ual: london college of fashion

23_24 MAIFP
IPT- EXTERNAL VISIT
SATCol – Processing Centre and Fibresort

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Garment waste diagnostics - Global textile waste in numbers:

What percentage of global carbon emissions is allocated to the fashion and textiles industries?

About **10% of Global GHG emissions** are assigned to fashion and textile products

What is the **percentage of recyclable textiles** is currently not separated ?

80% of recyclable textiles are currently **not** separated.

What are the **main origins of main textile waste?** Think of the categories and what percentages this might be per waste category:

Post industrial waste (fabric scraps from manufacturing) **– 5%**
Pre-consumer waste (unsold inventory and returns) **- 20%**
Post-consumer waste (used clothing) **- 75%**

Environmental Impacts

Environmental impacts of linear fashion through the lifecycle (product journey):

- Raw material/ Fibre manufacturing
- Production
- Use phase
- Disposal/ End of life

Figure 1. The environmental impacts of the linear fashion model

Lifecycle phase	Take → Raw materials	Make → Production	In use → In use	Dispose → After use
Carbon impacts associated with each lifecycle phase	30.7%	51.8%	23.8%	-6.3%
Water impacts associated with each lifecycle phase	92.4%	6.7%	0.9%	0%
Waste impacts associated with each lifecycle phase	4.5%	38.5%	0.1%	56.9%

Source: WRAP_Design_for_Circularity_Toolkit(2023)

Main reasons for scale of postconsumer textile waste:

- **External reasons - implicating the fashion industry:**

- **Globalisation of Fashion:**
  - The globalisation of the fashion industry has led to the production of inexpensive, mass-produced clothing, often with a shorter lifespan, contributing to increased disposal rates.

- **Consumer Culture / Overconsumption:**
  - The culture of constant consumerism and the desire for new possessions drive the disposal of clothing that is still in good condition but considered outdated.
  - Excessive buying and accumulation of clothing, often fuelled by advertising and sales, contribute to a surplus that may lead to the discarding of items.

Main Reasons for scale of postconsumer textile waste:

- **Internal reasons – created by the fashion industry:**

- **Fashion Trends and Fast Fashion:**
  - Rapid changes in fashion trends contribute to the disposal of wearable clothing as consumers seek to stay ‘in style’. Fashion companies businesses dependence on quick turnaround of clothing to maintain their operations

- **Quality and Durability:**
  - Some clothing items may not withstand frequent use and washing, leading to wear and tear that prompts consumers to replace them.

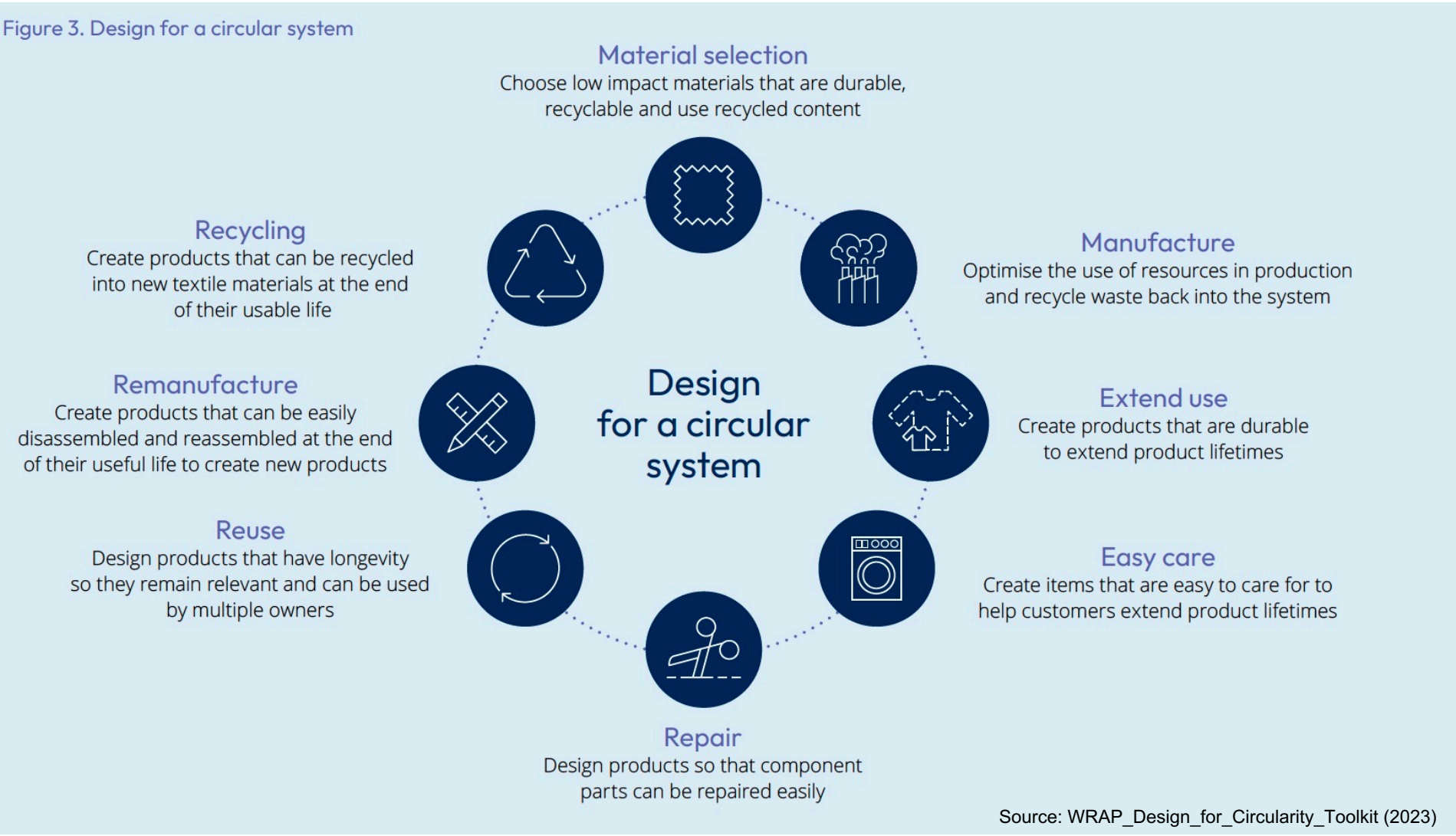
9 Rs of Circularity

Smarter product use and manufacture	R0	Refuse	Make product redundant by abandoning its function or by offering the same function with a radically different product
	R1	Rethink	Make product use more intensive (eg through sharing products or by putting multi-functional products on market)
	R2	Reduce	Increase efficiency in product manufacture or use by consuming fewer natural resources
Extend lifespan of product and its parts	**R3**	**Re-use**	Re-use by *another consumer* of discarded product which is still in good condition and *fulfils its original function*
	R4	**Repair**	Repair and maintenance of defective product so it can be used with its original function
	R5	**Refurbish**	Restore an old product and bring it up to date
	R6	**Remanufacture**	Use parts of discarded product in a new product with the same function
	R7	Repurpose	Use discarded products or its part in a new product with a different function
Useful application of materials	R9	Recycle	Process materials to obtain the same (high grade) or lower (low grade) quality
	R9	Recovery	Incineration of materials with energy recovery

Source: Focus of the Innovate UK LURU "Sprint" – 9Rs diagram adapted from Potting et al 2017 Circular Economy: Measuring Innovation in the Product Chain

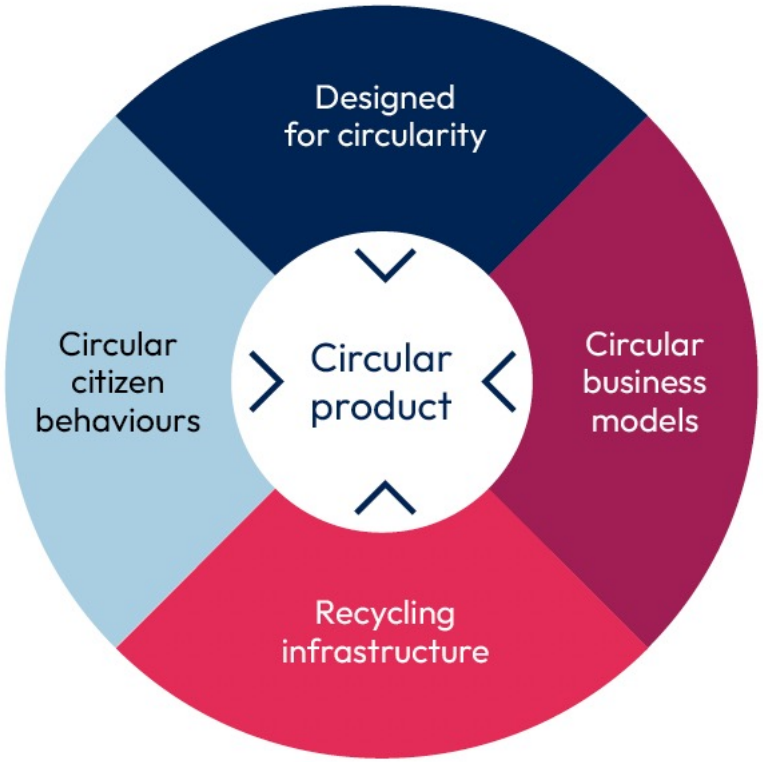
Circular design system

Figure 3. Design for a circular system



Source: WRAP_Design_for_Circularity_Toolkit (2023)

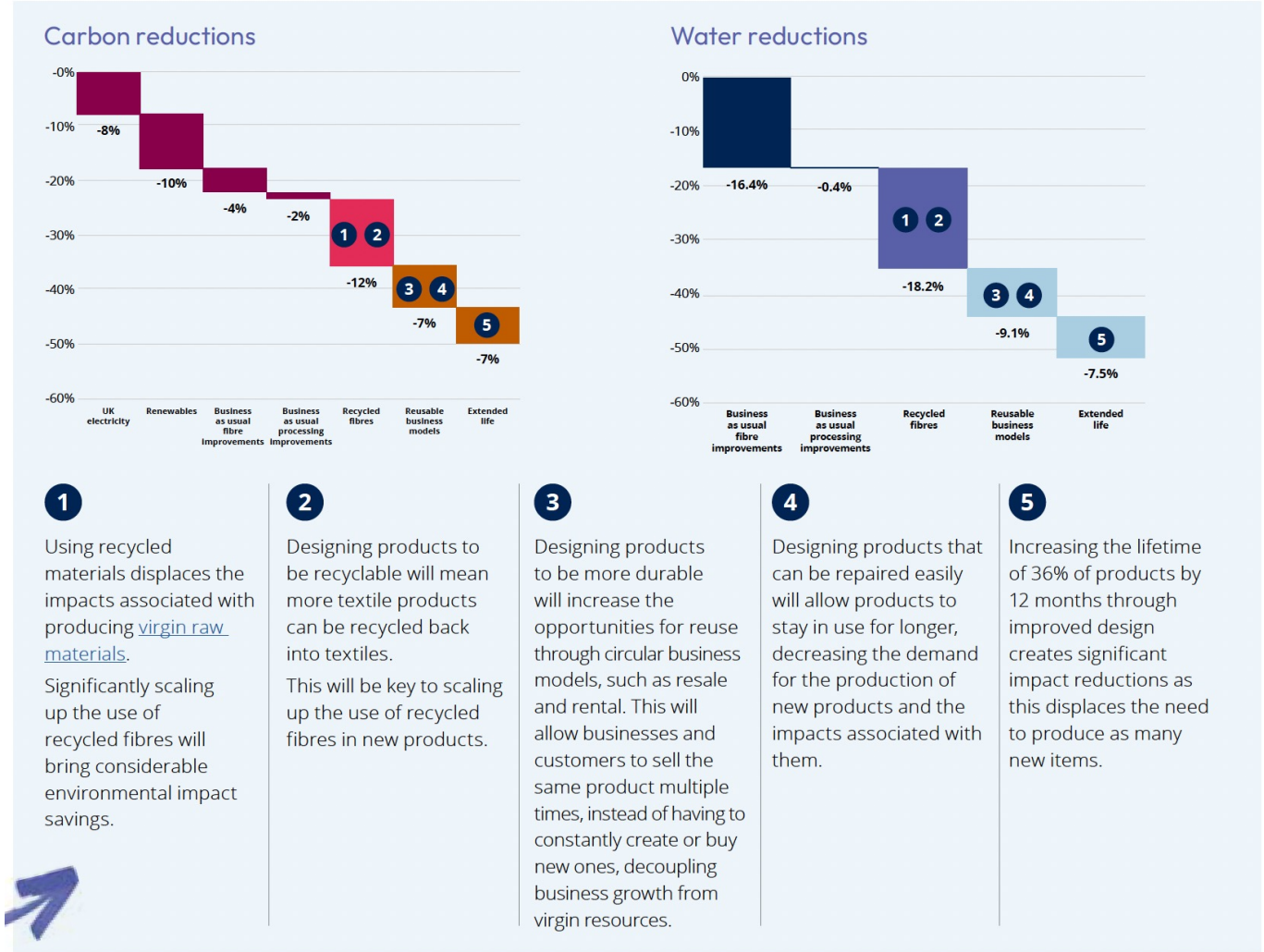
Circularity – A systematic approach



Source: WRAP_Design_for_Circularity_Toolkit (2023)

Circularity means thinking in a system which requires participation from all stakeholders

Projected effects of circular approaches



Source: WRAP_Design_for_Circularity_Toolkit (2023)

Highlights:

Carbon emissions of fashion can be reduced by

10% when using renewable energy

12% when producing in recycled fibres

9.1% when using a reusable business models

7.5% when extending the lifecycle (by 9 months)

Water usage can be reduced by:

18.2% when producing in recycled fibres

Lifecycle management of post-consumer clothing

Understanding your product's lifecycle

Understanding your product's lifecycle will be key to designing for circularity.

A product will go through four lifecycle stages:

- Raw materials
- Production
- In use
- After use

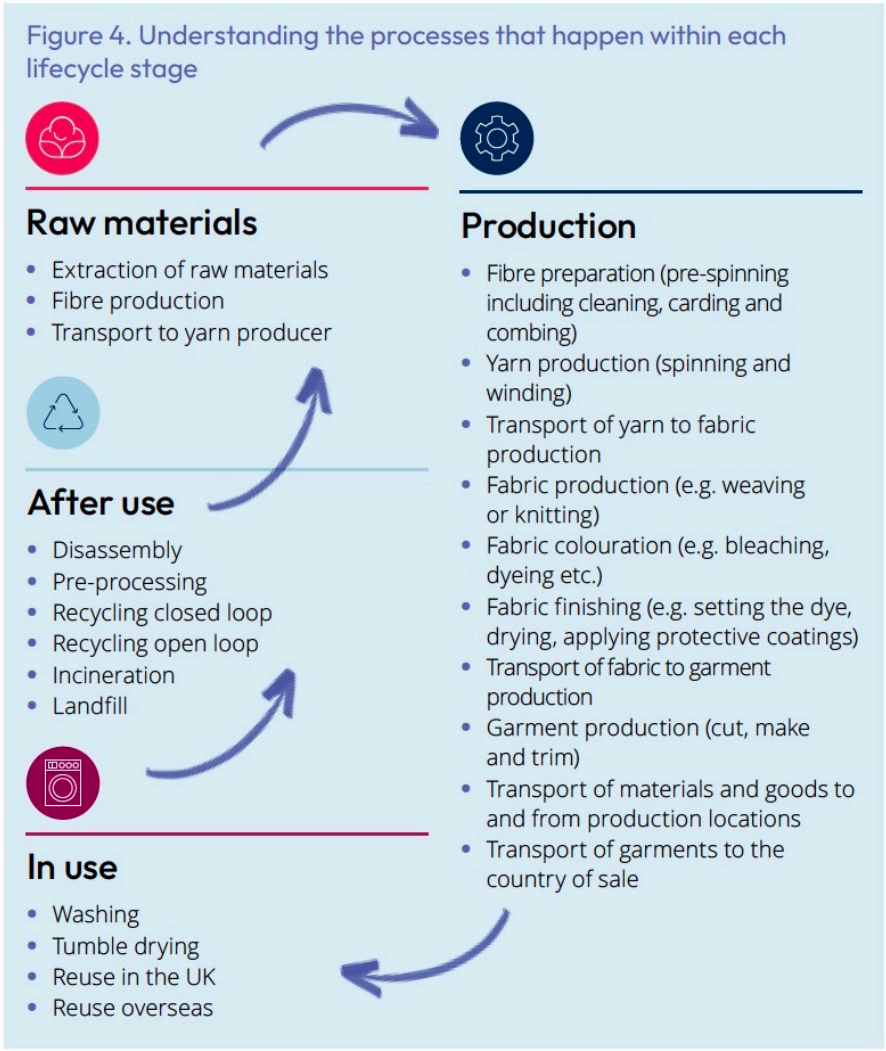
When designing for circularity you will need to think about each lifecycle stage, the processes that happen at each stage and how they interconnect and influence each other.

You will need to consider:

- How to reduce the impact of the raw materials you select
- How you optimise the use of resources and materials in production to eliminate waste and pollution
- How you create durable products that can be used for as long as possible
- How you can make products recyclable, so they never end up in landfill

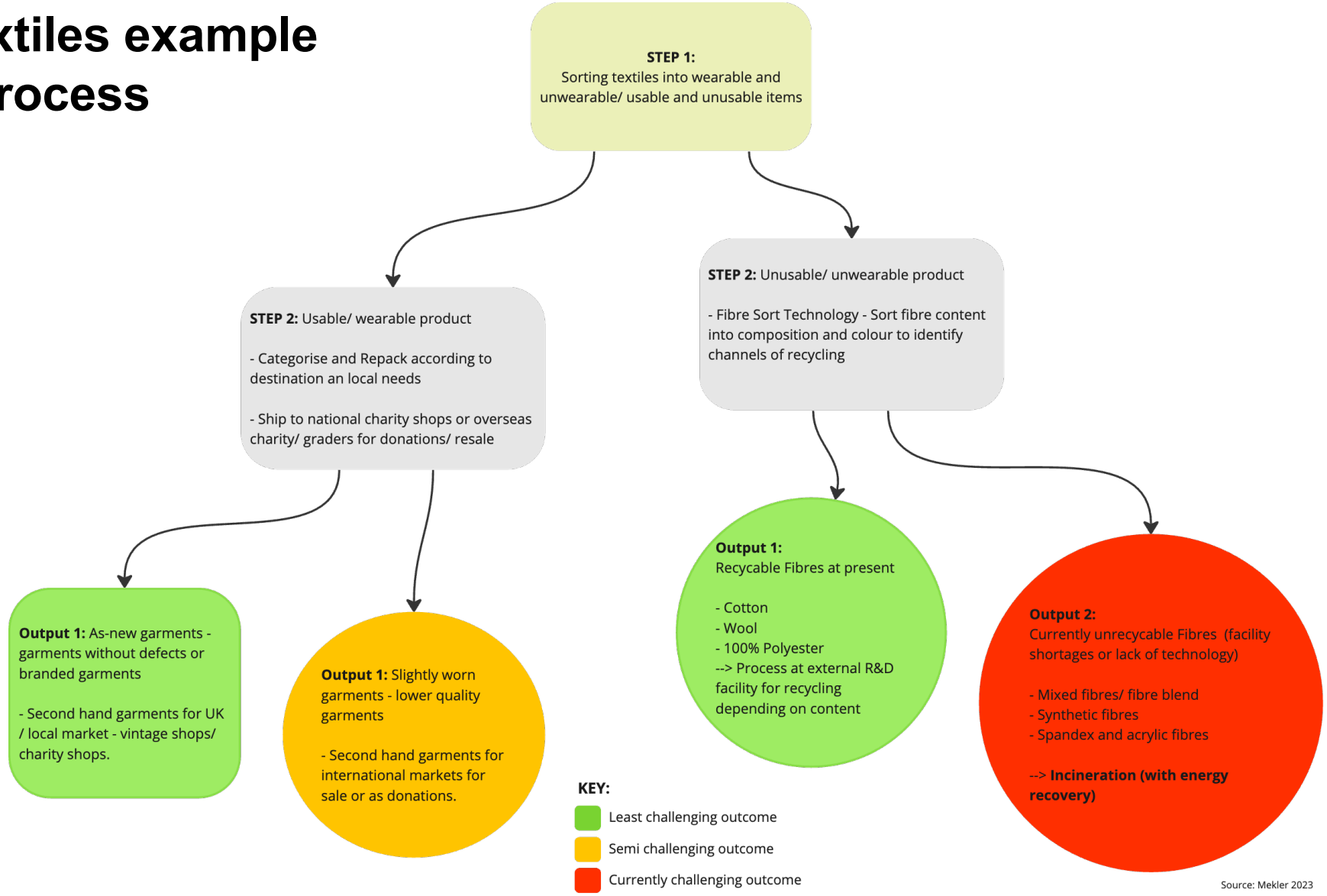
Designing for circularity goes beyond a product's initial use. Consideration also needs to be given to how items can be reused by multiple owners (i.e. can it go through a circular business model such as resale, rental, redistribution or repair?)

Figure 4. Understanding the processes that happen within each lifecycle stage



Source: WRAP_Design_for_Circularity_Toolkit (2023)

Secondary textiles example pre-sorting process



Recycling technologies for textiles and current industry availability

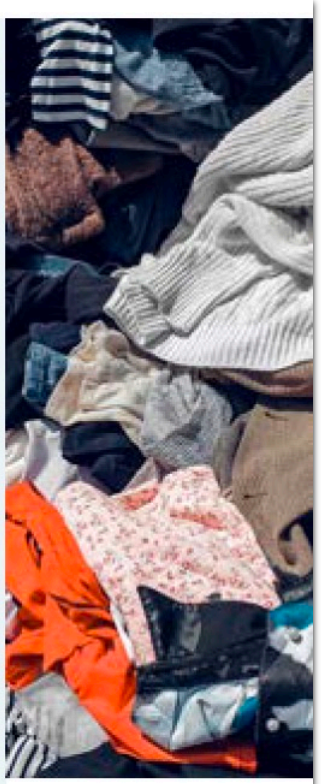
Use this table as a quick reference to understand what materials can be recycled by current and emerging fibre-to-fibre recycling technologies:

Fibre type	Fibre mix	Mechanical	Dissolution	Chemical
Cotton	100% cotton	♺	♺	-
	98% cotton/2% other	♺	♺	-
	95% cotton/5% other	♺	♺	-
	85% cotton/10% MMCF/5% other	♺	♺	-
	80% cotton 20% other	-	↻	-
	60% cotton/40% polyester	-	↻	-
	60% cotton/40% other	-	-	-
Polyester	100% polyester	♺	↻	↻
	98% polyester/2% other	↻	↻	↻
	95% polyester 5% other	-	↻	↻
	70% polyester 30% other	-	↻	↻
	60% polyester/40% cotton	-	↻	↻
	60% polyester/40% other	-	↻	↻
Nylon	100% nylon	♺	-	-
MMCF	100% MMCF	-	↻	-
	50% MMCF 50% polyester	-	↻	-
	50% MMCF 50% Cotton	-	↻	-
Wool	100% wool	♺	-	-
	95% Wool 5% other	♺	-	-
	85% wool/15% other	↻	-	-

Key

♺ Current recyclability

↻ Emerging recyclability



Source: WRAP_Design_for_Circularity_Toolkit (2023)

Opportunities and disruptors of textile recycling

Use this matrix to understand potential disruptors to the recycling technology you are designing for:

	Mechanical recycling	Dissolution and Chemical recycling
Mono-fibre	Yes	Yes , with up to 5% allowance for other fibres
Blends	No	Yes – mainly poly cotton blends. Generally, compositions must be at least 60% of one fibre, e.g. 60% polyester/ 40% cotton or 60% cotton/40% polyester[27].
Elastane	Up to 5% of garment weight for cotton and wool, however this must be included in overall allowance for 'other' materials. 0% for polyester	Up to 5% of garment weight, however this must be included in overall allowance for 'other' materials.
Colours	Dyes are not removed in the process. Feedstock will be sorted and recycled by colour so there is no need to consider colour.	Dyes can be filtered out so there is no need to consider colours, however you may need to consider the dyes that are used.
Plain white	Yes	Yes
Dyes	Feedstock will be sorted and recycled by colour, so dye types will not affect the recycling process. Dyes are not removed.	Vat or reactive dyes can be challenging to remove[34] for some technologies.
Prints/finishes	As feedstock is recycled by colour, prints can affect the colour of the output, so are less advisable. However, the output yarns can be bleached or overdyed if necessary. In general, water based prints are preferred. Coated or laminated prints and finishes are not suitable for this technology.	Can tolerate 'light' contamination of prints and certain finishes[2] depending on technology. In general, water based prints are preferred.
Threads	Where possible, threads should be the same fibre as the product. Generally, sewing threads are polyester due to their durable quality. If your product is a different fibre, this can be included in the 2% allowance. Metallised and lurex threads are not suitable for this technology.	Threads should be in the same mono-fibre as the product. If they are a different fibre, they can be included in the 2% allowance. Metallised and lurex threads are not suitable for this technology
Trims (including tapes, bindings, interfacings etc.)	Keep trims to a minimum, and match to main fibre where possible. Some thermo-mechanical technologies may be able to handle mono-fibre trims only.	Keep trims to a minimum, and match to main fibre where possible.
Care labels	Try to include mono-material care labels or use a printing technique on the garment so there is no need for a label. If you cannot use a mono-material care label, it must be included in the 2% allowance.	Try to include mono-material care labels or a printing technique on the garment so there is no need for a label.

Source: WRAP_Design_for_Circularity_Toolkit(2023)

2030 Minimum requirement recommendations on recycled product

Commercial considerations

Currently recycled materials can commonly carry an upcharge when compared to virgin materials. This is often due to limited availability and the costs of gaining certifications. This upcharge can vary depending on the fibre and its quality. However, increasing demand from the industry will help to scale up recycling capacities which may lead to reduced costs through economies of scale.

Certifications and traceability

To know that the materials in your product are recycled, they must be certified through the GRS, RCS, RCS Blended or SCS standards.

Minimum requirement recommendations

There are currently no industry minimum requirements for the amount of recycled content that must be used in clothing and textile products. However, as a guide, to hit the Textiles 2030 carbon reduction targets by 2030, our current scenario modelling suggests that, as a minimum, we need to switch:

40%
of cotton to mechanically recycled cotton

100%
of polyester to recycled polyester

100%
of nylon to recycled nylon

50%
of viscose to recycled and secondary sources

80%
of wool to recycled and secondary sources [13]

Achieving these levels of recycled content may not always be possible right now, but we would recommend that you always use as much recycled content as you can, without compromising on physical durability. Brands and retailers play a key role in pushing for the continued development of higher quality recycled materials, and driving demand for the investment and innovation in recycling technologies to make hitting these targets a reality.

Use the table on the following page to understand the environmental and commercial impacts of recycled fibres compared to their conventional counterparts[12].

Note: impacts listed in the table are based on comparison to conventional counterparts (e.g. recycled cotton compared to conventional cotton, and recycled polyester compared to conventional polyester).

Source: WRAP_Design_for_Circularity_Toolkit (2023)

Environmental ranking of textiles

Fibre		Environmental: Carbon	Environmental: Water	Commercial: Availability	Commercial: Cost	Commercial: Traceability	Examples
Cotton	Conventional cotton	C	D	🧺🧺🧺	£	✗	
	Mechanically recycled cotton (closed loop)	A	A	🧺	£ £	✓ ✓	Recover™, Texloop™, Wolkat, European Spinning Group, IKSO™, Marchi & Fildi, Pure Waste, The Billie System (by Novetex), CYCLO®
Polyester	Conventional polyester	D	A	🧺🧺🧺	£	✗	
	Mechanically recycled polyester (open loop)	A	A	🧺🧺	£ £	✓ ✓	Unifi® REPREVE Polyester, Seaqual®, Advansa
	Mechanically recycled polyester (closed loop)	No data available	No data available	🧺	£ £	✓ ✓	Project Plan B, Antex, European Spinning Group, Saya
	Chemically recycled polyester (closed loop)	No data available	No data available	🧺	£ £	✓ ✓	Ambercycle, CuRe, Jeplan, Ioniqa, Loop Industries, Worn Again Technologies
Nylon	Conventional nylon	D	D	🧺🧺🧺	£	✗	
	Chemically recycled nylon	B	D	🧺🧺	£ £	✓ ✓	Aquafil Econyl®, Unifi® REPREVE® Nylon, Chain Yarn GREENLON®, Fulgar® Q-NOVA®
MMCFs	Conventional viscose	B	B	🧺🧺🧺	£	✗	
	Chemically recycled MMCF (made from cotton)	No data available	No data available	🧺	–	✓ ✓	Re:newcell, Lenzing ™ Refibra ™, SaXcell, Infinite'd Fiber, Södra, Evrnu ®
Wool	Conventional wool	D	C	🧺🧺🧺	£	✗	
	Mechanically recycled wool	No data available	No data available	–	–	✓ ✓	Iinouiio, Manteco, Marchi & Fildi, Tesma Cashmere, My Will

Key

Environmental ranking indicators

Sustainability

More — Less

A B C D

* Very high impact, outlier from A–D range

Availability

- 🧺 Niche
- 🧺🧺 Growing availability
- 🧺🧺🧺 At scale

Cost

- £ Same price as conventional
- £ £ More expensive
- £ £ £ Significantly more expensive

Claims traceability

- ✗ No traceability
- ✓ Mass balance or incomplete traceability
- ✓ ✓ Fully traceable

Source: WRAP_Design_for_Circularity_Toolkit (2023)

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THANK YOU 4 COMING!