product sold in the EU must carry a Digital Product Passport (DPP), a data record accessible via QR code or RFID tag containing the product's full material composition, country of manufacture, repairability score, supplier information, care instructions and end-of-life guidance. It is part of the Ecodesign for Sustainable Products Regulation (ESPR).

WHY IT MATTERS

The DPP makes greenwashing structurally impossible. Brands can no longer claim sustainability without providing the data to prove it. For consumers it enables informed choices. For recyclers it enables automated sorting. For regulators it enables enforcement. It is the single most transformative piece of product legislation since labelling requirements, it makes the entire supply chain transparent and traceable by law.

SECTORS AFFECTED

All fashion brands, textile retailers, sportswear, luxury goods and home textiles selling in the EU. Importers of textiles are equally affected. Technology providers, recyclers and waste sorters will need to invest in DPP reading infrastructure. The luxury sector faces particular exposure given opacity of supply chains.

WHAT BUSINESSES MUST DO

Begin supply chain mapping now , you need to know every material, every supplier, every process. Invest in product data management systems. Work with suppliers to capture and digitise material data. Design products for repairability and include repair instructions in the DPP. Engage with the EU pilot programmes starting 2026–2028 to get ahead of compliance requirements.

EU Ban on New Petrol & Diesel Car Sales

WHAT IS IT?

From 2035, **no new petrol or diesel cars or vans can be sold anywhere in the European Union**. Only zero-emission vehicles principally battery electric , will be permitted for new sales. The regulation was agreed in 2023, giving manufacturers a 12-year runway. A limited exemption exists for e-fuel vehicles subject to a separate review.

WHY IT MATTERS

This is the most consequential single piece of automotive regulation in history. It effectively ends over a century of the internal combustion engine as the dominant consumer vehicle technology. **Every aspect of the automotive value chain from design, manufacturing, supply chains, dealerships, fuel retail, insurance to maintenance must reinvent itself**. It forces circular thinking on battery materials, rare earth recovery, and end-of-life vehicle design from the outset.

SECTORS AFFECTED

Entire automotive sector globally ; OEMs, Tier 1 and 2 suppliers, dealerships, leasing companies, fleet operators, fuel retailers, mechanics and repair shops, charging infrastructure providers, battery recyclers and critical mineral suppliers. Also affects energy utilities, construction (charging infrastructure) and financial services.

WHAT BUSINESSES MUST DO

OEMs must complete their EV transition well before 2035 to maintain market share, leading manufacturers are targeting 2030. Suppliers must pivot from combustion components to EV equivalents or exit the market. Dealerships must retrain technicians. Leasing companies must restructure residual value models. Battery manufacturers must build closed-loop recycling partnerships. Circular design for battery packs is now a commercial imperative.

The Role of the Consumer

- Consumers are not just end-users.
- Returning products, choosing repair, opting for rental: each behaviour keeps materials in circulation
- Consumer spending power is a vote for circular business models

- Gap driven by: price, convenience, lack of awareness and poor infrastructure
- Businesses must make circular the default, not the premium e.g Selling left overs at lower price/donations.

Attitude-action gap: sustainability matters but behaviour lags significantly

SECTOR: CARS

Automotive: Circular in Motion

CHALLENGE

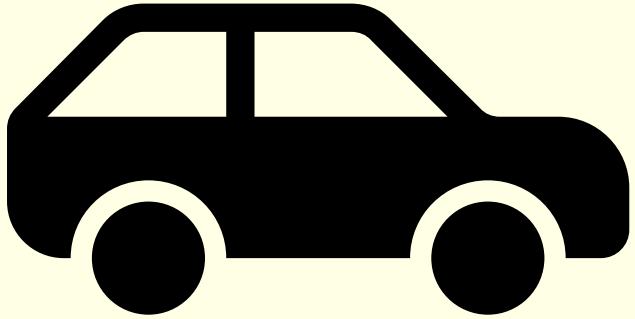
Short ownership cycles

CIRCULAR ADAPTATIONS

- Leasing & subscription models replace ownership
- Remanufacturing: parts rebuilt to original spec
- Design for disassembly & material recovery
- EU 2035 petrol/diesel ban forces redesign

CONSUMER ROLE

Embrace leasing over buying · Use car-sharing · Return vehicles through proper channels



SECTOR: HOTELS

Hotels: From Single-Use to Closed Loop

CHALLENGE

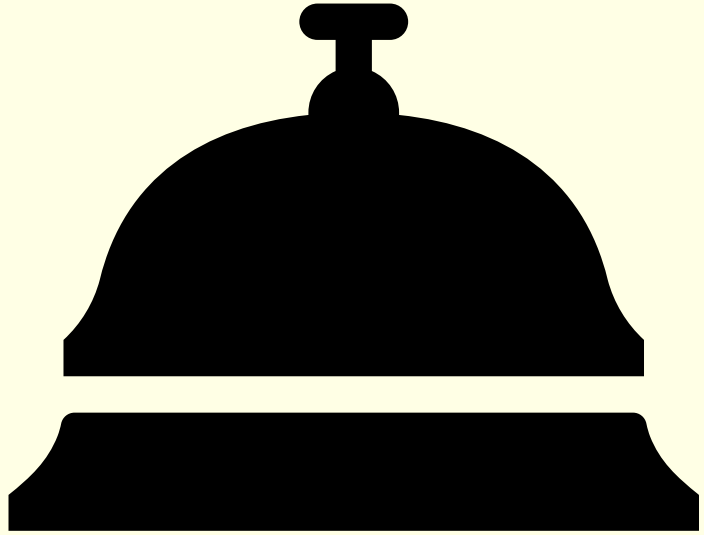
Single-use amenities, food waste, energy consumption, daily linen turnover at scale

CIRCULAR ADAPTATIONS

- Replace single-use toiletries with refillable dispensers
- On-site composting for food waste
- Linen hire models: return & re-use cycles
- Zero waste to landfill commitments
- EU food waste reduction: -30% per capita by 2030

CONSUMER ROLE

Opt out of daily linen changes · Choose Green Key certified hotels · Refuse single-use amenities



SECTOR: RESTAURANTS

Restaurants: From Kitchen Waste to Closed Loop

CHALLENGE

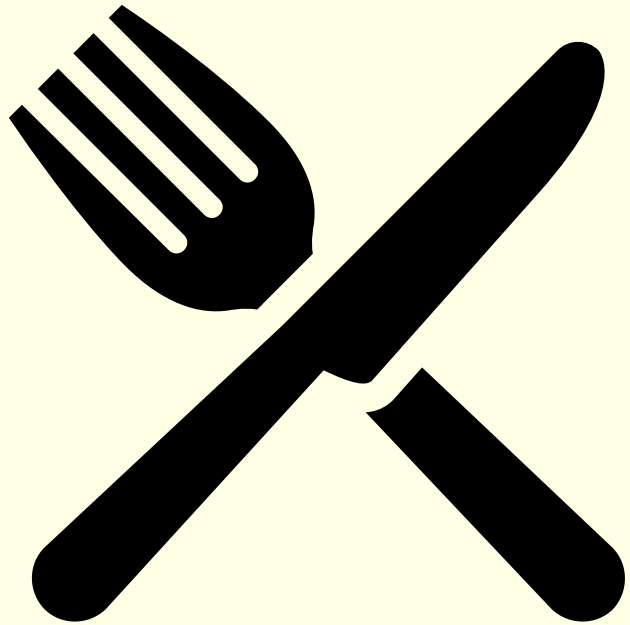
Food waste, single-use packaging, disposable serviceware

CIRCULAR ADAPTATIONS

- Nose-to-tail cooking: every part of every ingredient used
- Surplus food apps to eliminate end-of-day waste
- Reusable / returnable packaging schemes
- Compost all organic waste on-site or locally

CONSUMER ROLE

Use Too Good To Go · Accept imperfect produce · Return deposit packaging · Choose restaurants with circular credentials



SECTOR: FASHION

Fashion: The Industry That Must Reinvent Itself

CHALLENGE

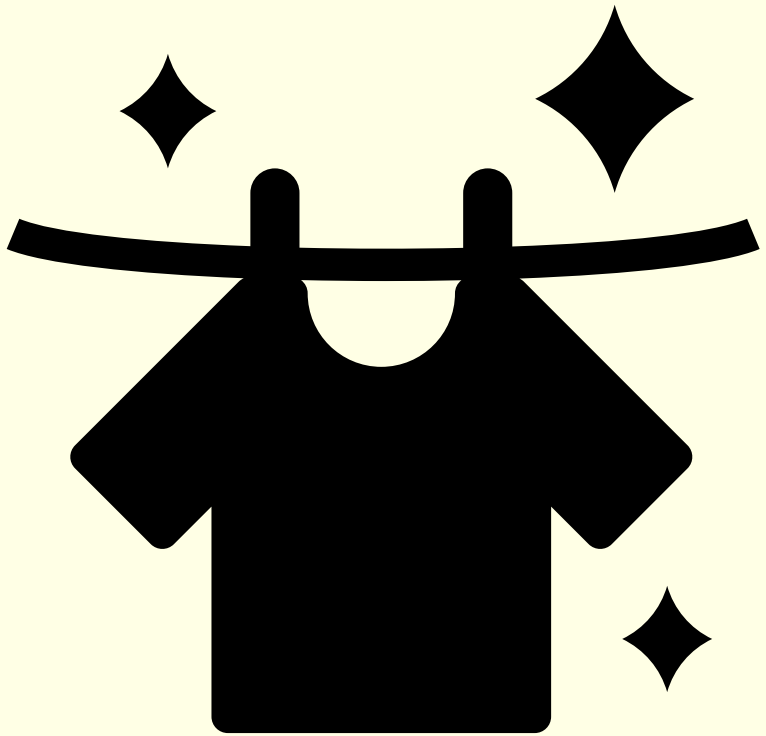
Fast fashion: garments worn 7–10 times before disposal · water consumption · GHG emissions

CIRCULAR ADAPTATIONS

- Rental & resale models extend garment lifespan
- Take-back schemes funded by EPR fees
- Recycled & biodegradable fibre investment
- EU: separate textile waste collection from Jan 2025
- Digital Product Passport: full supply chain transparency

CONSUMER ROLE

Buy less, buy better · Choose secondhand · Rent for occasions · Repair before replacing



What Can We Do? The Consumer Action Guide

Cars

- Choose leasing over buying
- Use car-sharing
- Maintain vehicles longer
- Buy certified pre-owned

Hotels

- Opt out of daily linen changes
- Choose eco-certified properties
- Refuse single-use toiletries
- Minimise food waste on own consumption

Restaurants

- Source end of day leftovers
- Carry reusable containers
- Ask about sourcing & provenance
- Compost at home

Fashion

- Buy secondhand:
- Rent for occasions
- Use brand take-back schemes
- Repair before replacing

Buy less · Buy better · Prioritise access over ownership · Use spending as a vote for circular businesses

How Long Does Transformation Take?

PHASE 1 Year 1–2	PHASE 2 Year 2–5	PHASE 3 Year 5–10+
Quick Wins	**Model Redesign**	**System Change**
• Waste audit across operations • Eliminate single-use materials • Join surplus food / resale platforms	• Redesign products for longevity • Shift to leasing / service models • Retrain & re-contract supply chain • Build reverse logistics	• Full circular model embedded • Closed-loop supply chains live • Measurable environmental impact • Culture & circularity aligned

Key Adaptations Across All Sectors

Business Model Shift

Move from selling products to selling **access**, performance or outcomes.

Design for Circularity

Durability, disassembly and repairability must be built in from day one.

Supply Chain Collaboration

Share materials data across the chain. Establish reverse logistics. Build relationships with remanufacturers, recyclers and material recovery partners.

Consumer Engagement

Make circular behaviours the easy default. Use deposits, incentives and clear communication to turn passive buyers into active participants in the loop.

Regulatory Readiness

Treat upcoming regulations as a planning horizon. Early adaptation avoids compliance costs and unlocks green finance at lower rates.

Measure & Report

Track circularity metrics: waste diverted, materials recovered, product lifespan, return rates. Report publicly as regulations require it by 2028–2030.

The question is not whether to transform — but how fast.

Environmental

Circular economy could reduce total municipal waste by 34% by 2030 and cut hard-to-abate emissions by 50%+ by 2050 (OECD 2025)

Financial

Net annual global gain of $108.5 Bn/year by 2050 under full circular model vs $640 Bn cost under business-as-usual (UNEP 2024)

Regulatory

EU, UK and global regulations are tightening fast , early movers turn compliance into competitive advantage and access to green capital

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