Unlocking Clothing Circularity in Australia.

Report Title:	Unlocking Clothing Circularity in Australia
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ACKNOWLEDGMENTS

Executive Summary

The *Unlocking Clothing Circularity in Australia* report outlines recommended actions to create a more circular clothing sector. The report considers each stage of clothing lifecycle from; manufacturing, sales, use and reuse, enabling the capture and sortation of clothing for reuse and recycling, to end-of-life recycling for clothing. This report is intended as reference for the clothing industry, government, and the development of the National Product Stewardship Scheme for Clothing.

Key actions include adoption of sustainable design of clothing, consumer care for garments, consistent clothing collection systems, the development of automated sorting of clothing, undertaking fibre to fibre recycling of clothing and aligning economic activity with sustainability outcomes.

A full matrix of recommendations is found at the end of this Executive Summary.

1.1.   Acknowledgements

Kmart is extremely grateful for the support of the Victorian Government through Sustainability Victoria for their partnering funding to this report and would also like to acknowledge the contributions of the Australian Fashion Council, its members and each of the brands, recyclers and other stakeholders who contributed to the formation of this research.

1.2.   Purpose of the Report

It is intended that this report helps focus and align the valuable efforts of brands, recyclers, government, and other industry stakeholders, including the development of the National Product Stewardship Scheme for Clothing. This report builds from the Australian Fashion Council's recently released Data and Global Scan reports which provide a global scan of how product stewardship and related schemes operate in jurisdictions around the world and detail how Australian's purchase, use and ultimately manage clothing at end of life.

Together with these reports that contextualise the challenges, realities, and opportunities of moving towards a more circular fashion sector in Australia. This report puts forward recommendations for action. Every effort has been made to ensure there is data consistency across the Unlocking Clothing Circularity report, and those that inform the designing of the National Product Stewardship Scheme for Clothing.

Kmart Australia is pleased to have jointly funded the creation of this report and is one of Australia's largest clothing retailers. Kmart Australia is committed to industry empowerment, and collaborative efforts to help create a more circular and sustainable fashion sector.

1.3.   Key data

With limited local manufacturing of clothing, clothing imports provide the most accurate insight into clothing use by Australians. Figure 1 shows clothing import by wholesale dollar value. Data on the number of clothing units and the weight of imported clothing are also identified in the report.
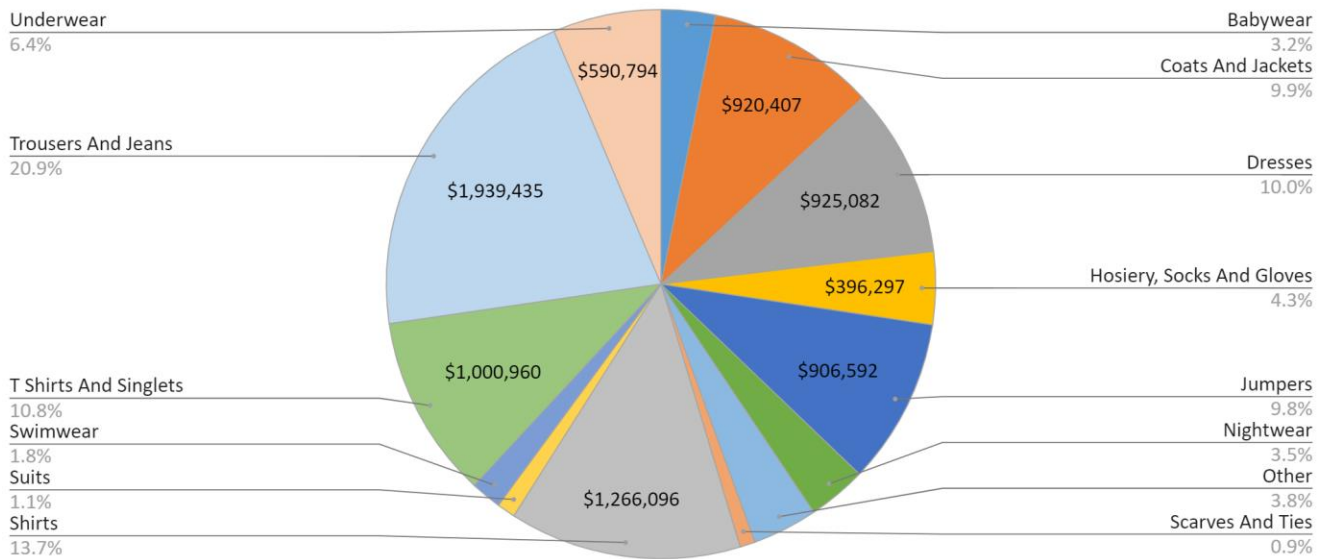
Figure 1. Clothing Imports by type and dollar value.

In addition to the inflow of new clothing into Australia, there is also a significant export trade in second-hand clothing into other markets. This totals around 100,000 tonnes annually with most destined for developing countries in Asia, Africa and the Pacific.[2]

1.4.   Key Findings

The circular economy particularly, promotes a systemic change in thinking away from the traditional linear or "take, make and dispose" economies where resources and raw materials are extracted from the natural world, transformed into products to be used and then disposed of. It reframes this as a challenge of how products and services are designed, used, sold and hopefully, resold and/or remade.

The broad reach of the clothing sector, contributing 10% of global emissions[3] and impacting economic, cultural, and social wellbeing in every country in the world poses a clear opportunity for this shift in thinking. This report identifies a range of areas where opportunities for more circular and socially sustainable approaches can be worked towards such as: how we purchase

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[1] National Clothing Product Stewardship Scheme. (2022). *Clothing Data Report.*
[2] Australian Bureau of Statistics. (2021). *Customs imports 2018-19 chapters 61-62 clothing*

[3] Ellen MacArthur Foundation. (2017). *A new textiles economy: redesigning fashion's future*.
https://ellenmacarthurfoundation.org/a-new-textiles-economy

and use our clothes with a growing emphasis on garment durability, repair, rental, wash and dry care of clothes and second-hand purchase.

Already, the charity sector plays an important role in capturing wearable clothing for a subsequent use beyond the original purchaser. The challenges identified in this report include making collection and sortation pathways for consumers clearer, more convenient, and more consistent.

Unlocking the value in reusable and end-of-life garments requires larger scale and more automated sortation capabilities – a key recommendation - that would effectively identify and sort wearable garments for reuse and unwearable clothing by fibre type and even colour, to aid the development of recycling. The current lack of recycling and sortation infrastructure for clothing is seen as a major barrier to circularity, but also a major opportunity for economic and employment growth through improved reuse and recycling rates and the development of industry.

The challenges faced by the fashion industry has led to a range of commitments and actions that are moving the sector to a more circular pathway. This takes many forms and includes a focus on fibre production, fabric production processes and waste reduction, clothing manufacture and shipping (including pre-consumer scrap management).

Greater attention and investment are being placed on clothing care aspects, maximising reuse, and the development of a clothing fibre to fibre recycling system. Currently the level of recycled content in clothing is very low and recycling garments and re-spinning the fibre back into fabric production offers perhaps the largest market for recycled fibres. The demand for recycled fibre in clothing manufacturing at a global level is starting to drive recycling infrastructure and Australia has an opportunity to play an active part in this global industry expansion.

1.5.   Recommended Actions

This report and its recommendations cover all aspects of the clothing value chain from manufacture and sales, through community use and reuse, to end-of-use outcomes for clothing. The report explores a wide range of possible actions for broader consideration. The key recommendations of this report are summarised in the following table. Each of these will require a focus by brands, retailers, governments, and consumers. Each of the actions identified is grouped around the following focus areas:

- o   Manufacturing and sales

- o   Clothing Use

- o   Collection and sorting for reuse

- o   Recycling

- o   The role of industry and

- o   The role of government

See Table 1. for a matrix of recommendations

Table 1. Summary of Recommendations

	<--- Sector Role --->					
	Manufacture and Retail	**Clothing Use**	**Collection, Sorting and Reuse**	**Recycling**	**Industry**	**Government**
<--- Recommendation --->	**Inventory control** Attention on pre-consumer waste should include strategies for improved ordering, logistics and monitoring for a reduction in unsold garments.	**Customer education** A consumer education program should be established focusing on care in purchasing decisions, optimal washing, drying and storage of clothing and the transfer of excess clothing to charity donation.	**Consistent, coordinated collection** Consistent collection system be established that combines consumer convenience with coordinated industry and charity effort. It should address both the need for timely donations of wearable clothing with the transfer of unwearable garments to a recycling destination.	**Synthetic fibre recycling infrastructure** The development of synthetic clothing recycling in Australia needs to be a key priority. Engagement with existing polyester recyclers and chemical recycling proponents will be important in identifying suitable technologies and any needed infrastructure support	**The AFC National Product Stewardship Scheme** is central to a more circular clothing sector with strong public support. The scheme will need to set targets in consultation with government and to ensure a full set of quality data on the sector guides actions. The use of eco-modulation will help to reward brand circularity initiatives.	**Data and definitions** To equip all stakeholders to base their efforts on activity with sound results, a suite of life cycle analysis and other evidence-based guidance is required.
	Donation of unsold clothing Unsold garments are often destroyed by brands and offer an opportunity to support welfare and charitable outcomes.	**Take back** Brands should consider providing a take back option as part of an extended producer responsibility and to foster brand loyalty.	**Transparency** Where point of sale clothing collections are established, they should be linked to charity partners with transparency on end destination of collected garments.	**Natural fibre recycling infrastructure** Cellulosic clothing recycling in Australia needs to be a key priority. Engagement with the existing pulp and paper recycling sector will be important in identifying suitable technologies and any needed infrastructure support. Opportunities for global recyclers to establish in Australia should also be explored.	**Customer Education** A consumer education program should be established focusing on care in purchasing decisions, optimal washing, drying and storage of clothing and the transfer of excess clothing to charity donation.	**Ban export of unwearable clothing to non-accredited markets** It is recommended that to protect vulnerable developing countries from adverse outcomes, and provide the chain of custody assurance required, a ban on unwearable clothing should be developed to prevent clothing being exported to landfill overseas.
	Dead fabric stock Transferring end of roll fabric stock to smaller producers through an online platform is planned and should be supported	**Fabric composition labelling** Underpin the capture, sorting and processing of clothing, accurate labelling of clothing stating the fibre composition should be pursued. This labelling will need to be agreed across the sector, ideally globally.	**Automated sorting** Automated sorting technology be introduced in Australia. This should focus on sorting for wearability, both locally and for export. It should also incorporate technologies that can sort by fibre type and colour.	**Business case for domestic infrastructure** Technical and economic advice should be sought on the potential and feasibility to value add to domestic recycling with the development of fibre production.	**Take back** Brands should consider providing a take back option as part of an extended producer responsibility and to foster brand loyalty.	**Foreshadowed ban on domestic landfilling** It is recommended that a foreshadowed ban on clothing to landfill be set to encourage investment in reuse and recycling infrastructure and meet community concerns about resource loss. More immediately, a ban on the destruction of pre-consumer clothing should be implemented.
	Focus on value not volume Brands should pursue business viability through a realignment from a reliance on quantity growth towards increasing value as a more stable and circular model	**Repair** Increasing emphasis should be placed on basic garment repair rather than discarding including community education on simple tasks: reinstating buttons, seam and hem repair and clothing size adjustment.	**Shared sortation** A shared large scale sorting centre should be developed for each key capital. This can handle clothing from all charities and provide the economy of scale for efficient sorting for reuse and recycling.		**Collection, sorting, and recycling development and funding** The development of necessary collection, sorting, and recycling infrastructure is crucial and identification of where funding assistance is required	**Restrict 'inferior garments'** Address concerns about declining product quality and garment life, restriction on the import of inferior clothing. This will require the development of an agreed set of design and manufacture objectives.
	Less discounting Brands should explore options to reduce discounting that could deliver more to a viable sector and ongoing profitability than continued growth.		**Fabric composition labelling** Underpin the capture, sorting and processing of clothing, accurate labelling of clothing stating the fibre composition should be pursued. This labelling will need to be agreed across the sector, ideally globally.			

Re-sale

Brands could consider the stocking of second-hand clothing of their brand in their retail outlets.

Accreditation

An accreditation scheme should be developed for collectors, sorters export and reprocessors. This will give all stakeholders assurance about the flow of clothing after use and to ensure maximum environmental and social benefit.

2. A Global Perspective

The Ellen Macarthur Foundation, founded in 2010 to accelerate the transition to a circular economy, works with business, academia, policymakers, and institutions to mobilise systems solutions at scale, globally, concentrating on key areas, including fashion, where shifting to a circular economy can have the biggest impact.

The Foundation produced the seminal report *A New Textiles Economy: Redesigning fashion's future*[4] which found the following:

- o Worldwide, clothing utilisation – the average number of times a garment is worn before it ceases to be used – has decreased by 36% compared to 15 years ago.
- o Globally, customers miss out on USD 460 billion of value each year by throwing away clothes that they could continue to wear, and some garments are estimated to be discarded after just seven to ten wears.
- o The textiles industry relies mostly on non-renewable resources. Less than 1% of material used to produce clothing is recycled into new clothing, representing a loss of more than USD 100 billion worth of materials each year.
- o Across the industry, only 13% of the total material input is in some way recycled after clothing use. Mostly into lower-value applications.
- o More than USD 500 billion of value is lost every year due to clothing underutilisation and the lack of recycling.
- o Total greenhouse gas emissions from textiles production, at 1.2 billion tonnes annually, are more than those of all international flights and maritime shipping combined'.
- o If the industry continues its current path, it is estimated that by 2050, it could use more than 26% of the carbon budget associated with a 2°C pathway.

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[4] Ibid.

2.1. Global Agreements and Partnering

Increasingly, the global fashion industry has embraced moving from a linear to a more circular approach which addresses all impacts from fibre production, manufacture, logistics, use, and end of life. Many brands are taking on sustainability measures within their operations, and there has also been a growing sense of collaborative effort across brands and with other key stakeholders up and down the value chain.

Every year the industry comes together in Copenhagen at the Global Fashion Agenda (GFA) conference. The GFA acts as a "thought leader" for brands and retailers to ensure sustainability is a strategic priority. It produces regular reports such as the annual CEO Agenda, which outlines the crucial sustainability priorities for fashion's leaders, the Pulse Report[5], a qualitative and quantitative report of the sustainability performance of the global fashion Industry, and Fashion on Climate, an analysis of the industry's GHG emissions and how fashion stakeholders can focus efforts to meet climate targets. It also leads The Circular Fashion Partnership, a cross-sectional partnership to achieve a long-term, scalable transition to a circular fashion system.

Recently the Ellen Macarthur Foundation has examined ways to decouple revenues from raw material production – through business models such as resale, rental, repair, and remaking – to reduce greenhouse gas emissions, pollution, and biodiversity impacts. It also promotes ways in which fashion design decisions can foster circularity.

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[5] Global Fashion Agenda. (2017). *Pulse of the Fashion Industry.*
https://www.globalfashionagenda.com/publications-and-policy/pulse-of-the-industry/

In 2012, the Sustainable Clothing Action Plan (SCAP) was developed in the UK. The Plan was a ground-breaking collaborative framework designed to reduce the environmental footprint of clothing in the UK. This plan resulted in the scheme meeting targets to reduce carbon and water footprints, but it didn't quite meet its waste targets. Over the eight-year period there were many repair, re-sale, collection, and recycling initiatives undertaken by signatories. It has now been succeeded by a new program, Textiles 2030.

Similarly, across Europe the European Clothing Action Plan was initiated to bring environmental and economic benefit to the clothing sector through a range of work packages co-funded and delivered by European partners. It covered a range of innovation pilot projects, encompassing sustainable design, production, consumption, public procurement, collection, recycling, and reprocessing. Finishing in 2019, the ECAP programme helped to inform and support EU policy on sustainable clothing.

In 2020, the European Commission adopted a new circular economy action plan (CEAP), following on from the first action plan 2015-2019. It includes an EU strategy for textiles, aimed at stimulating innovation and boosting reuse of materials within the sector.

The United Nations Environment Programme facilitates the One Planet network, a global community of practitioners, policymakers, and experts, including governments, businesses, civil society, academia and international organisations, ensuring sustainable patterns of consumption and production. Textiles is one of the network's key areas of focus. UNEP works towards achieving the Sustainable Development Goals and is currently developing a roadmap to make the textile value chain more circular and sustainable.

The Circular Fashion Partnership is a cross-sectorial project, led by the Global Fashion Agenda, to support the development of the textile recycling industry in Bangladesh by capturing and directing post-production fashion waste back into the production of new fashion products. In addition, the partnership seeks to find solutions for the COVID-19 related pile-up of deadstock and to engage regulators and investors around the current barriers and economic opportunities in the country. To do so, the initiative facilitates circular commercial collaborations between textile and garment manufacturers, recyclers and fashion brands operating in Bangladesh. Since its launch in November 2020, over 50 brands, manufacturers, recyclers, and NGOs have signed up to take part in the Circular Fashion Partnership.

Moving on from early meetings that expressed strong rhetoric but lacked solid actions, there are now more widespread initiatives emerging in many parts of Europe, North America and in the Asian countries that form the major manufacturing heart of the sector (India, Bangladesh, and China). This report outlines some of the initiatives that are most relevant to the development of an Action Plan in Australia.

2.2. EPR and Product Stewardship

2.2.1. Europe

In response to the low rate of clothing recovery in Europe, the EU is introducing the new European Waste Directive. Under this directive, by 2025 EU member states are obliged to have a system in place for separate collection of textiles, not only re-wearable garments. This is likely to drive investment in both reuse and recycling capacity. Some individual countries are already moving in this direction with Finland announcing that it will become mandatory to sort textile waste in Finland in 2023.

2.2.2. France

An extended producer responsibility scheme has been operating in France since 2008. All clothing sold into the French market has a product levy applied which goes to a central fund. These funds are then used to support clothing circularity initiatives across design, collection, sorting, reuse, and recycling. It has a minimum threshold to avoid placing a financial or compliance burden on small businesses. It incorporates an eco-modulation feature that rewards brands who are designing and selling clothing that is more sustainable in fibre choice, recyclability, and recycled content.

2.2.3. Emerging European initiatives

Under the umbrella of the New Cotton Project, a range of brands, recyclers and other stakeholders have embarked on a three-year initiative to recycle cellulose based clothing and other textiles into a fibre that can then be used in garment production. The major brands Adidas

and H&M are both committed to utilise the recycled fibre that will be processed at the Infinited Fibre Company site in Finland.[6]

There are over 20 million pairs of jeans sold each year in the Netherlands and The Denim Deal, an agreement between the Dutch Secretary - Circular economy and Environment, and 30 players from the denim industry, is a collaboration including all lifecycle stakeholders.[7]
This agreement collaborates to find solutions to close the production loop. So far, they have committed to using a minimum of 5% recycled content in every pair of jeans and create at least three million jeans with 20% post-consumer recycled (PCR) content.

The Denim Deal will run for three years (started in October 2020) as an alliance of international frontrunners in the denim industry and at the end of each year, a report is produced detailing the activities undertaken by the parties, the results achieved, and the progress made towards their objectives.

2.3.   Summary of global activity

The challenges faced by the fashion industry have led to a range of commitments and actions that are moving the sector to one that is more circular. This takes many forms and includes a focus on fibre production, fabric production processes, waste reduction and pre-consumer scrap management, and clothing manufacture and shipping. There is now an increasing focus on addressing the growth in clothing consumption and reducing clothing ownership and storage.

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[6] Infinited Fiber.(2021). https://infinitedfiber.com/blog/2021/07/05/infinited-raises-eur-30-million-adidas-and-bestseller-among-new-investors-hm-group-leads-financing-round/

[7] The Netherlands Ministry of Infrastructure and Water Management. (2020, October 29). *C-233 Green deal on circular denim.* https://www.government.nl/documents/reports/2020/10/29/c-233-green-deal-on-circular-denim-denim-deal

Greater attention and investment is being placed on clothing care reuse through initiatives such as ECAP. Whilst industry programs lead by WRAP UK for example, are exploring the development of a clothing fibre to fibre recycling system.

There is also a much higher degree of collaborative effort through the Global Fashion Agenda and extended producer responsibility activity, particularly across Europe and North America. While still at early stages, an emerging clothing recycling industry is now gathering pace alongside a reuse sector, with a greater focus on transparency and social outcomes. These activities are often undertaken in partnership between brands, government and recycling sector partners.

The transformation from a very linear sector to a circular approach is deeply challenging for a sector with a recent history of increasing sales. There seems little doubt that much of the industry sustainability activity is a direct response to increased community concerns around climate change, plastics proliferation, and excessive consumption.

The rate of change in thinking, collaboration and action is rapid. Clothing recycling technologies generally are still maturing, and the expansion of recycling capacity for synthetic and cellulosic clothing reprocessing will be a challenge over the next decade. Linked to this will need to be sustained market pressure for recycled content from brands and consumers to drive demand and investment.

Over the decades, the consumption pattern of fibre has changed significantly after the commercialisation of polyester. Synthetics now accounts for over two thirds of textile fibres production and is the primary area of growth in fibre production.[8]

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[8] Textile Exchange. (2021). *Preferred Fiber and Materials Report 2021*. https://textileexchange.org/textile-exchange-preferred-fiber-and-materials-market-report-2021/

GLOBAL FIBER PRODUCTION IN 2020
IN MILLION TONNES (+%)

Plant fibers: ~32.7 (~29.9%)

Other plant-based: ~ 6.5 (~5.9%)

Cotton: ~26.2 (~24.2%)

Animal fibers: ~1.7 (~1.57%)
- Wool - sheep: ~1.0 (~0.94%)
- Other: ~0.05 (~0.05%)
- Down: ~0.53 (~0.49%)
- Silk: ~0.11 (~0.10%)

~109 million mt

Manmade cellulosic fibers: ~6.5 (~5.9%)

Viscose: ~5.2 (~4.73%)
Acetate: ~0.9 (~0.78%)
Lyocell: ~0.3 (~0.26%)
Modal: ~0.2 (~0.17%)
Cupro: ~0.02 (~0.01%)

Synthetic fibers: ~68.2 (~62%)
- Polyester: 57.1 (~52%)
- Polyamide: ~5.4 (~5%)
- Other synthetics: ~5.7 (~5.2%)
- Polypropylene: ~2.9 (~2.7%)
- Acrylics: ~1.7 (~1.6%)
- Elastane: ~1.1 (~1.0%)
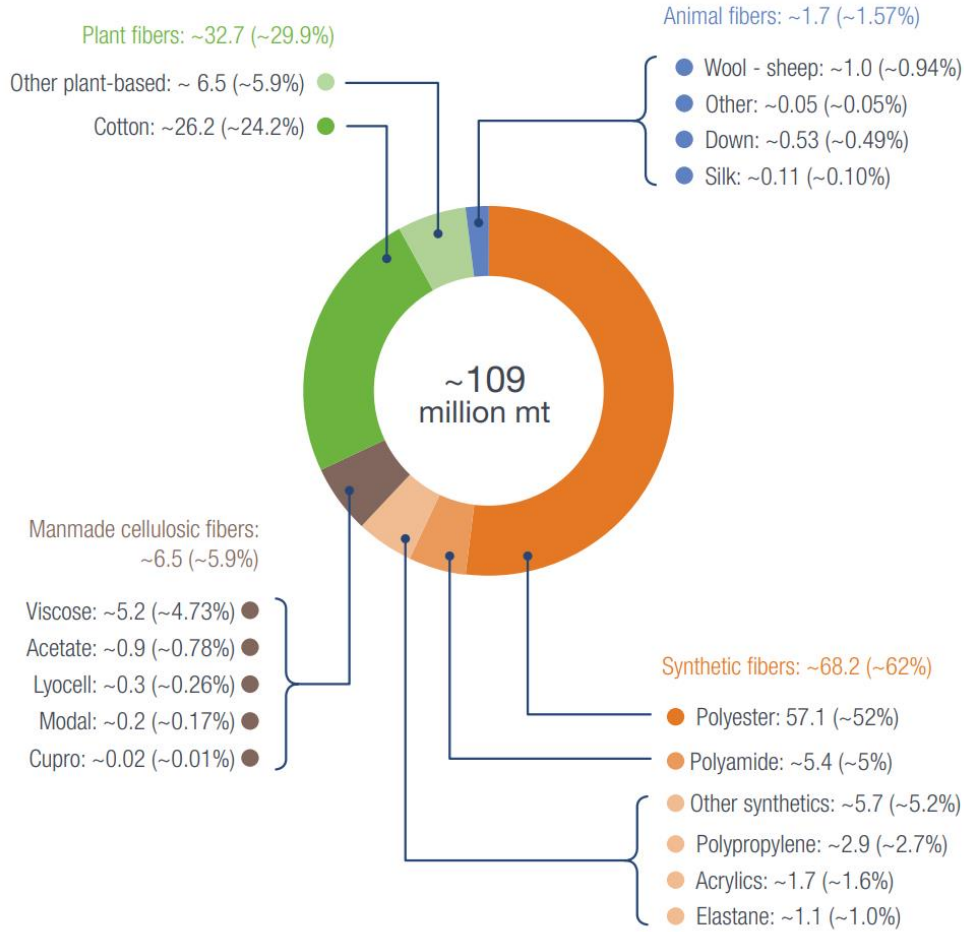
Nearly 70 million barrels of oil are used each year to make the world's polyester fibre.[10] A large amount of clothing is of a mixed fibre profile, particularly polyester/cotton and polyester/elastane blends. These blends, despite being desirable from a cost and technical performance perspective, pose significant challenges when it comes to recycling.

Before clothing is manufactured, there are significant issues and impacts in the production of clothing-based fibre. This covers petrochemical sourcing of synthetic materials, crop-based impacts for fibres such as cotton, and animal derived materials such as silk and leather. Much greater attention is now being placed on the environmental impacts of each of these fibre sources.

While there has been a concentration on environmental impacts such as land and water use, pollution and carbon emissions, there has also been a strong focus on the social impacts at this point in clothing production, and considerable focus is now on ethical issues such as worker and community safety and modern slavery.

There has been a much stronger focus on supply chain transparency as brands have sought to identify and manage the sourcing of materials for fibre and textile production. Beyond individual brand efforts, there has also been a rise in third party monitoring and reporting on social and environmental impacts at the early stages of clothing production.

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[9] Ibid.

[10] Ellen MacArthur Foundation. (2017). *A new textiles economy: redesigning fashion's future*. https://ellenmacarthurfoundation.org/a-new-textiles-economy

3. The Australian situation

3.1.   Community concern

Australian consumers are increasingly focussed on the source of their purchases and the environmental and social impact of what they are buying. This is particularly seen in the clothing market with a growing concern about upstream worker conditions, agricultural impacts, and an overall reticence about the use of synthetic clothing. This has led to a greater focus by brands on transparency and chain of custody for procurement of fibre, fabric, and apparel into their system.

Across the community there is a dramatic upswing in concern about carbon impact and this has resulted in a major reviewing by the fashion sector of its global warming contribution. Many individual brands are now measuring the carbon impacts of their garments in both production and consumer use and disposal. Aligned to the carbon concerns there is also an increasing community campaign to reduce plastics consumption. This is based on the ubiquitous growth in plastics, its fossil fuel sourcing, and litter and disposal impacts, including ocean based plastic waste.

In recent years there has been a much stronger focus in the media on clothing purchase and a growing questioning of the direction of fast fashion and clothing related impacts. Increasingly this includes a spotlight on end-of-use outcomes for clothing. This has encompassed destruction of unsold garments, the impact of exported clothing in developing countries, and the flow of clothing into landfill. Some of the data cited about clothing consumption and impact has been wildly exaggerated or difficult to source.

3.2.   Brand Action

Many brands have responded to consumer interest in sustainability, and much progress has been made into the level of tracking and reporting on upstream supply of clothing. Alongside address concerns about worker conditions, crop impacts, and pre-consumer waste in manufacturing countries, the sector has also challenged the linking of brand profitability to increased sales. After two decades of rapid growth in clothing sales, some brands are looking to a model of increasing value and supply chain efficiency over volume increases.

Customer facing labelling is also undergoing change as consumers seek a greater focus on organic sourcing, recycled content, and modern slavery assurances. There is exploration of the

potential for labelling that allows a consumer to track the life of the garment from fibre origin through fabric and garment manufacture, and even destination options.

New lines are increasingly incorporating sustainability measures. Examples include:

- o Recycled content
- o Incorporation of ocean sourced plastics
- o Organic crop sourcing
- o 'Natural' fibre content
- o Compostable garments
- o End of life takeback

3.1.   Community responses

As with other products, consumers are keen to divert their clothing from a landfill destination into reuse or recycling. Consumers seeking to do the right thing are creating a recycling system contamination issue. Part of the reason for this is that the willingness of the community to divert from disposal has not been fully met by clear, consistent, and convenient pathways for both wearable and unwearable clothing.

There has also been a global movement to review the amount of clothing individuals hold in their wardrobes. Dealing with this 'wardrobe crisis' has taken many forms. For some it is focussed on donating or selling their surplus clothing, for others it has impacted their purchasing habits, with either a reduction in purchase or greater second-hand purchase. This has included clothing swap events and the rise of clothing rental models, such as Glam Corner.

A CIRCULAR APROACH FOR CLOTHING

4. Supply Chain Impacts

With the volume of clothing imported to Australia each year, focus is needed on upstream impacts from fibre production, fabric production and garment production. Regardless of the type of fibre used in our clothing, much attention needs to go into lowering the carbon, water consumption, pollution and social impacts of clothing production.

Many brands are active in focusing attention on this phase of clothing sustainability, and improving the transparency of supply chains is crucial. Ensuring worker conditions are sound, and adopting a living wage, must be the foundation of the clothing supply chain. The end of life opportunities of clothing are strongly linked to the ways it is made, labelled and constructed.

4.1.   Import of clothing

The rapid escalation of customer purchasing that has occurred over the past twenty years is now plateauing in most developed countries. There is community concern about perceived reduction in life span of clothing and the clothing industry will need to be seen to be actively addressing the issue of product quality. Our average purchase volumes of new clothing per person per year is widely recognised as something that will need to stabilise at a local level.

The development of the Product Stewardship Scheme for Clothing (PSS) has included a major focus on understanding the flow of clothing through manufacture, sales, use and end of life management of clothing. This crucial data details clothing quantities in units, weight and dollar value. Below is a summary of clothing imported into Australia by type and by units during the 2018-2019 period.[11]

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[11] Australian Bureau of Statistics. (2021). *Customs imports 2018-19 chapters 61-62 clothing*
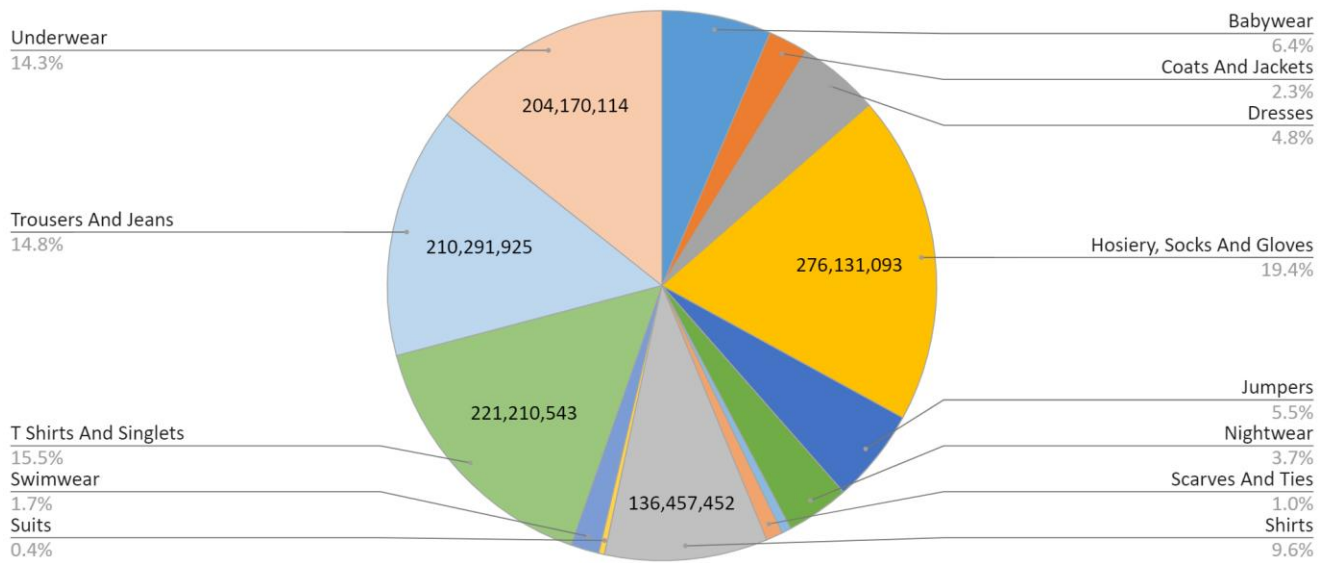
Figure 3. Clothing Imports by type and number of units.

Source: AFC Clothing Product Stewardship Scheme Data Report[12]

The following graph shows the import by weight. This has been calculated by attributing an average weight to each clothing category.

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[12] National Clothing Product Stewardship Scheme. (2022). *Clothing Data Report.*
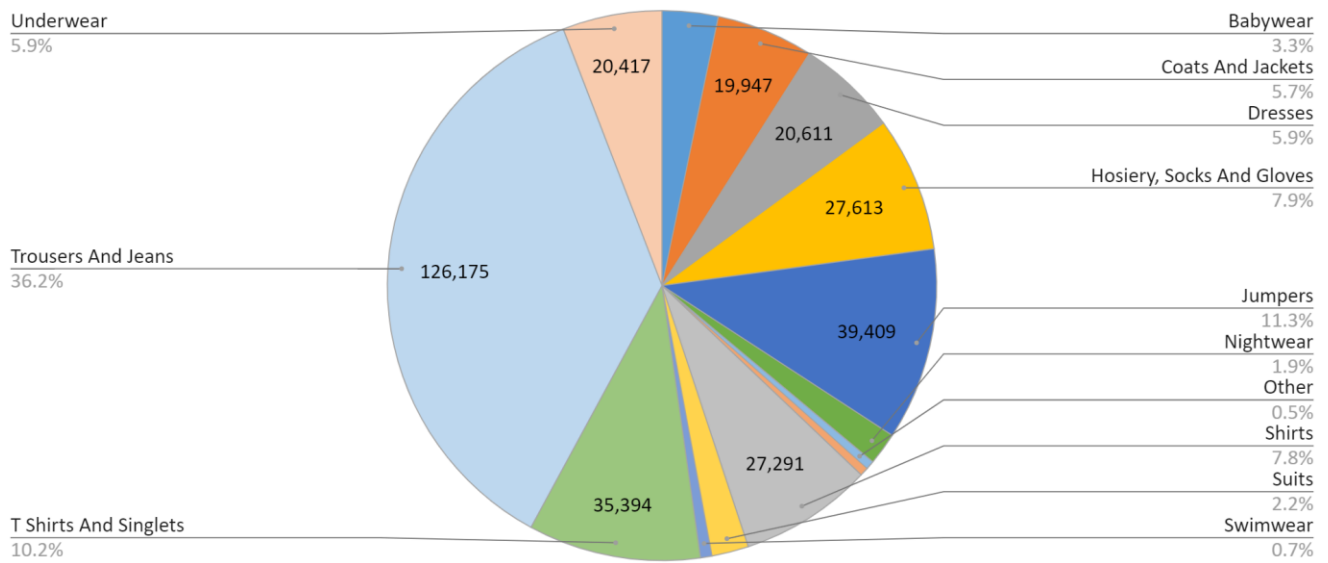
Figure 4. Clothing Imports by type and weight of clothing.

Source: AFC Clothing Product Stewardship Scheme Data Report[13]

While this outlines the picture by number of units, and by weight, the monetary value the picture is quite different.

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[13] Ibid.
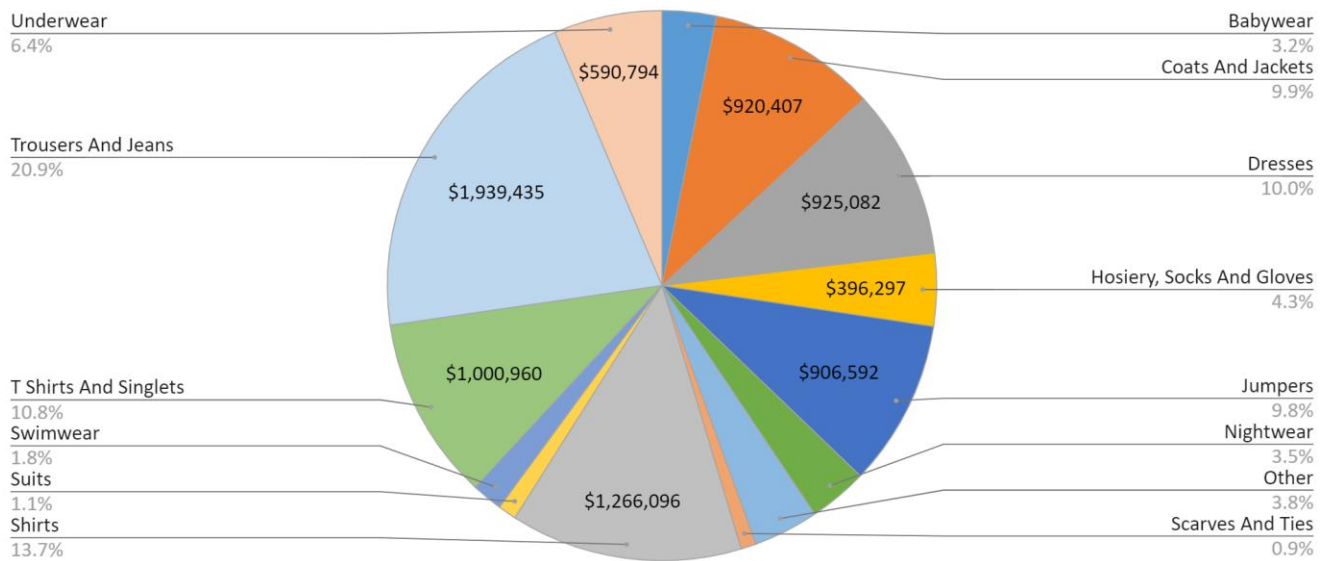
Figure 5. Clothing Imports by type and dollar value.

Source: AFC Clothing Product Stewardship Scheme Data Report[14]

The PSS data report provides a full analysis of the sector across garment life and enables a high level of understanding of where opportunities for increased circularity are to be found.[15]

Understanding garment types is crucial in how we plan for more circular clothing systems. For example, it is noted that underwear and hosiery are significant categories but have little reuse

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[14] Ibid.

[15] Ibid.

prospect and will require fibre recycling pathways to divert them from landfill, conversely, jeans and trousers can often be repaired and/or reused.

4.2.   Local clothing production and imports

Local production quantities are relatively small compared to imports, but remain an important part of the Australian fashion industry. Each contribution the various sector players have, and the roles they can assume as part of a more circular industry must be considered.

International data on clothing purchase is patchy, making comparison difficult, however, it is likely that we are among the highest per capita clothing purchasers globally. The United States appears to have a higher rate of purchase alongside Denmark and Norway which are likely to have similar clothing consumption rates to Australia.

Global data does show a strong correlation between household incomes and clothing purchase. We can also see that clothing affordability has changed dramatically over the past twenty years, leading to substantial growth in annual clothing purchase. In some countries this is now moderating or stabilising.

4.3.   Clothing fibre profile

Over the past 15 years there has been an increased use of polyester use in clothing. This is reflected in data showing the share of synthetic fibre in global fibre production has risen from

one third in 2008, to two thirds in 2022.[16] Most of this is in polyester, with significant use of nylon and polypropylene as well.

The demand for technical performance clothing has led to a greater range of mixed fibre materials in garments. Blends of cotton/polyester are very common, and it is increasingly common to see the use of elastane in garments such as active and outdoor wear.

Blending of fibres in a garment does present the sector with a further end-of-use challenge. Multi-material garments create the additional hurdle of separating fibres with differing recycling potential. While polyester dominates synthetic fibre usage, there are also significant amounts of nylon (4%), polypropylene (2%) elastane and other polymers. In the natural fibre content category, cotton is the most significant (24%), with smaller amounts of viscose and wool.[17]

4.4. Recycled content

Analysis of the clothing fibre profile has shown a very low level of recycled content compared to other products. The amount of clothing being recycled is extremely low and the use of recycled materials in clothing production remains low. There has been an increase in polyester (PET) material being used in clothing, but this still leaves virgin fibre content at over 90% and recycled content at less than 10%.[18]

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[16] Textile Exchange. (2021). *Preferred Fiber and Materials Report 2021*. https://textileexchange.org/textile-exchange-preferred-fiber-and-materials-market-report-2021/

[17] Ibid.

[18] Ellen MacArthur Foundation. (2017). *A new textiles economy: redesigning fashion's future*. https://ellenmacarthurfoundation.org/a-new-textiles-economy

To reduce the environmental impacts of sourcing virgin fibres, brands are increasingly seeking recycled fibre options. While this is economical and widely available in synthetic fibres (i.e. Repreve) there are few commercial scale options for procuring cellulosic fibres. Increasing market demand for these fibres will support this industries continued growth.

The Ellen Macarthur Foundation estimates that closed loop recycling (clothing fibres derived from used clothing) accounts for less than 1% of fibre used in clothing production .[19]

In a major example of recycled fibre development, the Swedish based company Re:newcell is currently building a large cellulose fibre recycling plant that began operating in late 2022.[20] It is planned to reach 360,000 tonnes output by 2025. The demand for recycled content by brands globally is likely to continue to drive major expansion of this sector for both synthetic and cellulose based clothing.

4.5. Design for Durability

There has been a decrease in the durability of garments over the past twenty years driven by fast fashion trends and volume retail models. The decrease in the cost of clothing has initiated an increase in consumer purchasing and consistent price reduction pressure is likely to have impacted garment quality (stretching, shrinking, stitching failures or button or zip failure).

Despite this, many brands are achieving quality improvements in colour fastness and design allowing garments to hold their shape better and for longer. This is important, as analysis of the reuse sector shows brands with high durability are sought after, and those considered to have

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[19] Ibid.

[20] Renewcell. (2021). https://www.renewcell.com/en/circulose/

poor durability are not retained for reuse by sorters. Durability is an essential feature when donated clothes are to be kept in the system for reuse.

4.6.   Design for Recyclability

Regardless of the lifespan of the garment and its potential for reuse, ultimately all garments reach end of life as clothing and attention globally is shifting to utilising fibres that are more readily recyclable. Part of this is an ambition to have less complex multi-material garments, as these are generally more challenging and costly to recycle.

There is increasingly an acceptance that even with increased product life and reuse activity, all clothing eventually reaches disposal as clothing. Being able to capture and recycle the component materials is now a central focus of the fashion sector in most developed countries to improve the quality of both reuse and recycling streams. Ensuring that both fit-for-wear and end-of-life clothing are treated most appropriately is driving a focus on clothing recycling that will need to span both synthetic and natural fibres, particularly polyester and cotton respectively.

Much of the clothing in developed countries reaches end-of-life in developing countries and the focus on recyclability will therefore need to consider capture and reprocessing of clothing from developing country waste streams.

4.7.   Managing Production

Currently some retailers have suboptimal management of their supply chains, resulting in levels of unsold and returned product that can have poor end-of-life outcomes. By applying a greater level of sophistication and rigor to ordering and the identification of more sound pathways for upcycling pre-consumer garments, major clothing waste can be avoided.

There will always be a degree of unsold clothing, and pathways for these into welfare-based outcomes is crucial, but a strong focus on the reduction of overproduction and oversupply must be maintained. This can include better ordering and communication with suppliers, greater attention to sales trends and demand, and getting the right mix of sizing to match demand.

In the drive to meet everchanging market demand, more rapid design, production, and freighting has been required. Improvements here would build an industry more resilient to external disruptors such as the COVID-19 pandemic.

4.8. Over supply

The percentage of oversupply is difficult to measure but many brands are now seeking ways to address this for both economic and environmental reasons. Greater precision in supply chain logistics is an opportunity to avoid the cost of oversupply.

Beyond oversupply and unsold or heavily discounted garments, there is also a waste that arises from the fabric and clothing production sector. As the waste is concentrated at the point of production in countries such as Bangladesh, India and China, capturing this waste in these jurisdictions is the primary focus.

As the fibre profile of pre-consumer fabric is more generally known, this makes it easier to sort and recycle. The Circular Fashion Partnership has found that in 2019, Bangladesh produced approximately 577,000 tonnes of waste just from the Ready-Made Garments (RMG) sector and fabrics mills of which almost half (250 thousand tonnes) was 100% pure cotton waste. It is estimated that factories in Bangladesh could sell this 100% cotton waste to the recycling market for up to 100 million USD.[21]

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[21] Global Fashion Agenda. (2021). *Recycling 100% cotton waste could save Bangladesh half a billion USD on cotton imports*. https://www.globalfashionagenda.com/recycling-100-cotton-waste-could-save-bangladesh-half-a-billion-usd-on-cotton-imports/

4.9.   Reduced inventories

One of the ways brands and retailers are seeking to reduce production and oversupply problems is to order less and operate more on a demand driven basis, rather than a supply basis. This includes some adoption of 'made to order' where garments are produced in line with demand.

The problem of dead stock is also a challenge for the sector, as is the production of fabric that is subsequently not used for garment production. Efforts to transfer some of the end of roll fabric stock to smaller producers through an online platform are planned and have received government support.

4.10.   Donation of unsold clothing

At a global level there are some poor examples of management of pre-consumer clothing waste such as the burning of new clothing by Burberry. Improvements to the end destination outcomes for pre-consumer waste will be aided by a higher level of transparency and chain of custody by brands. The role of agencies such as Thread Together offer a good example of management of unsold stock in Australia. Over 300 brands supply excess stock that is sorted and transferred to welfare agencies across the nation.

4.11.   Sustainable sales growth

While many brands remain focussed on business health through driving increased sales, there is recognition that a realignment of their business from a reliance on quantity growth towards increasing value, is a more stable and circular model. Until recent years, questioning the increasing clothing production and consumption was the 'elephant in the room' and rarely a focus for brands. This has changed markedly in the past three years with a growing awareness that ever more clothing production and sales is not sustainable.

4.12.   Less discounting

As the sector assesses the economic impact of moderating sales growth, it is looking to where economic viability will lie. A range of industry assessment reports have pointed out the cost to

the sector of heavy discounting of clothing.[22] It has been suggested that addressing this discounting could deliver more to a viable sector and ongoing profitability than continued growth.

4.13. Increased secondhand sales by retailers

Most clothing purchases are of new garments, there has, however, been a global increase in second-hand clothing sales. This has been primarily through donations to charities and their retail outlets, but increasingly through online sales platforms and commercial 'vintage' clothing outlets and informal clothing swaps and hand me downs. Some brands are now commencing or considering the stocking of second-hand clothing in their retail outlets.

Where a retailer is collecting their branded clothing back, it can be linked to this clothing being stocked for sale within the store. Patagonia is the best example of this practice. This can also include elements such as lifetime garment guarantees or repair of garments before resale. It is anticipated that this practice will increase, and we could see more clothing displays of both new and used in the same store, even on the same racks.

Recommended Action

Brands are strongly recommended to place emphasis on durability and recyclability in clothing design and production

Recommended Action

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[22] Global Fashion Agenda. (2017). *Pulse of the Fashion Industry*.
https://www.globalfashionagenda.com/publications-and-policy/pulse-of-the-industry/

Attention on pre-consumer waste should include strategies for improved ordering, logistics and monitoring for a reduction in unsold garments.

Recommended Action

The channelling of unsold garments into welfare outcomes must be pursued with elimination of brands destroying unsold garments.

Recommended Action

Efforts to transfer some of the end of roll fabric stock to smaller producers through an online platform are planned and should be supported.

Recommended Action

Brands should pursue business health through a realignment from a reliance on quantity growth towards increasing value as a more stable and circular model

Recommended Action

Brands should explore options to reduce discounting that could deliver more to a viable sector and ongoing profitability than continued growth.

Recommended Action

Brands could consider the stocking of second-hand clothing of their brand in their retail outlets.

5. Use of Clothing

5.1. Clothing in use

The clothing use phase covers behaviours an impacts arising from the point of sale to its disposal for reuse, recycling, or landfill. New clothing entering the market is only part of the picture and to fully understand the opportunities for circularity we need to delve into the size of our wardrobes, and how much clothing is in use in Australia.

The question of whether wardrobe inflow and outflow are matched is not known in Australia but data from like countries, such as Netherlands, Denmark, indicates an annual 3% increase of owned clothing.[23] If the annual increase in clothing sales is estimated to be around 3%, this indicates that we are holding more of our clothes in our wardrobes each year. The reversing of this practice may flush more of our clothing into charity and other reuse opportunities. Based on global data, total clothing held in Australian wardrobes is estimated as 3.75 times annual purchase or 1,440,000 tonnes.[24]

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[23] Maldini, I., Duncker, L., Bregman, L., Piltz, G., Duscha, L., Cunningham, G., Vooges, M., Grevinga, T. H., Tap, R., & Balgooi, v. F. (2017). *Measuring the Dutch clothing mountain*. https://www.hva.nl/kc-fdmci/gedeelde-content/projecten/projecten-fashion/measuring-the-dutch-clothing-mountain.html

[24] Textile Exchange. (2021). *Preferred Fiber and Materials Report 2021*. https://textileexchange.org/textile-exchange-preferred-fiber-and-materials-market-report-2021/
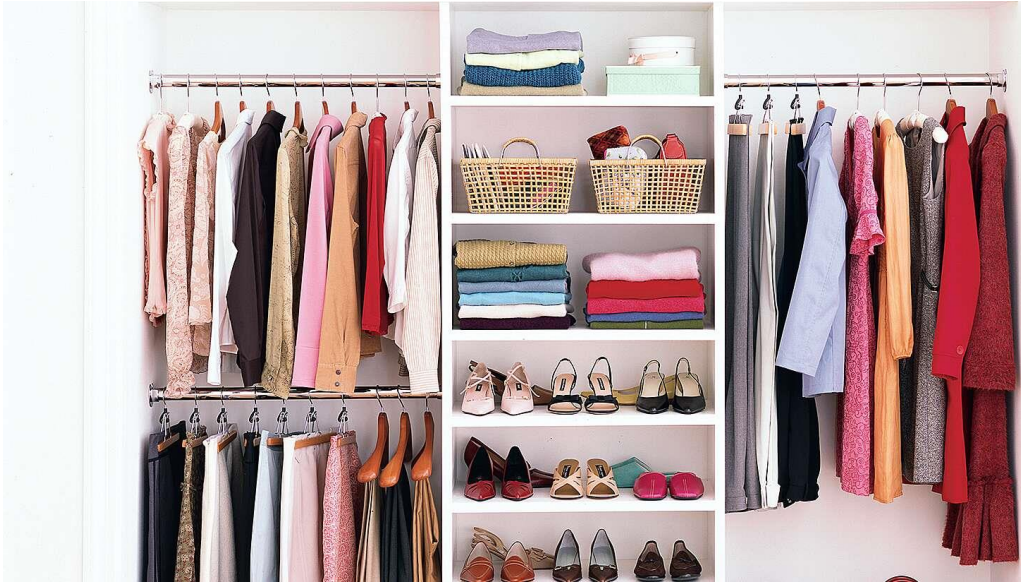
One element of this stockpiling of clothes is the purchase of clothes that subsequently never get worn by the purchaser. The trend to online purchase of clothing may be contributing to this with the bypassing of "trying on". A common reason given for garments not being worn is that they are the wrong size.

Surveys in similar countries have shown that although we may own many garments, only an estimated 71% have been worn in the past year. The retention of clothes that are not being worn prevents potential use by others and can contribute to a challenge where donated garments are many years out of fashion, limiting reusability.

5.2.   Education on purchase and care for clothing

It is possible to reduce clothing waste and extend clothing life through education focussed on purchase of durable garments, and care of clothing through washing, drying and storing optimally. This could emphasise the journey that clothing travels in production, together with tangible ideas on making clothes last.

5.3.   Establishment of clothing rental

At a global level there has been a significant increase in consumers renting rather than purchasing garments. This can help to maximise the rate of use for clothing, particularly in certain garment types. Higher end fashion has been a major focus, as has baby and infant wear. There has always been a small clothing rental market, primarily in formal wear or in commercial applications like medical gowns and hospitality.

In recent times there has emerged a wider range of clothing rental initiatives. This has encompassed baby clothes through to everyday garments and a wider range of occasion clothing. At a global level the range of rental organisations are expanding and include rental companies such as Circos, rental of clothing for babies and mothers in the Netherlands, and women's fashion rental companies - Nuuly, Armoire, Le Tote, Fashion Pass, Haverdash, Hirestreet, Hurr, By Rotation and Raineys Closet. Each of these have specific market options with some specialising in premium brands while others are linked to budget wear or different sizes. Some allow selection of specific garments, while others deliver an additional service of selecting garments for the consumer based on nominated criteria.

Australia could benefit from a shift towards clothing rental and efforts to promote this option should be established. Existing clothing brands can play a major role in the rental sector. This rental model would mirror similar services that exist for motor vehicles, tools, music, mobile phones and snow gear. The key to stronger outcomes from rental is linked to each of the following:

- o Minimising the impact of the washing of clothes
- o Maximising the number of times that a garment is rented before reuse or recycling, and
- o Minimising the transport impacts of transfer of garments to and from the renting consumer.

5.4.   Take and buy back

In a few cases, brands are standing behind their clothing and offering to buy the garments back. The most notable is Patagonia which has a repair service, buy back and sale of second-hand all within their stores. The buy back is linked to receival of their own brand clothing and often is offered as a credit on new clothing rather than a cash payment. This model is seen as extended producer responsibility, but also contributes to brand loyalty.

5.5.   Consistent labelling of fibre source

To underpin the capture, sorting and processing of clothing, accurate labelling of clothing declaring fibre composition will be needed. The form of this labelling will need to be agreed across the sector, ideally at a global level. Aligning labelling with optical fibre sorting technology will be crucial.

This may include embedded barcoding or other technologies like radio frequency identification (RFID) that could then be applied in automated sorting, customer education and communication and transparency disclosures.

5.6.　Washing and drying

Durability and garment product life is a crucial aspect in increasing circularity. WRAP UK has undertaken research that has identified that better washing and drying of clothing makes it possible to extend the average life of garments by nine months to approximately 3 years.[25] The condition of clothing is influenced by the original quality of the fabric, how the clothing is manufactured and how consumers wash, dry and care for their clothing.

This research found many consumers are not caring for their clothing as well as they might. Issues such as excessive washing, high temperature drying and poor storage each contribute to poor durability and shorter lifespans. This has led to community education campaigns that emphasise the environmental and economic benefit from better caring for clothing.

5.7.　Storage and care of clothing

Many consumers are holding large inventories of clothing, including a high proportion of clothing that does not get worn. There are also studies that show that the lack of proper care for our clothing is sometimes comes at the cost of the maximum life of the garment, including poor

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[25] WRAP. (2017). *Sustainable clothing: a practical guide to enhancing clothing durability and quality*. https://wrap.org.uk/resources/guide/sustainable-clothing-guide

storage systems and purchasing without considering how they might complement the existing wardrobe.

5.8.   Increased repair focus

In addition to laundry and storage practices, an increasing emphasis is being placed on basic garment repair rather than discarding. This has included community education on relatively simple tasks such as reinstating buttons, seam and hem repair and clothing size adjustment. There is no reliable data on the extent of repair activity, but it is certainly more prominent in the awareness of consumers, and many are becoming better equipped to extend clothing product life.

Recommended Action

A consumer education program should be established focusing on care in purchasing decisions, optimal washing, drying and storage of clothing and the transfer of excess clothing to charity donation.

Recommended Action

Brands should consider providing a take back option as part of an extended producer responsibility and to foster brand loyalty.

Recommended Action

To underpin the capture, sorting and processing of clothing, accurate labelling of clothing stating the fibre composition should be pursued. The form of this labelling will need to be agreed across the sector, ideally at a global level.

Recommended Action

An increasing emphasis should be placed on basic garment repair rather than discarding. This could include community education on simple tasks such as reinstating buttons, seam and hem repair and clothing size adjustment.

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6. Collection, Sorting and Reuse

6.1. Clear, convenient, consistent collections

As with other products, consumers will be more likely to adopt circular practices, including donation to charity, if they are provided with collection systems that have the following features:

1. Clear - a widespread understanding of the best donation pathways, and clarity on what can be donated is crucial.
2. Convenient - Consumers will be more active if the pathways offered are convenient. Collections from place of residence achieves the highest yields, drop off at visited sites not far from home is also deemed convenient.
3. Consistent - The best results in recovery come when the system is consistent across councils, states, or even nationally. Consumers don't respond well to inconsistent approaches and consistency enables more effective education.

There is currently some community confusion about the optimal pathway for unwanted clothing. As a result, donations are fragmented into bins that are masquerading as charities, and the donation of unwearable clothing in the absence of a pathway for these garments. This practice places a cost burden on clothing charities and occasionally a health risk.

6.2. Point of Sale collection

Retailers are also unsure if they should be offering point of sale takeback in addition to charity systems, and whether this should be limited to receiving only their garments, and whether a reward for customers is appropriate.

The collection of used clothing through retail outlets has expanded significantly and has primarily been driven by brands seeking to be seen to be part of the end-of-life solution. These collections are sometimes linked to charities but many lack transparency, and some question what the clothing is destined for. In some cases, it will be exported unsorted, meaning more unwearable clothing will be included and reuse in the receiving market will be severely impacted.

Often collections will be linked to downstream recycling, but transparency is frequently lacking. The scope of some collection programmes are limited by brand or article type such as cotton t-shirts, that are then linked to reward schemes where consumers are given discounts on new clothing. These are sometimes criticised for driving further consumption.

6.3. Clothing Reuse and the Charity sector

The cost of discarding unwearable clothing is significant for charities with an estimated 24,000 tonnes per year disposed of by this route[26], highlighting the importance of developing a fibre recycling sector to underpin reuse. Large volumes of used hosiery and underwear contributes greatly to this waste problem for charities.

When unable to be sold locally, an estimated 62% of clothing donated to charities[27], or 105,900 tonnes annually, is exported to developing countries as wearable clothing providing affordable clothing in many developing countries. Australian clothing is exported primarily to Asia, the Middle East and Pacific nations. While a large proportion of exported clothing is shipped to United Arab Emirates and Malaysia, after subsequent sorting it is sold in a range of other developing countries. Ultimately though, these garments will reach end of life, and enter the waste stream in the receiving country, many of which lack the engineered landfill destinations that dominate here in Australia.

Across the globe, there has been increased industry, government and consumer focus on reuse of second-hand clothing. While charity collections remain strong, there has been an increase in clothing flowing into large, sophisticated sorting facilities. The SOEX plant in Germany draws clothing from all over Europe and sorts to over 300 categories before selling these into Eastern Europe and developing countries. Large sorting facilities also operate in the United Arab Emirates, Malaysia, and USA.

Charities in Australia undertake sorting in a range of formats. Some sorting is done at store level by paid or volunteer staff. For some larger charities there are centralised sorting and

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[26] MRA Consulting. (2021). *Measuring the Impact of the Charitable Reuse and Recycling Sector: A comparative study using clothing donated to charitable enterprise*

[27] Ibid.

warehousing sites. This sorting is both for separation of wearable from unwearable and sorting into different clothing types. Distribution to stores is then managed, matching store needs and demographic profile of each retail site. Some larger charities are looking at forms of mechanised, or automated, sorting. At the present time all sorting is undertaken manually across an estimated 700 million items each year.

The clothing recycling and reuse sectors for clothing are quite different when compared to systems for other products. Clothing reuse is well established, predominantly operated by charities, but no significant recycling sector yet underpins it. The charity reuse sector has dominated clothing collection through donations that deliver a financial benefit to the charity on sale of the garment. There are a small number of large charities where clothing reuse is a major part of their organisational scope. These include Salvos Stores, Vinnies, Red Cross, Save the Children and others. There are also many smaller organisations that may only operate in one city or town and may have just one or two outlets.

Alongside the charity collections, there is also a number of private sector collectors. The biggest of these are Southern Cross Recyclers (SCR), and King Cotton. Many private collectors form a link with a charity to encourage donations. This can then supply the receiving charity partner with a nominal financial benefit without any collection effort.

There are some council-provided drop off locations for clothing collection, usually in partnership with a charity, and a handful of councils are looking at clothing kerbside collections.

Beyond the charity sector, there are a range of informal reuse channels from online sales to family hand me downs, estimated to be a further 20,000 tonnes of clothing reuse, these reuse pathways are continuing to expand and are likely to have a greater role in the future.

6.4. Installation of automated sorting lines

Each year over 700 million items of second-hand clothing are sorted by clothing charity staff. This is based on clothing type and suitability for local sale. A fraction of this is somewhat sorted before export. Some of the clothing exported has not yet undergone a sort for its subsequent use as clothing, and its suitability for the destination market.

No sorting of clothing is currently focussed on separation based on fibre content or colour. This will be crucial to any efforts to recycle clothing at end-of-use. It is recommended that automated sorting technology be introduced in Australia, focused on sorting for wearability, both locally and

for export. It should also incorporate technologies that can sort by fibre type and colour. Piloting of existing technologies in Sweden and Netherlands should be a starting point.

6.5.   Cooperative larger scale sorting

Presently, each charity is largely responsible for sorting their donated clothing. This can be somewhat efficient for some charities but is a long way from the large-scale operations in other parts of the world. There is a potential economy of scale for a more collaborative approach, without compromising the roles of individual charities to source and manage the sale of their donations. This could take the form of an automated sorting facility that sorts clothing collected by each charity and then delivers the sorted wearable clothing back to the charity. The unwearable fraction could then be sorted by fibre and colour, and potentially be an income stream from recycling for the charities, rather than the current landfill disposal cost.

6.6.   Secure shredding

A small but significant amount of clothing is uniforms. For security reasons much of this cannot be transferred into reuse either locally or for export. This includes military, police and other emergency service uniforms. Most corporate uniforms are badged in some form and organisations do not want these in public circulation. Examples include banks, airlines and retail. Most uniforms are therefore collected and shredded to prevent reuse.

Many companies, including major retailers are keen to identify a recycling option for their uniforms. As they often control the recovery of these, and know the fibre makeup of the uniforms, there are options to transfer these to overseas recyclers, or to a local recycling outlet if established. Some uniforms used in extreme situations such as fire service uniforms are likely to have chemicals of concern that may hamper their recycling.

6.7. End market destination

The end market for donated clothing is a mix of local sales and export of wearable clothing to developing countries. Currently around 15-20% of sorted clothing is sold in local op shops. An additional 1.5% is used by the charities in their welfare programs. A further 62% is baled and exported for use as clothing in developing countries. The chart below shows the destination of used clothing by $000's value.
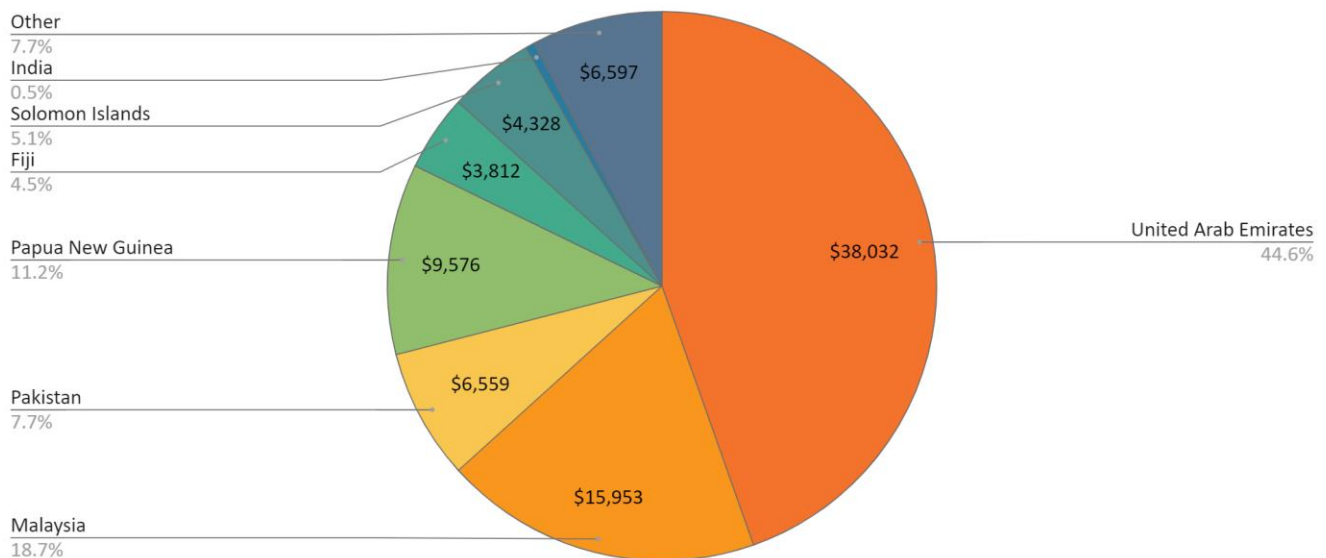
Figure 6. Clothing Exports by type and $000's value.

These markets vary in need based on climate and required sizing for their population. The price per kilogram of shipped clothing largely depends on the level of sorting that has occurred prior to export. For exports sent for subsequent sorting in Malaysia or the Middle East, the price is quite low at 60-75 cents per kilogram. This is illustrated in the chart below.
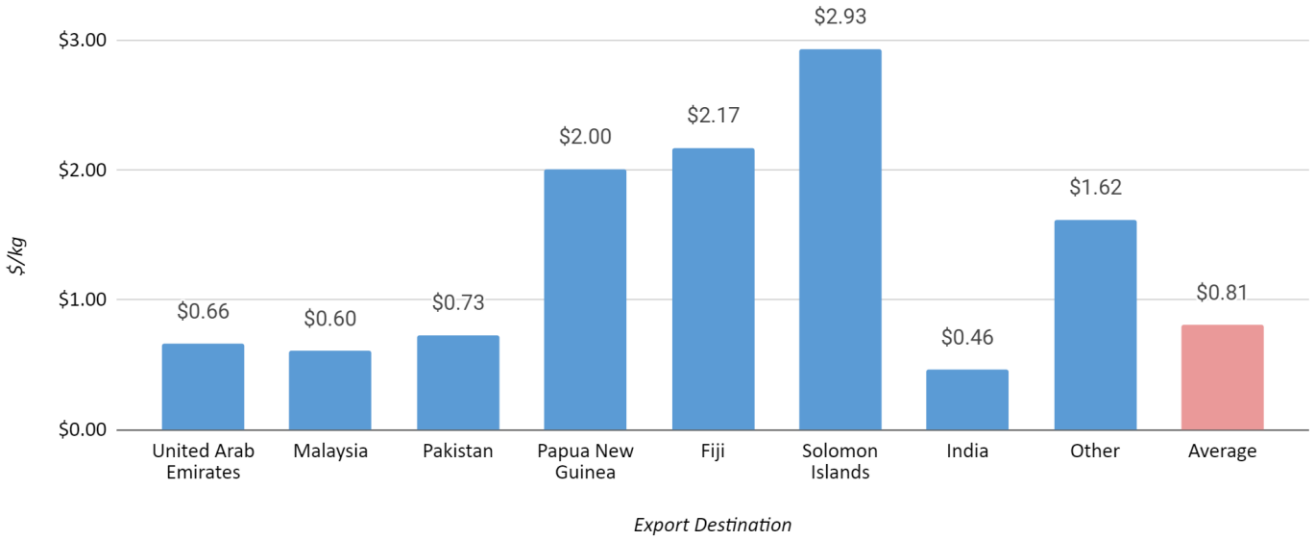
Figure 7. Clothing Exports by destination and $ per kilogram.

[28] National Clothing Product Stewardship Scheme. (2022). *Clothing Data Report.*

This reflects the cost of offshore sorting, but also that a large component of the clothing will not be saleable and might be landfilled or used in energy recovery. Where garments are sorted prior to export, the price received is between $1.80 and $3.00 per kilogram. This demonstrates the value added by sorting prior to export.

Australia is consistent with other developed countries in that only a minority of donated clothing is resold back within the donor country. At a global level there is a flow of clothing from western economies to less affluent Eastern European countries and developing countries in Africa, South America, and Asia.

There are positive and negative aspects to this large-scale transfer. It is undoubtedly a way for more people to access clothing where buying new would not be possible, and in many cases second-hand clothing is competing with cheap garments, helping to reduce overall global consumption of new clothing.

However, there are two key areas of concern about the export of clothing markets:

First, there is an element of unwearable clothing in some shipments and these garments are destined straight for landfill. In this case, wealthy countries are transferring their waste problems, and even if the clothing is wearable, it is likely to have a shorter life based on its previous life before donation.

Second, all the clothing exported is finding its way into the waste streams of poorer countries regardless of it being wearable. Little thought or support has been given to how producers take downstream responsibility for exported clothing. Scandinavian countries have been assessing the impact of clothing export and are considering more stringent export controls.

6.8.   Accreditation of collectors, sorters, processors

Australia needs higher levels of transparency to better managing end-of-use clothing. Currently there is very little visibility of who is collecting, sorting, exporting, and processing Australian worn clothing, potentially undermining community confidence in social and environmental outcomes.

An accreditation system for clothing collectors, sorters and recyclers would boost transparency and give all in the value chain assurance of sound practices. There is already cynicism about bogus charities, collection stockpiles and the impact of exporting of unwearable clothing to developing countries. An accreditation scheme will help to track outcomes and reward collectors, sorters and processors who are operating verified systems. The tracking and reporting systems applied by Thread Together for pre-consumer unsold garments offers a strong template for application to post consumer clothing.

6.9.   Education on reuse and recycling

There is currently little consumer education on how to optimally dispose of unwanted clothing. A national coordinated campaign to maximise wearable clothing into reuse and unwearable clothing into recycling is required. This should be built around a clear, consistent and convenient pathway for both wearable and unwearable clothing.

Recommended Action

It is recommended that a consistent collection system be established that combines consumer convenience with coordinated industry and charity effort. It should address both the need for timely donations of wearable clothing with the transfer of unwearable garments to a recycling destination.

Recommended Action

Where point of sale clothing collections are established, they should generally be linked to charity partners with transparency on end destination of collected garments.

Recommended Action

It is recommended that automated sorting technology be introduced in Australia. This should focus on sorting for wearability, both locally and for export. It should also incorporate technologies that can sort by fibre type and colour.

Recommended Action

A shared larger scale sorting centre should be developed for each key capital. This can handle clothing from all charities and provide the economy of scale for efficient sorting for reuse and recycling.

Recommended Action

To underpin the capture, sorting and processing of clothing, accurate labelling of clothing stating the fibre composition should be pursued. The form of this labelling will need to be agreed across the sector, ideally at a global level.

Recommended Action

An accreditation scheme should be developed for collectors, sorters export and reprocessors. This will give all stakeholders assurance about the flow of clothing after use and to ensure maximum environmental and social benefit.

7. Recycling

7.1. Synthetic clothing

The dominant synthetic material in clothing is Polyester (PET). PET in packaging is now widely collected and recycled in all developed countries including in Australia, where over 100,000 tonnes is recycled annually.[29] and is the largest recycled content source for clothing.

The natural progression is for polyester clothing to be recycled and then used in the production of new clothing. Polyester now accounts for 62% of textile fibre[30], and the reprocessing of clothing polyester into new clothing fabric is central to a circular clothing sector. This is in its early stages in the US and Europe and will likely require both mechanical and chemical recycling technologies.

As Australia has major PET recycling plants in many locations around the country, it is well placed to pursue polyester clothing recycling here. Some trialling of polyester clothing with existing PET recyclers will be important and may be best done initially with pre-consumer material.

As this closely aligns with existing PET (polyester) packaging recycling, there are likely to be opportunities for collaborative infrastructure use. As well as PET there is also significant synthetic clothing content for Nylon (polyamide), and Polypropylene. There are a wide range of existing recyclers of these plastics in Australia, in most states, and a dialogue with these

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[29] Envisage Works. (2021). *Australian Plastics Flows and Fates Study 2019–20 National Report.*

[30] Textile Exchange. (2021). *Preferred Fiber and Materials Report 2021.* https://textileexchange.org/textile-exchange-preferred-fiber-and-materials-market-report-2021/

operators should be pursued. The continued expansion of synthetics in clothing will require a significant source of recycled material, and Australia can develop a sector capable of processing over 100,000 tonnes annually, based on the profile of clothing entering the market.

7.2.   Natural fibres

Across Europe, Asia and North America there are a number of initiatives to recycle clothing made from cotton, viscose and other cellulosic or natural fibres. The most significant of these is the Swedish based company Re:Newcell who have developed pulping and recycling used clothing back into a fibre for use in new clothing fabric manufacture. They established a site in central Sweden with an annual capacity of 7000 tonnes. In 2021 the company announced that they were building a larger processing plant in Sundsvall, northern Sweden on the site of a current pulp and paper mill operated by SCA.

This recycling line, currently under construction, has come online late in 2022 with an annual output capacity of 60,000 tonnes. The first three years of output has already been purchased by H&M and two other fabric manufacturers and in early 2022 the company announced that, based on increased demand, they will double the plant capacity to produce 120,000 tonnes. Further, Re:Newcell have brought their 2030 growth target to process 360,000 tonnes annually forward to 2025. The scale of this expansion is linked closely to the strong demand by a range of brands to incorporate recycled fibre into their garments, Levi, a major American brand, has committed to full recycled content by 2025.

Other cellulose recycling initiatives include the Infinited Fibre Company in Finland. Globally there are a number of major developments in the recycling of cotton and other cellulosic clothing into a recycled pulp suitable for fibre production. It will be important that Australia implements a similar sector for the end-of-use processing of this clothing, for which government support to develop infrastructure will be required.

It remains to be seen whether the downstream recycling solution for Australian clothing will be through existing local recycling entities in both synthetics and cellulose fibres, or whether global recyclers will handle Australian sourced material here in Australia or overseas. Australia would benefit economically through employment from handling the reprocessing here and selling either the processed material or spun fibres produced from recycled content.

As any recycled fibre produced is likely to be used in clothing and fabric production in China, India, Bangladesh and other sourcing countries, there are some strong arguments for the reprocessing to occur in these jurisdictions.

Regardless, the existing pulp and paper industry should be engaged to identify if existing underutilised pulping plant can be converted from paper recycling to clothing feedstock, as is being done in Sweden. A capacity of 100-150,000 tonnes per annum is likely required for Australia and the Pacific region based on the profile of clothing entering the market.

7.3. Recycling in Australia

Globally there are increasing opportunities for clothing recycling, but there are currently only a single small Australian based recycling operation and a small amount of clothing collected and exported for reprocessing in South Asia.

Mechanical recycling is perhaps the most established technology, where textiles are transformed into felt-based products for use in automotive (upholstery, noise deadening), insulation and other industrial or commercial applications. Organisations such as SOEX have processed hundreds of thousands of tonnes of clothing by this method. More recently, chemical recycling of clothing is emerging, particularly in Europe, where the output material is more consistent and more readily used in clothing and other consumer goods applications.

The prospect of recycling of clothing in Australia is worthy of strong government support. BlockTexx have begun textile recycling on a small scale in Queensland and similar recycling technology is being backed by a range of clothing industry partners.

The scale of available waste clothing volume for recycling is estimated at 250,000 tonnes per annum. Much of this is a blend of synthetic and natural fibres, adding a further challenge to reprocessing. A minimum 100,000 tonne capacity would be required to replicate a cellulosic recycling plant. This could be achieved through the conversion of an existing line of pulp and paper making to clothing recycling.

Recommended Action

The development of synthetic clothing recycling in Australia needs to be a key priority. Engagement with existing polyester recyclers and chemical recycling proponents will be important in identifying suitable technologies and any needed infrastructure support

Recommended Action

The development of cellulosic clothing recycling in Australia needs to be a key priority. Engagement with the existing pulp and paper recycling sector will be important in identifying suitable technologies and any needed infrastructure support. Opportunities for global recyclers to establish in Australia should also be explored.

Recommended Action

Technical and economic advice should be sought on the potential and feasibility to value add to domestic recycling with the development of fibre production.

8. The Role for Industry

8.1.   Product stewardship scheme establishment

A central element of any strategy to create a more circular clothing sector is the establishment of a product stewardship scheme. This has been recognised and is being developed by the Australian Fashion Council and its member brands and retailers. The scheme and the independent stewardship organisation are due to be operating on a formative basis in 2023, will play a coordinating role of industry effort including: community education, research and development support and potential rebate mechanism for collection and sorting for reuse and recycling. The proposal is for a four cent levy to be applied to all eligible garments to fund the programs objectives.

8.2.   Introduction of product stewardship levy with eco-modulation

A key aspect of product stewardship schemes is the agreement to impose a product levy on product sold, to fund scheme activity. In framing the levy, an approach that has been well received in the French scheme is an eco-modulation element to the levy. This means brands pay a lower rate on clothing which exhibits design aspects such as improved recyclability or recycled material content. This can play an important role in the scheme achieving its goals and rewarding brands for their product design efforts and reducing scheme operating costs over time.

8.3.   Setting of state and national targets aligned to implementation plans

The Clothing Product Stewardship Organisation should establish a forward-looking plan over the short, medium and longer term, with targets to guide and measure progress towards its goals. In developing these targets, the industry body should consult industry, community representatives and all levels of government to maximise the buy in of all stakeholders.

8.4.   The Need for Quality Data

It is crucial for the management of clothing to have good data on every aspect of clothing manufacture, sales, use, reuse and end-of-use outcomes. This includes understanding the structure of the sector to ensure the outlined actions are efficient and fair to all, large and small.

It is also important to have a comprehensive understanding of the flow of clothing to frame the plan for maximised effectiveness. Lastly, the data acts as an important baseline by which we can measure changes as actions are implemented across the sector.

8.5.   Addressing Data Gaps

There is a need to keep refining and expanding the range of data through stakeholder engagement and global research to fill data gaps.

Some of the gaps that need to be addressed include:

- a better understanding of pre-consumer clothing, covering production waste and unsold garments,
- the amount of clothing destined for landfill here and abroad,
- the evolving informal reuse channels,
- the scale of garment repair,
- the significance and trend of clothing rental,
- and, importantly, the triggers that lead to discarding and disposal, remembering that not all clothing has suffered product failure at this stage.

8.6.   Infrastructure development

Large scale infrastructure is going to be required to implement a more circular clothing system in Australia, bringing with it major gains in employment and productivity efficiency. This infrastructure will include automated sorting plants for sorting both wearable clothing for reuse and unwearable clothing for recycling, enhancing both streams.

Recycling of both synthetic and cellulosic clothing textiles is a high priority due to their fibre prominence. The supporting infrastructure for collection is also an area for attention, the development for which is likely to require funding support from major industry and government. To this point, limited funding from the Federal Government has been devoted to more sustainable clothing end-of-use pathways and will need to change if Australia is to derive the benefits of onshore clothing reuse and recycling that are being sought.

Recommended Action

The development of a National Product Stewardship Scheme is central to a more circular clothing sector with strong public support. Ensuring all significant local and global brands are actively involved is crucial. The scheme will need to set targets in consultation with government and industry and to ensure a full set of quality data on the sector guides actions.

Recommended Action

Brands should consider providing a take back option as part of an extended producer responsibility and to foster brand loyalty.

Recommended Action

The development of crucial collection, sorting, and recycling infrastructure is crucial and identification of where funding assistance is needed will be important.

9. The Role for Government

9.1. Provision of scienced based direction for initiatives

Brands, retailers, and consumers often have difficulty in ensuring their actions are based on solid analysis to achieve environmental and social objectives. Too often activity is mis-directed and sometimes counterproductive. To better equip all stakeholders and their activities, a suite of life cycle analysis and other evidence-based guidance is required. This should be open access and will negate the need for individual brands and others to commission duplicate research in a costly manner.

Where initiatives are marketing based and lack a tangible benefit it is important to call this out as greenwashing. An area of concern requiring independent research and reporting relates to micro fibres, particularly microplastics. Analysis of this aspect covering production wear and the wash cycle would be of great value.

9.2. Ban on exports of unwearable clothing to unaccredited markets

It is vital that unwearable clothing be managed and transferred to fibre-to-fibre destinations either within Australia or in accredited export to prevent it finding its way to developing countries that lack commensurate markets and infrastructure. To underpin this and protect vulnerable developing countries from adverse outcomes, a ban on unwearable clothing should be developed that mirrors those for other recyclables.

The development of transparent chain of custody arrangements can provide assurance to all in the supply chain, that exported clothing is meeting social and environmental objectives and not creating a transferred end-of-life burden.

9.1. Foreshadowed ban on landfilling of clothing

In time Australia should strive to manage the end-of-use outcomes for clothing without landfilling either here or in developing nations, however this cannot yet be achieved as there is no viable end-of-use recycling pathway of the required scale.

In order to accelerate the longer-term goal of circular resources, and to encourage the necessary investment in recycling infrastructure, a foreshadowed ban on the landfilling or

burning of clothing should be introduced. This should be regularly reviewed against recycling infrastructure capacity.

9.2.   Immediate ban on landfilling of pre-consumer clothing

In the past the community has been rightly concerned about surplus new clothing being burnt, dumped at sea, or landfilled by brands. There are options for transferring unsold clothing from brands and retailers to welfare agencies through organisations such as Thread Together. Well over 300 brands already utilise these systems for great social and environmental benefit.

Concerns about transferring unsold stock into destruction outcomes would be aided by a ban on the export of unsold new clothing. Regulations in France may offer a good model for adoption in Australia.

9.3.   Restriction on the import of inferior clothing

At a global level there is concern about the trend to clothing manufactured in a compromised manner that leads to short garment life and increased waste. Of particular concern are some garments that are being placed on markets in developing countries.

As with a range of other products, it would be appropriate to ensure imported clothing meets an agreed set of design and manufacture objectives. The definition of inferior or poor clothing would require the development of a methodology and assessment process. The APCO Prep design tool may offer some insight for this and could be linked to testing or monitoring of product failure rates.

Recommended Action

To equip all stakeholders to base their efforts on activity with sound results, a suite of life cycle analysis and other evidence-based guidance is required.

Recommended Action

It is recommended that to protect vulnerable developing countries from adverse outcomes, and provide the chain of custody assurance required, a ban on unwearable clothing to unaccredited markets should be developed.

Recommended Action

It is recommended that a foreshadowed ban on clothing to landfill be set to encourage investment in reuse and recycling infrastructure and meet community concerns about resource loss. More immediately, a ban on the destruction of pre-consumer clothing should be implemented.

Recommended Action

It is recommended that to address concerns about declining product quality and garment life, restriction on the import of inferior clothing be introduced. This will require the development of an agreed set of design and manufacture objectives.

10. Summary of Recommended Actions

10.1. Manufacture and Sales

Recommended Action

Attention on pre-consumer waste should include strategies for improved ordering, logistics and monitoring for a reduction in unsold garments.

Recommended Action

The channelling of unsold garments into welfare outcomes must be pursued with elimination of brands destroying unsold garments.

Recommended Action

Efforts to transfer some of the end of roll fabric stock to smaller producers through an online platform are planned and should be supported.

Recommended Action

Brands should pursue business health through a realignment from a reliance on quantity growth towards increasing value as a more stable and circular model

Recommended Action

Brands should explore options to reduce discounting that could deliver more to a viable sector and ongoing profitability than continued growth.

Recommended Action

Brands could consider the stocking of second-hand clothing of their brand in their retail outlets.

10.2. Clothing Use

Recommended Action

A consumer education program should be established focusing on care in purchasing decisions, optimal washing, drying and storage of clothing and the transfer of excess clothing to charity donation.

Recommended Action

Brands should consider providing a take back option as part of an extended producer responsibility and to foster brand loyalty.

Recommended Action

To underpin the capture, sorting and processing of clothing, accurate labelling of clothing stating the fibre composition should be pursued. The form of this labelling will need to be agreed across the sector, ideally at a global level.

Recommended Action

An increasing emphasis should be placed on basic garment repair rather than discarding. This could include community education on simple tasks such as reinstating buttons, seam and hem repair and clothing size adjustment.

10.3. Collection, Sorting and Reuse

Recommended Action

It is recommended that a consistent collection system be established that combines consumer convenience with coordinated industry and charity effort. It should address both the need for timely donations of wearable clothing with the transfer of unwearable garments to a recycling destination.

Recommended Action

Where point of sale clothing collections are established, they should be linked to charity partners with transparency on end destination of collected garments.

Recommended Action

It is recommended that automated sorting technology be introduced in Australia. This should focus on sorting for wearability, both locally and for export. It should also incorporate technologies that can sort by fibre type and colour.

Recommended Action

A shared larger scale sorting centre should be developed for each key capital. This can handle clothing from all charities and provide the economy of scale for efficient sorting for reuse and recycling.

Recommended Action

To underpin the capture, sorting and processing of clothing, accurate labelling of clothing stating the fibre composition should be pursued. The form of this labelling will need to be agreed across the sector, ideally at a global level.

Recommended Action

An accreditation scheme should be developed for collectors, sorters export and reprocessors. This will give all stakeholders assurance about the flow of clothing after use and to ensure maximum environmental and social benefit.

10.4. Recycling

Recommended Action

The development of synthetic clothing recycling in Australia needs to be a key priority. Engagement with existing polyester recyclers and chemical recycling proponents will be important in identifying suitable technologies and any needed infrastructure support

Recommended Action

The development of cellulosic clothing recycling in Australia needs to be a key priority. Engagement with the existing pulp and paper recycling sector will be important in identifying suitable technologies and any needed infrastructure support. Opportunities for global recyclers to establish in Australia should also be explored.

Recommended Action

Technical and economic advice should be sought on the potential and feasibility to value add to domestic recycling with the development of fibre production.

10.5. The Role of Industry

Recommended Action

The development of a National Product Stewardship Scheme is central to a more circular clothing sector with strong public support. Ensuring all significant local and global brands are actively involved is crucial. The scheme will need to set targets in consultation with government

and to ensure a full set of quality data on the sector guides actions. The use of eco-modulation will help to reward brand circularity initiatives.

Recommended Action

A consumer education program should be established focusing on care in purchasing decisions, optimal washing, drying and storage of clothing and the transfer of excess clothing to charity donation.

Recommended Action

Brands should consider providing a take back option as part of an extended producer responsibility and to foster brand loyalty.

Recommended Action

The development of crucial collection, sorting, and recycling infrastructure is crucial and identification of where funding assistance is needed will be important.

10.6.   The Role of Government

Recommended Action

To equip all stakeholders to base their efforts on activity with sound results, a suite of life cycle analysis and other evidence-based guidance is required.

Recommended Action

It is recommended that to protect vulnerable developing countries from adverse outcomes, and provide the chain of custody assurance required, a ban on unwearable clothing should be developed.

Recommended Action

It is recommended that a foreshadowed ban on clothing to landfill be set to encourage investment in reuse and recycling infrastructure and meet community concerns about resource loss. More immediately, a ban on the destruction of pre-consumer clothing should be implemented.

Recommended Action

It is recommended that to address concerns about declining product quality and garment life, restriction on the import of inferior clothing. This will require the development of an agreed set of design and manufacture objectives.

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10.8. Glossary

Definitions courtesy of National Product Stewardship Scheme for Clothing

Cellulosic fibres	These consist of two families: grown (cotton, linen, hemp, bamboo, ramie, nettle) and man-made (viscose, lyocell, rayon, cupro, acetate). They should only be considered sustainable if they're either grown ethically and/or organically, such as GOTS cotton, or produced with responsibly sourced wood or plants, like FSC-certified Tencel.
Chemical recycling	Adopts a series of chemical processes to depolymerize/dissolve the fibre from of the fabric into monomer/solvent form either to make newer fibre compound of it or extract one compound from a mix.
Circular design	Circular design is an approach that replaces the 'take-make-waste' linear model with a circular model of design in which products are designed to be environmentally low-impact, to last for a longer time and to be easily reused or recycled at the end of their useful life. The aim is to eliminate waste and to enable continuous, closed-loop use of resources.
Climate change	Global heating driven by human emissions of greenhouse gases, as well as large-scale shifts in weather and climate patterns, including increased weather emergencies.
Closed-loop recycling	Recycling processes that turn materials back into raw feedstock of equal quality. For textiles, this means the creation of recycled fibres and yarn. The chemical recycling of polyester creating new yarns would be considered closed loop, and the new product would be marketed as recycled polyester. In the textile and fashion industry, this process remains very rare. Focusing on the exact same raw component nevertheless restricts recycling options.
Clothing	Wearable products including those made out of textiles (e.g. shirts, trousers, etc.). Excludes single use wearable items such as PPE.
Clothing charities	Charities that receive donated clothing and sort and sell these either locally or through export.
Clothing utilisation	The average number of times a garment is worn before it ceases to be used

Deadstock	Originally an industry term for excess inventory that has never been sold to a customer, deadstock is now also used to describe products that are no longer available for sale from their original brand but that are still desirable, such as unworn vintage.
Design for disassembly	Designing products with materials, systems and components that are recyclable and reusable, to reduce consumption of resources and consider the complete lifecycle of a product.
Developing countries	A developing country is a sovereign state with a less developed industrial base and a lower Human Development Index relative to other countries.
End-of-life	The point at which a product can no longer be used in its existing state and, in a linear economy, would be disposed of by being sent to landfill or burned. In a circular economy, end-of-life means the start of a new cycle, as products are reused or recycled into other items or resources.
End-of-use	The point at which a product can no longer be used in its existing state and, in a linear economy, would be disposed of by being sent to landfill or burned. In a circular economy, end-of-life means the start of a new cycle, as products are reused or recycled into other items or resources.
Extended Producer Responsibility (EPR)	Extended Producer Responsibility is an environmental management strategy and policy approach that allocates producer's responsibility - be it financial and/or physical— for the management of products in the post-consumer stage of a product's life cycle.
Item/garment	Piece of clothing. Sometimes items include more than one garment, such as in packaging including several pairs of socks, and sets of underwear.
Landfill	Any household or commercial waste that's not recycled or reused will usually end up at a landfill site, also known as a tip, rubbish dump or garbage dump. Landfills cause a number of environmental issues, from infrastructure damage to pollution of local roads and rivers and contamination of groundwater and soil. Once full, the ground above a landfill may be reclaimed for other uses.
Life cycle assessment	Lifecycle assessment (LCA) is a technique used to analyse the environmental impact of all stages of a product or service lifecycle from cradle-to-grave or cradle-to-cradle, from the raw material through to manufacturing and use to end-of-life disposal or recycling.
Linear model	A material that follows the 'take-make-waste' model of linear production, being extracted from the earth and then sent to landfill after use, rather than the preferable circular model. It's recognised that we now need to move, as a global society, from a linear to a circular approach.
Mechanical recycling	The process of recycling the textile fabric back into fibres without the use of any chemicals. This process includes shredding and carding process to extract the fibres from the fabric. This fibre can then be spun to make yarn for either woven or knitted fabric.

Microplastics	Very small pieces of plastic, less than 5mm in size, that contain synthetic polymer, semi-synthetic polymer or modified natural polymer and cannot biodegrade in the environment. They are used extensively in beauty formulas and are also shed from clothing when it is washed. There is research to show these particles negatively impact marine life and are being consumed by humans through the food chain. The impact on the body is yet to be fully realised, but early research points to negative impacts on the digestive system, lungs and immunology. New EU legislation is in the pipeline to ban microplastic-producing ingredients from being used in beauty products.
Mono materials	Materials that only consist of one material or fibre rather than a blend. It is easier to recycle a garment or product made from one single material, as this avoids having to separate several materials and then recycle them all separately.
Natural fibres	Natural fibres used in clothing textiles come from natural sources. Protein and cellulosic fibres are most commonly used within textile manufacturing for clothing. Protein fibres are sourced from animals, such as wool, silk and cashmere. Cellulosic fibres come from plant sources, including cotton, flax, hemp and jute.
Nylon (Polyamide)	Nylon is a generic designation for a family of synthetic polymers composed of polyamides. Nylon is a silk-like thermoplastic, generally made from petroleum, that can be melt-processed into fibres, films, or shapes.
PET plastic	PET (polyethylene terephthalate) is one of the most commonly used thermoplastic polymers globally. It has a wide range of uses, from polyester fibres for textile production to food and drinks packaging. PET is not biodegradable but can be recycled into rPET and reprocessed into new products.
Polypropylene	Polypropylene is a thermoplastic polymer used in a wide variety of applications. Polypropylene belongs to the group of polyolefin plastics and is widely used in Australia.
Post-consumer textile waste	Items that have been discarded by the final user and are no longer intended to be used as a consumer item. Post-consumer waste is most commonly created in household settings and is harder to collect, identify and recycle than pre-consumer waste. Activities such as collection, sorting, repair and resale can revalorise this material.
Post-industrial textile waste	Textile by-product from the manufacturing stage (eg. clipping waste, offcuts, roll ends and remnants). Also termed pre-consumer waste in some cases.
Pre-consumer textile waste	Materials or products that are discarded before reaching the consumer. This can range from materials lost during the production processes, such as fabric scraps or paper cuttings, to damaged or unsold stock. Pre-consumer waste is used more readily within recycling, as access to materials and identification is more readily available.
Product Stewardship	Product Stewardship is based on the idea that actors throughout a supply chain retain a level of responsibility for offsetting the social and environmental impacts of the materials/product produced and consumed ("shared responsibility").

Waste Hierarchy	A set of priorities for the efficient use of resources. The R-strategies have a hierarchy should be followed in order to transition to a circular economy. This hierarchy is: refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, recover.
Recirculation	All activities that work toward a circular economy – specifically those which put clothes in use for longer.
Recycling	Recycling is the process of breaking down textiles into raw materials which are then used to make new products.
Repairability/repairable	Repairable products can be restored to their original functionality by repair and mending techniques, either by the consumer, a repair service, or the manufacturer that originally created them. There is a growing movement called Right To Repair that petitions for products to be able to be repaired by default.
Repurpose	Repurposing is a process of transformation, where products, materials or content are used in a different way to the original intended purpose.
Resale	In resale and re-commerce systems, previously bought products are sold again to new owners. Marked by the rise of re-commerce platforms and in-house marketplaces, the re-commerce economy has the potential to disrupt traditional retail strategies and bring circularity into the mainstream.
Retail value	Value of the retail volume at the point of sale.
Retail volume	Volume of sales to consumers, measured in items, including both offline and online purchases and excluding second-hand products (reused).
Reuse	Textile products are used again, with no alteration to the original item.
Second-hand item	Item that was owned and used by another person before, including garments bought in second-hand shops or markets, items given or exchanged.
Stewards	Organisations which put products on the market (also called Producers).
Supply chain	The activities, people and resources that together work to produce a product or service, from sourcing raw materials to final delivery to the end-user. Companies must optimise supply chains in order to keep costs down, maintain fast production cycles and stay competitive.
Synthetic fibres	Synthetic or artificial fibres are man-made thread or filaments from which a textile is created. These fibres are usually made from fossil or petrol-based components via polymerisation, a process that extrudes the material through spinnerets combining monomers that make a long chain of material called polymer.

Textiles	Textile-based products and materials including all clothing, accessories and home textiles.
Unwearable clothing	Garments that are no longer suitable for wearing due to wear or damage.
Unworn item	Item that has not been worn in the last year or not worn at all.
Upcycling	The process of transforming waste materials and discarded or unwanted products into something of a higher quality or value, often using crafts or artisanal knowledge as tools.
Use phase	The phase in which a garment is used, this includes consumption, wearing, washing and repairing if it is done by the first user. In a linear economy, the use phase leads to disposal; in a circular economy, the use phase leads to recirculation.
Value chain	The activities involved in a company making a product or service, comprising the stages involved in creating a product from conception to distribution. A value-chain analysis helps a company evaluate the individual elements and details involved in each part of its business process, while also helping to increase production efficiency through the elimination of unnecessary waste to help deliver greater value at a lesser cost.
Waste	Unwanted, unusable, zero value or defective materials and substances. Anything discarded after its primary use is classed as waste, in contrast to the term 'byproduct', which refers to a joint product that has minor economic value. According to the EU Waste Framework Directive, if the substance is passed on to be reused or recycled it is still legally considered waste if it's no longer required by the person or organisation that produced it. Waste can be elevated to become a by-product or a resource through any process, innovation or system that brings its value above zero.
Wearable clothing	Second-hand clothing that remains in a suitable condition for further wear.