



PLASTIC FASHION 101

by

**SIMPLY
SUZETTE**

supported by

**FASHION
REVOLUTION
CANADA**

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hello! and welcome to Plastic Fashion

We define 'PLASTIC FASHION' as any process or material that is derived from or contains oil & gas – the same raw materials that make up fossil fuels. And sadly, most of the clothing we make today is made of oil.

This initiative expands upon Simply Suzette's Denim and Fashion Supply Chain 101, focusing on plastics in fashion. We initiate with foundational principles of sustainability and how they interlink with plastics and fossil fuels, then progress through the supply chain stages to show you the hidden world of plastic in fashion - beginning at the source.

101

Our objective is to shine a light on the multiple ways in which plastics have entered the fashion industry, and how this causes various health risks, as well as social and environmental concerns. We believe that if there was more knowledge on fashion supply chains, consumers, designers, and all those who come across fashion in their lives would have the tools to make more responsible choices.

Feel free to skip directly to the part that interests you the most, and let us know if this was useful for your work, studies, or curiosity!

We start by introducing some practices that are relevant across the entire supply chain and then dive into the specific steps that materials go through.



where are plastics found in fashion?

The fashion industry has an addiction to plastic, which comes from a long history of finding the cheapest price and listening to the wrong lobbyists, you can deep dive into this topic here.

Have you ever thought of all the places in which plastics are found in fashion? There are some obvious ones, such as plastic buttons, zippers, hangers or plastic soles for shoes, then some more hidden ones such as small percentages of plastic-based materials in cotton blends or supply chain packaging that the consumer never sees (shipping bags and shrink wrap), and finally there are plastics that the human eye can't see, in coatings, dyes, and chemicals used in washes to give a range of effects.

Here we dive deeper into the different categories where you can find plastics.

fibres and blends

If you have never thought about the difference between natural materials and fossil based fibres, take a moment to look in your wardrobe and check some labels for nylon, polyester and acrylic. How many of your clothes don't contain even 2% plastic? Very few, right?

Clothes – especially fast fashion – are made of these cheap synthetic fibres. Polyester, nylon, acrylic, and spandex are some of the primary synthetic fibres derived from plastic polymers like polyethylene terephthalate (PET) and polyamide.

These fibres were introduced in fabric design for their strength, elasticity, and resistance to wrinkles, making them ideal for a wide range of apparel, from athletic wear to everyday garments. At the time, it wasn't known that microplastics, tiny plastic particles less than five millimetres in size, would become a huge concern for human and ecosystem health. Microplastics can shed from synthetic fabrics during washing and wear, finding their way into the environment and even into our bodies through ingestion or inhalation.

accessories and chemicals

Plastics are also used in various components and embellishments in clothing. From zippers and buttons made of plastic to waterproof coatings and laminates applied to fabrics, plastics contribute to the functionality and aesthetic appeal of garments.

Water-resistant jackets often feature coatings or membranes composed of polyurethane or polytetrafluoroethylene (PTFE), commonly known as Teflon, to repel moisture and enhance weather protection. Even in seemingly natural fabrics like cotton or wool, plastic elements can be present in the form of dyes, finishes, or reinforcements, highlighting the pervasive nature of plastics in modern textile manufacturing.

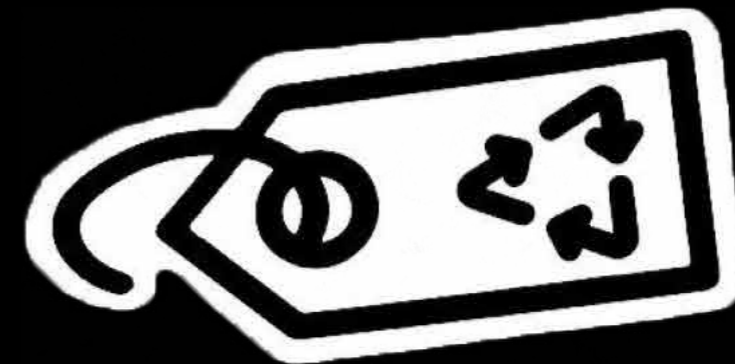
packaging

You might be familiar with the packaging used in stores or in your online deliveries. This is widely added to provide product presentation and brand identity, however, there is so much more plastic packaging used in supply chains that you will never see.

Plastic packaging is widely used from the initial stages of manufacturing to the final delivery to consumers as a protective barrier for garments during transportation and storage. Garments and accessories are often individually wrapped in plastic sleeves or bags to prevent damage during transit, ensuring that they arrive at their destination in pristine condition. Each manufacturer tends to discard this and use new packaging to ship things to the following subcontractor.

Plastic packaging is also utilised for bulk shipping of items often bundled together and encased in plastic shrink wrap or polyethylene bags to facilitate handling and logistics processes.

The waste generated from supply chain packaging is rarely quantified, and we have never seen it included in any LCA. On top of this, plastic tags and labels are added to present the final garments in store on (usually) plastic hangers, or for your neatly wrapped e-commerce purchases.



Now we go into the steps of the supply chain →



step 1
raw materials

synthetic
materials

traceability

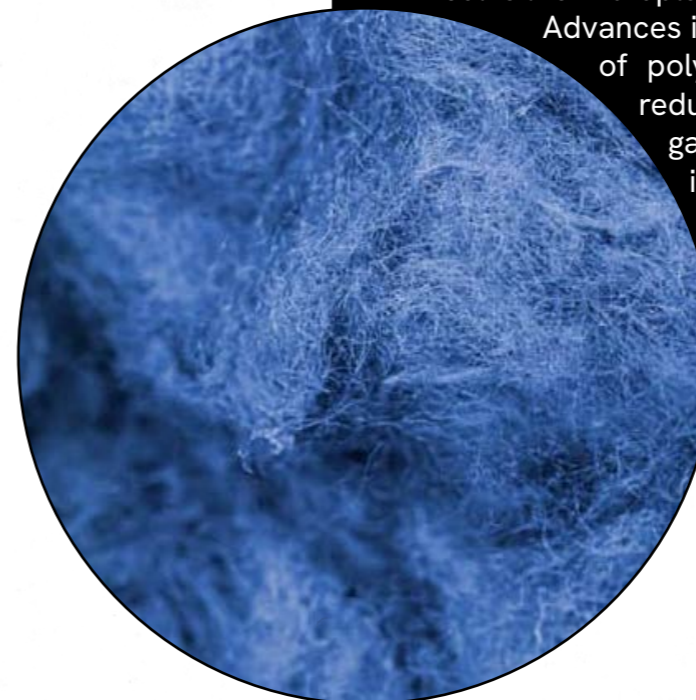
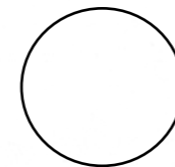
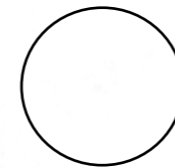
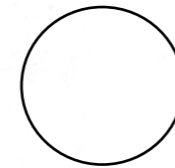
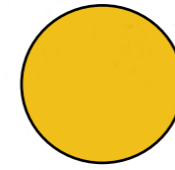
From issues with its extraction, its release of microplastics during use, and its incompatibility with a circular economy, so many aspects of plastic clothing are just wrong.

According to the Changing Markets Foundation, today over two-thirds (**69%**) of textiles are made from plastic, and this is expected to grow to **73%** by 2030. This is because oil-based fabrics such as polyester are cheap, smooth, strong, durable and consistent.

Most of the clothing we make today comes from petroleum (aka oil), a non-renewable resource. The petrochemicals industry has complicated social and political implications that are relevant to all industries that use petroleum-derived products.

Petrol is used to make all types of synthetic materials, which include:

- + Polyester
- + Nylon
- + Elastane / Spandex
- + Lycra (branded spandex, polyester and nylon)
- + Plastic buttons, zippers, and beads



Polyester, a synthetic fibre derived

from petroleum, is the most widely used fibre in the clothing industry today with estimates reaching up to two thirds of all fashion. Its emergence as a fashion staple can be attributed to its durability, resistance to shrinking and stretching, and its quick-drying capabilities. Developed in the early 20th century, polyester's popularity soared in the 1970s when the textile industry began to favor it for its ability to mimic natural fibres at a lower cost and for its performance characteristics.

The process of making polyester involves the polymerization of ethylene glycol with terephthalic acid. This produces a plastic fibre that can be spun into threads and yarns, and used to weave or knit into fabrics. If you want to get into the details, we've outlined the exact extraction process [here](#).

Many make the argument for polyester production because it uses less water and land than most natural fibres. However, according to Common Objective, the energy required to produce polyester (125 MJ of energy per kilogram produced) makes it a high-impact process and based on its extraction process, it is clearly not superior to natural fibres even though LCAs may say otherwise (more on this below).

Efforts to improve the sustainability of polyester focus on recycling existing polyester materials and developing bio-based alternatives. However, we warn against recycled polyester as it still fuels our desire for plastic based materials and does not solve the microplastics issue, which are discussed in detail [here](#).

Advances in technology are also exploring the creation of polyester from bio-based sources, aiming to reduce dependency on oil and lower greenhouse gas emissions. Despite these efforts, polyester is still plastic – meaning the same materials are used for fossil fuels and for clothing with many of the same impacts.

synthetic materials

traceability

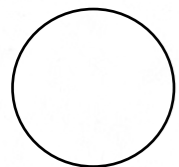
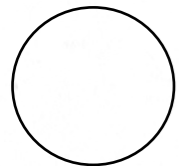
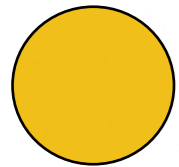
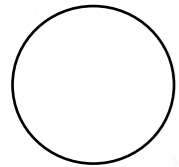
Nylon

was a groundbreaking synthetic fibre

and made its debut in the 1930s as the first true synthetic textile fibre, revolutionising the fashion and textile industries. Celebrated for its exceptional strength, elasticity, and resistance to abrasion and mildew, nylon quickly became a cornerstone material for a vast array of products, ranging from hosiery and swimwear to parachutes and toothbrush bristles. Its invention marked a new era in textiles, offering a durable, versatile, and cost-effective alternative to natural fibres.

The creation of nylon involves the polymerization of caprolactam, resulting in a material that boasts high tensile strength and flexibility. This process yields a fibre capable of being woven or knitted into fabrics that are lightweight, yet strong, with a silky smooth texture. Nylon's ability to dry quickly and retain its shape even after repeated wear and washing has cemented its place in our wardrobes and homes.

Like other synthetics, nylon is petroleum-based, its production relying heavily on non-renewable resources and emitting significant levels of greenhouse gases. Additionally, nylon is not biodegradable, contributing to the persistent problem of plastic pollution in our ecosystems. The durability that makes nylon so valuable also means it can take decades to decompose, posing challenges for waste management and recycling efforts.



Spandex

also known as **elastane** or by the

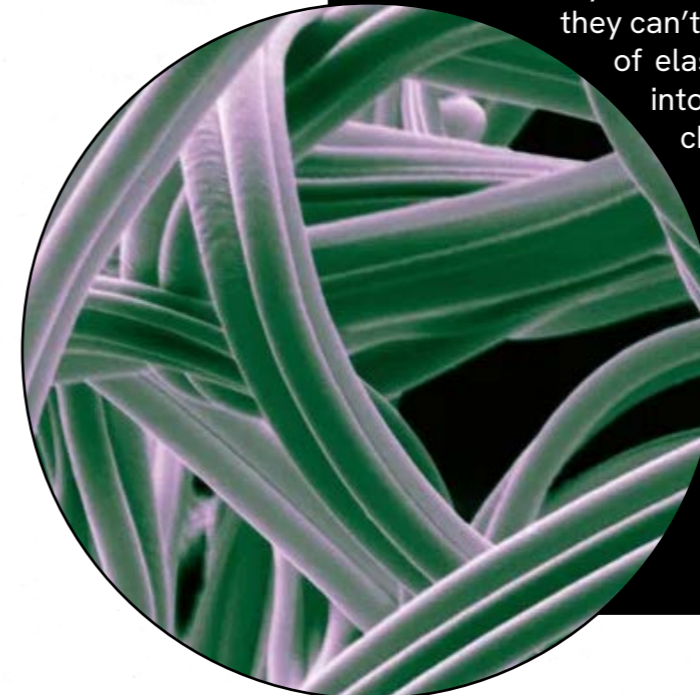
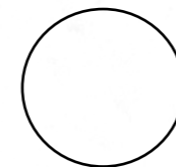
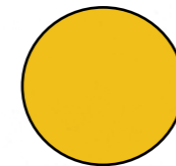
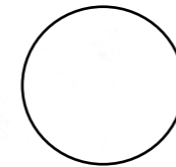
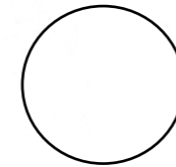
brand name **Lycra**, is a synthetic fibre known for its exceptional elasticity. It is a lightweight, soft, and smooth material that can stretch up to five times its original length, making it a crucial component in a wide range of clothing for its ability to enhance comfort and fit. First developed in the 1950s as an alternative to rubber in garments, spandex quickly became indispensable in the fashion industry, particularly in activewear, swimwear, and underwear.

From an environmental standpoint, spandex presents challenges similar to those of other synthetic fibres. Being petroleum-based, its production is resource-intensive and contributes to the consumption of non-renewable resources. Additionally, spandex is not biodegradable, leading to concerns about its long-term impact on the environment, particularly as it contributes to the growing issue of textile waste in landfills.

Natural rubber offers an intriguing alternative to elastane (spandex) in various applications due to its unique properties and environmental benefits. Derived from the sap of the rubber tree (*Hevea brasiliensis*), natural rubber possesses elasticity, resilience, and durability that can be harnessed in the textile industry, particularly in the production of elastic components of clothing.

Natural rubber boasts notable advantages for the planet and our well-being, but it's not a perfect match just yet. Its elasticity and strength are commendable, yet sometimes they can't fully compete with the stretch and resilience of elastane. Moreover, transforming rubber trees into chic garments involves navigating complex challenges, from avoiding deforestation to ensuring fair working conditions. However, innovators and forward-thinkers are tirelessly enhancing natural rubber's performance and refining its production process, so keep an eye out for the nature-based solutions!

But keep in mind, natural alternatives are only sustainable if we significantly reduce production.



synthetic
materials

traceability

Alternatives to Synthetics

In a perfect world, consumption would be reduced significantly, but there will always be some clothing made in which case synthetics should be replaced by natural fibres (which is extremely easy in most cases). For stretchy materials, it is more complicated, however solutions are being developed.

+ **COREVA™** is an innovative technology developed and patented by Candiani Denim that uses a plant-based yarn obtained from natural rubber to replace synthetic, petrol-based yarns. Made from organic cotton wrapped around a natural rubber core, the result is a yarn that is completely plastic-free and biodegradable. By replacing conventional synthetic and petrol-based elastomers with a new, custom-engineered component, Candiani has created an innovative stretch denim fabric – without compromising the elasticity, physical qualities, and durability of jeans.

+ **Mechanical Stretch.** One natural stretch solution we have seen from Naveena Denim is creating high-stretch fabrics made from 100% cotton. How have they done this? The Mecha-Stretch concept is a mechanical stretch concept designed for 100% cotton woven fabrics. It truly has an elastic behaviour thanks to a specialised weaving technique. This kind of weaving technique can be found in all fashion garments.

+ **Pangaia bio-based nylon** is biodegradable plant-based nylon sourced from castor beans, however, the material states that it is only 30% derived from bio-based origins. Keep your eyes on Pangaia as they work to increase this with time and learn more about it [here](#).

+ **Lycra bio-based spandex.** The LYCRA Company has partnered with QIRA to produce bio-based spandex, specifically plant-based sugars derived from field corn grown by Iowa farmers. This innovation supports moving away from fossil based fibres while preserving performance standards and existing manufacturing processes.

Recycled Synthetic Materials

The environmental and social impacts of synthetic materials have long been a concern, but with growing awareness of the harms associated with their extraction and processing, recycled versions are now emerging as the fashion industry's celebrated sustainable alternatives.

From PET bottles transformed into polyester fabric to reclaimed nylon fishnets morphing into swimwear, there is hardly a single high street fashion brand who isn't shouting about recycled synthetics.

Certifications include:



Recycled synthetic materials are the fashion industry's nod to a "less guilt" approach, trying to clean up the mess left by their non-recyclable siblings.

One might believe « recycled polyester » is made from recycled polyester fabric but sorry to burst your bubble – it is not. In fact, it is made from recycled PET, commonly known as... plastic bottles! To make recycled polyester, plastic bottles are shredded into flakes, converted into pellets, melted, and spun into yarn. But, what's wrong with diverting plastic bottles from landfills and turning them into fabric?

In order to create recycled polyester, PET material is taken out of a potentially circular economy and dragged into a linear, product-to-waste, one. Bottle-to-bottle recycling can work efficiently in a closed loop where new bottles can be made from old ones. But once a bottle is turned into polyester yarn and blended with other fibres, like cotton, it cannot be recycled anymore. There are amazing technologies extracting polyester to recycle it, but these have yet to be scaled, meaning garments containing polyester are most likely to end their life in the incinerator or landfill. These recycling methods may also come with high costs in the form of chemical and energy use.

While recycling lets synthetic materials take a second chance at life, it's slapping a band-aid on a much larger problem. We're still in bed with the plastic industry, complete with its tricky microplastics that release during processing and with every wash, turning our oceans and aquatic friends into unwilling participants in this not-so-glamorous saga.

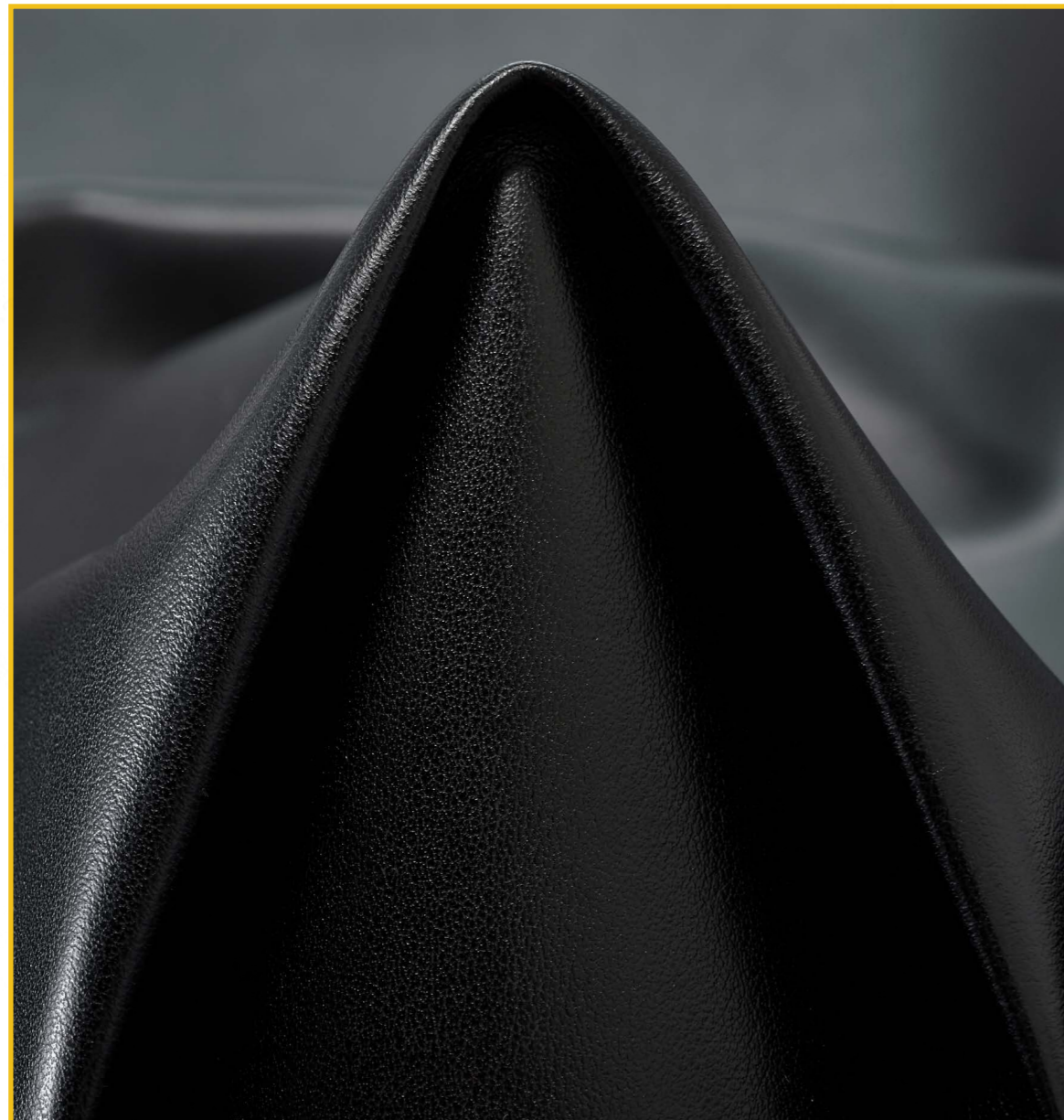
Sure, converting waste into wearable items does cut down on some energy and resource use, but let's face it, we're essentially still sitting at the table with the petrochemical industry. So, while recycled synthetics are making an attempt at a "less bad" approach, perhaps it's time to get rid of them altogether.

PU Leathers

A lot of vegan/animal-free leather alternatives contain plastics, the first one that reached markets years ago is PU leather or Microfiber Leather. A lot of new alternatives combine bio-based materials with a percentage of PU.

Microfiber Leather:

- + A smooth, synthetic material which can replicate the look and feel of animal skin products.
- + It's supple, durable and versatile, making it a more sustainable alternative to leather and suede.
- + PU = polyurethane = plastic



synthetic
materials

traceability

Many companies have a limited view of the network of business partners within their supply chain and do not get the full story behind their products. Getting this information and being able to know all the steps that a garment has gone through is called Traceability.

Most know their immediate suppliers, which are the factories that do the cutting, sewing and final quality control, but information about their suppliers, subcontractors, or component suppliers is easily lost. For plastics, information tends to get lost at the mill level: a mill buys dyed yarns from resellers, and there is no information on where the plastic pallets come from, let alone the raw materials and the oil extraction.

Traceability is the concept of looking at the supply chain and being able to accurately map all contents and suppliers from the raw material extraction stage to its end use. It requires the collaboration of all industry partners, the deployment of common approaches and reliable technical solutions that are fit for different environments.

Traceability is also key for recycled plastics, to ensure that those are really recycled, and not just labelled so. There are credible rumours that the demand for recycled PET in fashion was so high that a factory was set up to make plastic bottles just to "recycle" them into clothing.

The practice of subcontracting certainly plays a key role in traceability, which is highly connected to the amount of plastic packaging that we explain below.

Both transparency and traceability are now a priority for the garment industry to manage supply chains more effectively and discover where hidden plastics can be replaced, however transparency and traceability individually are not enough.

synthetic
materials

traceability

We have physical tracers and blockchain traceability, and we have some companies who are combining the two. Physical marking allows for information about the supply chain to be written in the garment through chemical or physical marking. Blockchain traceability requires adding information into the blockchain, which relies on the correct information being added at each stage.

Several of these solutions apply QR codes to clothing labels so that customers can learn about the provenance of their garments. These include the Lycle (mobile app and web traceability platform), or brand initiatives, such as by Residus. They can include information on fibres, certifications, processes, location of production, and visibility on several aspects of the supply chain. QR codes are also useful tools for informing consumers of best practices in garment aftercare and end-of-life.

Examples of traceability solutions are

+ **EON**, another major company focusing on traceability using QR codes, was founded in 2015 with the mission to power industry's transition to a circular system of commerce. EON established the CircularID™ Initiative in 2018, to develop a protocol that would unlock the communication and connectivity for this network. Through the initiative, EON led the development of the Circular Product Data Protocol - the global language for connected products. Today, EON works with global brands and retail's across the fashion industry to provide Digital ID technology and implementation.

+ **Aviant** has created a tracer technology employing 'taggants', unique chemical markers integrated into synthetic textile fibres during the spinning to dyeing processes. These taggants provide a distinct identity for customers and their product lines, enabling end-use fabrics to undergo testing to confirm their origin.

+ **The TextileGenesis™** platform is an outcome of intensive "grass-root" discussions with the entire apparel supply chain; its technology combines blockchain with GS1 (a global traceability standard) for the apparel industry. Its platform allows digitization and traceability of any textile asset such as fibre, yarn, fabric, or garment through fibrecoins™ (blockchain based digital-tokens, likened to fingerprints). fibrecoins stay intact no matter how many times the material is reused or recycled, and the information is stored using blockchain, which can't be altered or tampered with.

+ **Tailorlux** is a solution provider for material integrity and detection, offering a total concept that gives your product an individual fingerprint. Uniquely, the tracer is permanent even when it's recycled and can be easily implemented in yarns and threads made of synthetic fibres or cellulose.



step 2 materials processing

Fabric production and material processing is a step in the life cycle of a garment that consumes a significant amount of energy. In this stage, the raw material described above is turned into a fabric. For synthetic fibres, this means turning it into a yarn, and then either weaving or knitting it. A lot of fibres can also be made into non-wovens, or in the case of leathers, this step is completely different.

Vertically integrated facilities will generally blend their pre-consumer and post-industrial waste into their products at this stage too and like we learned in the raw materials stage, we want to continue to increase the amount of recycled fibres in our clothes :) But let's keep them microplastic free.

Fabric Production from Fibres

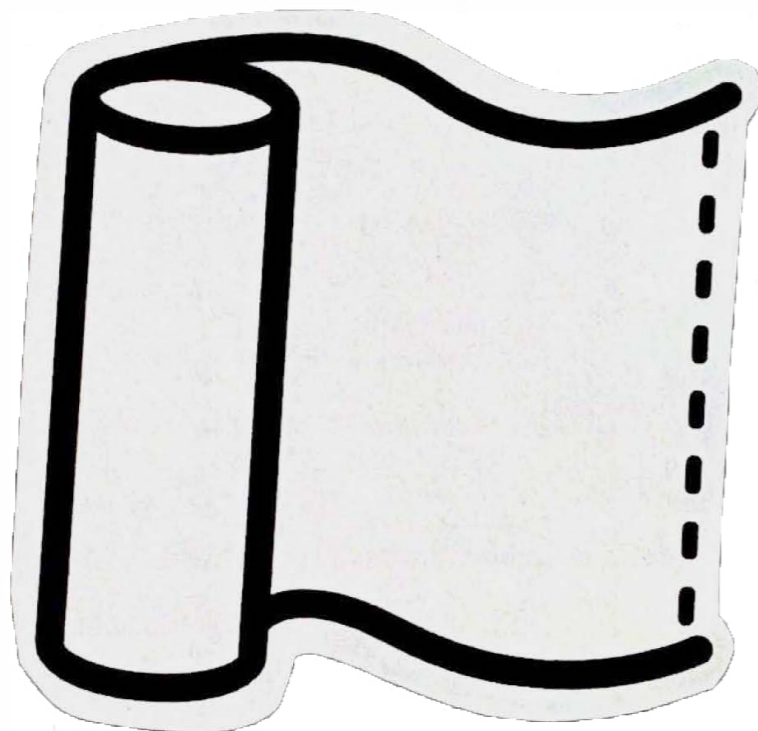
Yarns

Weaving & Knitting

Dyeing

Extruding synthetic fibres

The creation of synthetic fibres is a fascinating journey from raw material to textiles. Unlike their natural counterparts, synthetic fibres begin as chemical solutions derived primarily from petrochemicals. This process, known as extrusion, transforms these solutions into the countless synthetic fibres that populate our wardrobes and homes.



- + **Melting or Dissolving:** The first step in extruding synthetic fibres involves melting or dissolving the polymer. For example, nylon and polyester are melted, whereas acrylics might be dissolved in a solvent to create a thick solution.
- + **Spinning:** Once in liquid form, the polymer solution is forced through a spinneret—think of a honey-like substance going through a showerhead with multiple tiny holes. As the solution extrudes through these holes, it forms long, continuous filaments.
- + **Cooling and Solidifying:** The emerging filaments are then cooled, either by air or water, causing them to solidify into fine threads.
- + **Drawing:** To enhance their strength and elasticity, the solidified fibres are stretched, or “drawn,” which aligns the polymer molecules within the fibres. This process can increase the fibre’s strength significantly.
- + **Texturing:** Synthetic fibres are often texturized to give them certain characteristics, such as the soft hand of natural fibres or specific performance qualities. Texturing can create fibres that mimic the feel of cotton, wool, or silk.

Fabric Production from Fibres

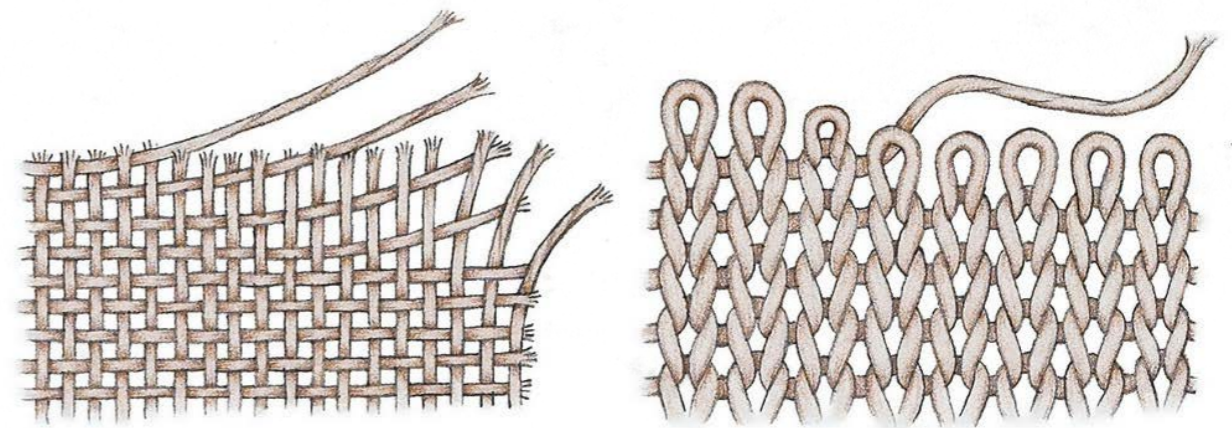
Yarns

Weaving & Knitting

Dyeing

To most fashion enthusiasts, the difference between a woven and a knit fabric is very clear. But this is not an exclusive club: we want to include everyone!

So, what's a woven VS knit?



A **knit** fabric is made up of a single yarn, looped continuously to produce a braided look.

A **woven** fabric is generally produced on a loom and made with many threads that will be placed at two specific angles. The two angles will then define your warp and weft directions.

To set our yarn up for weaving, we need to coat it to ease the friction that occurs during weaving known as a sizing formula. Then we take our dyed yarns for our warp and weft and watch the magic happen!

Fabric Production

from

Fibres

Yarns

Weaving & Knitting

Dyeing

What & How

There are plenty of ways in which colours are applied to materials in fashion, which include cone dyeing, garment dyeing, hank dyeing, knitted fabric dyeing, stock dyeing, wool tops dyeing, warp dyeing, woven fabric dyeing, wet processing, fibre dyeing, yarn dyeing, etc. The most common categories, however, are yarn-dyeing or piece-dyeing.

Yarn-dyeing means that the yarns are coloured before weaving. They can be stored as raw yarn and dyed when required according to the dictates of fashion. Piece-dyeing means that cloth is woven as what is known as 'grey' goods or 'prepared for garment dyeing' and is then dyed according to fashion need.

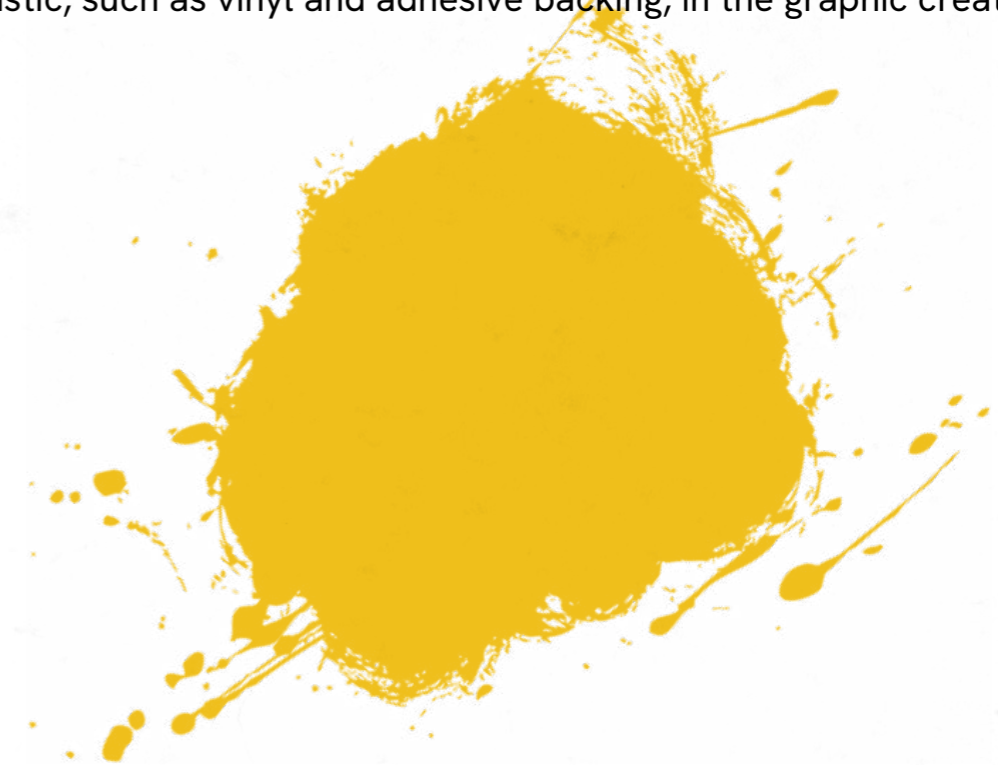
In 2011, the organization GreenPeace launched a process of accountability through GreenPeace's Detox Campaign, a campaign designed to raise awareness of brands on their environmental impact, ask them for transparency along the supply chain and make consumers aware of the dangers of fast fashion, which led to the establishment of ZDHC (Zero Discharge of Hazardous Chemicals), a program dedicated to promoting a more responsible use of chemicals.

Finishing processes may also be riddled with petrochemicals and plastics in the form of flame retardants, water repellency, stain repellency and other aspects that add functionality to fabrics.

Often not taken into consideration are prints like you may see on graphic tees that use plastic, such as vinyl and adhesive backing, in the graphic creation process.

Dyeing can have major environmental impacts because of the amounts of chemicals, water, and energy used.

If factories' discharged water is left untreated, it goes straight into waterways. In many communities surrounding dye factories, dyes have accumulated in rivers to the point where light can no longer penetrate the water's surface. This accumulation can kill aquatic plants and animals and pollute essential drinking water sources for surrounding communities.



Denim is a whole other ball game. If you want to learn more about denim's dyeing and supply chain in-depth, read our Denim 101 resource [here](#).

step 3

cut & sew

1.1 Sampling

Sampling is a process of making a product prototype prior to starting bulk production, and is a key part of the design and pre-production process, as it provides an essential opportunity to analyse what works before putting the design into production. Before deciding on the final shade, fabric, and fit, factories can make dozens of samples for one item that then goes into production. \$6 to 8 billion is spent on sampling in the fashion industry every year, with each sample usually wrapped in plastic. These samples often are not sold, and their environmental impact should not be overlooked.

1.2 Best Practice

3D sampling allows brands to create a virtual fit model of their product, and has become an innovative tool to minimise the harmful effects of the sampling stage. Companies like Clo3D, Taas, Optitex and Marvelous Designer provide digital sampling services, and it is impressive to see how they can recreate different fabrics, patterns, and lighting on the digital clothes.

2.1 Cutting

Automated cutting allows for a machine with an automated moving blade to cut rolls into parts of garments. This can be better worker safety, since the traditional cutting method required for employees to handle cutters manually. Furthermore, the cut pieces are repeated perfectly to reduce waste.

Cutting waste is one of the least talked of issues in fashion: tiny pieces of fabric are either incinerated or thrown to landfill. Many of these scraps are polyester based meaning they will never degrade. You can read more about the upcycling of fabric waste in ['End of Life'](#).

There is also a big problem of minimum order quantities that is not well known. Fabric is considered a high volume low price product, therefore manufacturers who have to run extremely big machines and use vast amounts of chemicals in their production set a minimum order quantity. Garment manufacturers however receive an order from brands, who do not take responsibility over the order quantity from the mill, so they end up with unused fabric that they have to store or dispose of.

2.2 Best Practice

CAD design is a program used for placing patterns and connecting with cutters. Experts would use their knowledge to reduce the fabric waste by maximising the fabric used with clever pattern placements.

Cutting waste highly depends on the design, size range, and fabric details, and the percentage of cutting waste can vary from 0 up to 20%. Although being used more widely in fashion classes than in industrial settings, Zero Waste Pattern Cutting means that the pattern pieces fit together so that no fabric is wasted during the cutting phase. This also allows to reduce the amounts of cuts that are required.

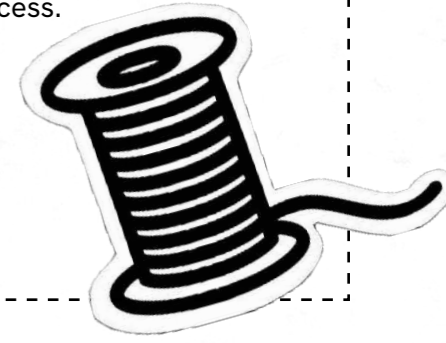
Intellocut is a fabric planning optimization software designed to help apparel and textile businesses save fabric in roll form in order to boost topline. It distributes patterns along the rolls to maximise fabric utilisation and reduce offcuts. Think of this as a puzzle solved by software!

3 Sewing

Sewing factories employ hundreds of thousands of people, all using variations of simple sewing machines. This is why the sustainability of this step is mostly social: material is transformed mechanically only.

However, a very hidden piece of plastic exists amongst this step. And that is in our sewing threads.

Sewing thread components tend to be neglected when calculating the fibre composition of a garment, yet an estimated 180m is needed for making a pair of jeans! ...and most are composed of polyester or cotton-poly blends. The reason polyester threads are so popular is again for its cheap price and durability. 100% cotton threads tend to become fluffy and weak during the washing or finishing process.



step 4

packaging, packaging,



and more packaging

Tags, care labels, hangers, hang tags, polybags, cartons, all contribute to the waste that comes from this industry. And we rely too much on plastic for packaging or presenting a product!

what & how

best practices

Polybags are the ubiquitous packaging of the fashion industry – something that unites brands small and large, from sportswear to luxury to fast fashion retailers. This is the clear plastic bag which covers every garment from manufacturing to retail stores or consumer homes. Hundreds of billions of polybags are estimated to be produced for the fashion industry every year. Brands should consider not only the materials used but consider the wider system used with the packaging – for example, how will it be collected and recovered at all points where waste is generated?

Bioplastics are also a new hot topic. Bioplastics are plastic materials produced from renewable biomass sources, such as vegetable fats and oils, corn starch, straw, woodchips, sawdust, recycled food waste, etc. They can be great if they are also compostable, however this often requires industrial facilities that many regions do not have, and bioplastics may reduce the quality of the compost and therefore its market value. Without the necessary facilities, bioplastic packaging could end up together with normal plastics and cause problems in the recycling process. It can be confusing to understand that some plastics can be biobased but not compostable, therefore we suggest that you check out a useful [diagram made by Ecoage in their article](#) explaining this group of materials.

Recycling could be increased thanks to government subsidies, legislation, oil price rise, design for recyclability (narrower range of polymers, no coloured plastics), advances in recycling technology and in sorting (optical recognition etc.). Collaboration and cooperation comes back as being the key to achieve a circular economy.

what & how

best practice

Best practice for packaging is to ask: **Is this really needed?**

There are so many tags, boxes and bags that the consumer will never use. Brands should encourage consumers to put their new purchase directly in their bag, without adding unnecessary weight to it.

Ideally, brands would have strong, isolating, and moisture proof reusable containers that fit the requirements across their supply chains, share with suppliers, and use over and over again. If the logistics of sales require for something to end with the consumer, then it should be compostable and made from renewable sources.

FSC is a certification that we have already mentioned in the description of [Tencel](#), and the same thing that is certified in the growing of trees (at a rate that allows them to recover) is valid for all paper based materials for packaging. Look for brands that use 100% FSC certified paper and carton for their tags, boxes and bags.

Recycling is also a delicate topic, it does come third in the rule “reduce, reuse, recycle”. It can be a good solution for certain types of packaging, but not all recycling programs accept polybags. Most countries have started requiring recycling information to be written on the packaging, so try to look for recyclable materials. Here you can find recycling symbols explained.

Seaman paper has launched a line of transparent paper bags designed to replace single-use plastic poly bags. Try to look for them!

Mushroom® Packaging is a great example of a low impact packaging, it is made with hemp hurds and mycelium (which you know how much we love). It is a high-performing packaging solution, cost-competitive, thermally insulating, and water-resistant. It can be composted in a natural environment (differently than most bioplastics) in 45 days. It is also certified 100% Biobased and Cradle to Cradle Gold.

Look for compostable bioplastics and make sure you dispose of them in the correct bin!





step 5 use & care

There is no doubt that fashion is one of the most wasteful industries and denim is frequently criticised for being one of the worst offenders. We know a significant amount of greenhouse gas emissions are linked to the manufacturing of garments and unfortunately, garments are being worn 40% less than the previous generation. This leads us to the real problem – overproduction and overconsumption.

We produce way more than we need, so much so that about 30% of what is produced is never actually worn. Some brands will partner with organisations to donate their unsold goods, but we need to be buying less, choosing well, and making it last, while the industry continues to minimise waste and maximise resources.

Read more on “Waste Solutions for the Denim Industry” written by Simply Suzette [here!](#)

garment
care

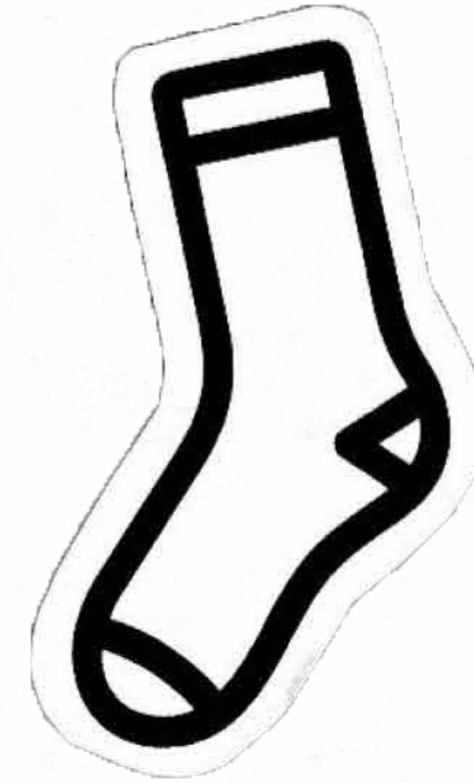
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how to buy
better

On top of the issues that come with garments not being used at all, the Use/Care phase plays a very significant role in the life cycle impact of clothes, and has even been estimated to be the stage with the highest impact together with raw material extraction. Laundry alone accounts for approximately 30% of the carbon footprint of clothing. During this phase, large amounts of water, energy and chemicals are used and microplastics are shed in washing, tumble drying and ironing. It also is the longest phase of the garment, as these actions can be repeated hundreds of times, further degrading the garment and turning it into waste. It really is a critical stage, where our habits can make a big difference. Additionally, impact varies for different products and depends upon factors such as consumer behaviour, geographical zone in which the product is used, and even the weather conditions in that zone. Let's look at each one of these issues in detail...

Washing, drying and ironing at home requires large amounts of water, energy (mechanical and thermal), and chemicals usually derived from petrochemicals. Additionally, all this stress reduces the lifespan of clothes, as fibres degrade or shrink, colours fade, and clothes end up not being usable anymore.

Many of you have probably read terrifying headlines detailing the amount of plastics that we eat on average every year due to microplastics having entered the food chain, and being found in water, vegetables, milk, etc. Remember us mentioning microplastics earlier?



Microplastics are plastic pieces less than five millimetres in length, mostly formed when plastic waste material that has been discarded in nature breaks down. Microfibres are a subcategory of microplastics that are fibrous in shape, mostly formed in the washing of textiles that contain plastics, such as polyester and nylon. According to researchers at the International Union for Conservation of Nature (IUCN), plastic particles washed off from products such as synthetic clothes & textiles contribute to 35% of primary microplastics polluting our oceans. That is a LOT!

How does this happen? During each wash, the fibres undergo a large amount of stress due to the force of the water, the temperature, and the chemicals that are applied through soaps, softeners etc. This causes fibres to break into pieces so small they're not visible to the human eye and end up in the water.

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There is no need to panic, and yes you should still continue washing your clothes, however there are several things that you can do:

- + Firstly, washing garments less often is the most effective way to reduce the environmental impact. By washing your jeans every 10x instead of every 2x, you can drastically reduce energy use, climate change impact, and water intake!
- + Spot-clean your clothes. Often a small stain means that we wash 3kg of fabric – this seems unnecessary right? Just use a damp cloth. It also means you can rewear your jeans much faster than having to wait for when you find the time to do a full wash.
- + Make sure you check the fabric care label to make sure that you're washing your clothes on the right setting, to ensure that they will not get damaged through the washing cycle. Keep in mind that the number for the temperature is the maximum temperature that the garment can withstand – not the advised temperature for the wash.
- + Try to purchase eco-friendly fibres, such as 100% cotton jeans, that will not release any microplastics when washed.

- + Reduce washing temperature. Higher temperatures encourage the loss of dye and fade black and bright clothes by opening up the fibres. Unless your jeans are truly filthy, cleaning denim at a cooler temperature (30 degrees C or lower), and as little as possible, will help them last longer and look better. Does your older family member believe that you only really clean your clothes with very hot water? You can explain to them that detergents (such as Ariel and Persil) have evolved significantly in the last decades, and for clothes not including baby clothing, towels and bedding, they can effectively kill bacteria and remove stains.

+ Always wash at full load.

+ Only use a small amount of detergent on a delicate cycle. Find a list of good detergents [here!](#)

+ Turn your clothes inside out, this will protect the most visible part of your favourite pieces.

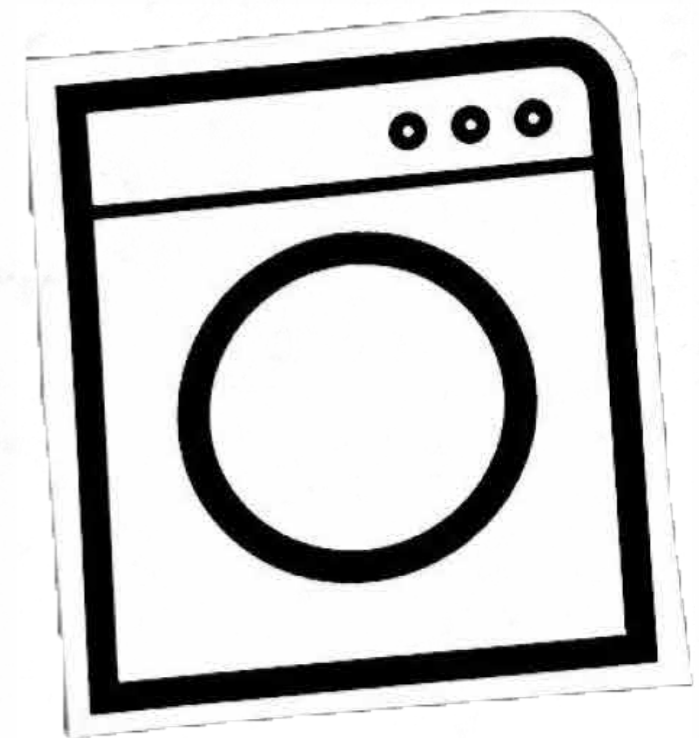
+ For knits, hand wash over machine wash when needed and lay flat to dry.

+ Wool barely needs to be washed, especially because wool jumpers rarely touch our skins, so they don't absorb sweat. If they do absorb an unpleasant smell, they just need to be hung out and the material will naturally lose it! If you do have to wash them, and can't just spot clean a stain, make sure you hand wash, or wash cold with a delicate spinning setting and hang dry. This way you won't create pilling and your jumper could last forever.

+ Leather is a tricky one to wash, but the great news is that it barely gets stained, it's naturally moisture resistant, so as soon as it gets stained, try wiping it with a damp cloth.

+ For all clothes try to avoid drying and ironing as much as possible. Generating heat requires vast amounts of energy. Hanging your clothes can be a pleasant and mindful activity, which can also reduce your electricity bill. Give clothes a shake and smooth them out before you hang them up, so that they don't dry and set with creases.

+ Consider using a filtering bag or ball that traps microfibrils during washing.



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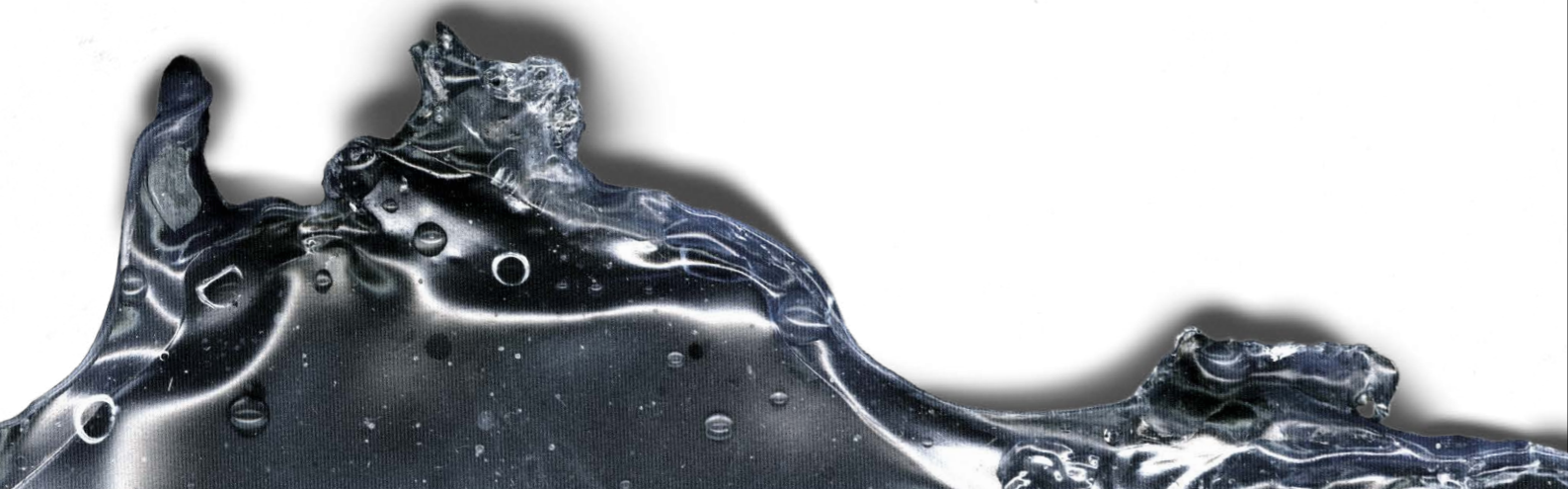
Good news!

100% organic natural fibre jeans, t-shirts, and shirts are produced by many brands. Look out for them and remember that there is a lot more than just the fabric to inform yourself on, so give the tag a proper read.

GINETEX, the International Association for Textile Care Labelling, has developed an internationally applicable logo for sustainable care. Consumers are given information to help them reduce the environmental impact of caring for textile. Look out for Clever Care on your labels. Apparel companies such as G-Star Raw and Stella McCartney are adopting the clevercare.info logo on their care labels.

Want to reduce microplastics getting in our precious water? The Guppyfriend laundry bag, which is also supported by Patagonia, and the Cora Ball, which does not require you to put your clothes in a bag during washing, are the two best known options to reduce microplastics in your wash. Another option is Gulp, a device that traps fibres by connecting between the outflow pipe and the drain. Lint LUV-R and Planet Care are filters that can be retrofitted to machines, although these filters are less effective than the named options. Find the listed products here.

Self cleaning surfaces? Seriously? Well don't get too excited yet – there is not a garment available yet that can be bought and used for a lifetime without ever seeing a wash. But of course, nature has developed self-cleaning surfaces that are a class of materials with the inherent ability to remove any debris or bacteria from their surfaces in a variety of ways. The self-cleaning functionality of these surfaces are commonly inspired by natural phenomena observed in lotus leaves, gecko feet, and water striders to name a few. Research is being done into ways to use this in garments, so stay tuned, because we might hear some surprises soon.



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How to Buy Better & Avoid Plastics Fashion



LAWS AND GOVERNMENT PROJECTS

Governments should take on the task to ensure that the supply chains of items produced and imported are humane and respectful. There are many systems that can be put in place that are slowly being implemented like taxes on fast fashion items (primarily made of fossil fuel based raw materials) as we have seen in France.

But polyester is plastic and we need to stop producing it! Just like we've started to tax shoppers on plastic bags, or ban plastic straws, it is time we start to do something about it in fashion.

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PURCHASING QUESTIONS

Before you buy, we challenge you to ask yourself the four questions:

- + Do I really need this?
- + What is it made out of and where was it made?
- + Is there a repair service?
- + What will I do when I am done with it? Upcycle, restyle, or resale?

At Simply Suzette we spend our time looking for solutions, which naturally led us to adding more questions and searching for more answers:

- + Is it designed for durability? (see the End of Life section)
- + Is this something that I can style in different ways and wear often?
- + Have I looked for a vintage/second-hand alternative?
- + Does it have a clear care label, including tips to wash it in a sustainable way?
- + Am I prepared to keep loving this item even if it slightly changes in colour or feel?
- + If it ever gets damaged in the future, could it look cool with repair stitches, patches, or embroidery? (we are thinking of our favourite upcycling brands)

If you are already on your degrowth journey, trying to consume less, we challenge you to try the Rule of 5 by Tiffanie Darke!

Bonus Tip: If you're shopping online, look for digital sizing solutions like body scans to get your perfect fit and avoid the GHG emissions of shipping & returns!

BE CURIOUS

In a world where big companies can cover their actions with more publicity stunts, it is important to ask questions and dig deeper. Knowledge is power! The more you know about a company's policy on fossil fuels and plastics, the more you can make educated purchases.

buy less, choose well, make it last

DO SOMETHING

We can change our mindsets and ask the questions, but doing something about it is the hardest part. Sustainability is a journey that looks very different for everyone. It can start with finding and selling clothes second hand, or saving up to buy a good quality pair of jeans that will last you years instead of your \$20.00 pair that barely lasted one season. For some, it can start with buying their first pair of plastic free jeans and grow from there. But, it is always important to stay curious and be diligent!



step 6 end of life

Not to be dramatic, but the total quantity of fashion waste is estimated to reach 148 million tons in 2030.

Sadly the majority of clothing waste is incinerated or ends up in landfills in the Global South. Neither is a good solution. In the latter, natural fibres take hundreds of years to decompose and release greenhouse gases into the atmosphere, and synthetic materials are not designed to decompose at all and may release toxic substances. We clearly need better solutions for the end of the life of garments.

Today we know that poly-based clothing isn't as convenient as we initially thought. Synthetics leave traces of shedded microfibres that pollute the environment when they're released. In fact, research suggests at least 14 million tonnes of microplastics (in which fashion contributes to) have accumulated on the ocean floor which affects marine life that support the health of our planet and ourselves.

By some estimates, there are more pieces of plastic floating in the oceans than there are stars in our galaxy. Even that celestial visual offers a surface-level glimpse into the full scale and complexity of the issue.

Our over-reliance on fossil fuels for clothing production, specifically, creates a throw away culture of low-quality items that do not decompose and create a waste problem that ends up being shipped overseas to countries without the proper resources to manage the waste and adding to brands' negative environmental impact.

circularity
opportunities

what can you
do about it

Circularity Opportunities

What if there was no need to end the life of a garment at all?

The concept of durability looks at eliminating waste by making items that last much longer, which can be achieved by using resistant materials, not applying processes that destroy the fibres, and reducing the amount of times a garment has to be washed.

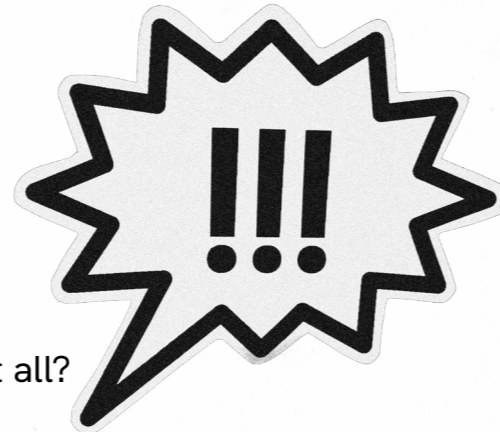
Durability is often measured as the number of times a garment can resist a certain type of test, that measures values such as abrasion, tensile and th strength, burst strength, stretch and recovery, perspiration tests, croaking, colour resistance to lights and washes, and staining. Garments that don't look the same after a few washes are definitely not durable!

What if you get bored of a style, or clothing items don't seem to fit anymore? Depop, ThredUp, Vinted, Ebay, second hand stores, and many more models are great solutions to allow people to exchange clothes. These systems need strong garments that can be shipped, exchanged, worn, washed, and resold, which ties back to the concept of durability and goes into designing for circularity.

Design for Circularity

Circularity is a concept which completely eliminates the concept of waste, both in terms of materials and value. Basically the end of life of a garment becomes the beginning of something else.

We have a huge respect for designers who are doing all they can to design the best garments they possibly can because as we've heard before, 80% of the impact of a garment comes from the design stage! But, not all designers have the knowledge to produce circular apparel and textiles.



How are circular apparel items actually different?

- + All trims should be removed entirely or reduced to a minimum as they are hard for recyclers to remove and are usually cut off and subsequently landfilled or incinerated
- + All must have recyclable materials which can be kept in use once a product and its components can no longer be reused or repaired. Natural materials are best suited for this.
- + Items should be of mono material meaning a singular raw material.
- + No hazardous chemicals should be used in the manufacture of the apparel as they can cause allergic reactions and respiratory diseases etc. in the garment workers and consumers. You can learn more about it [here](#).
- + Take back schemes must be in place for consumers to return their items, that are then either resold or upcycled by the brand. The brand must also avoid promoting consumption and have the proper reverse logistics in place to send pieces that cannot be resold or upcycled to garment recyclers.

A good certification to look for is **C2C (Cradle2Cradle)**.



When designing for longevity, durability, and reparability, the aim is to extend the use of a garment. On the other hand, when designing for disassembly or recyclability, the aim is to ensure that products and materials return to the system and can be regenerated through a biological or technical cycle. But, in order to cycle products successfully, we need to know EVERYthing that went into making it. Traceable supply chains and materials make this much easier to do so.

circularity
opportunities

what can you
do about it

RECYCLING INTO NON-FABRIC

Surely there must be a solution to the problem of fabric waste. Is there no other industry that would be happy to collaborate? The construction industry is always looking for large volumes of cheap materials right? Downcycling is a concept which describes how a material loses its value through a recycling process, and is repurposed as a lower quality item. This is often the case for textile waste reused in construction, mostly as an insulating material to fill walls. Textile waste is also used to fill mattresses and make rugs, however they are considered low quality items.

(Slightly off topic) Have you ever heard of Precious Plastics? It is a wonderful initiative which is present in lots of countries around the world, based on open source information on how to recycle plastic through shredding, heating, pressing or moulding. What if the same was done for fabric waste?

What if we used fabric waste instead of other materials that have a high impact? Check out two amazing projects that turn fabric waste into tiles and furniture:

- + [Fab-Brick](#)
- + [Stelapop](#)
- + [PLANQ](#)
- + [Nazena](#)

RECYCLING INTO NEW YARN AND FABRIC

The best solution is to keep clothing being used as clothing, ideally forever. Brands like Atelier and Repair or Bengabelknits have taken fashionable repairs to the next level, however sometimes there is no hope for your clothes to be used any further, as they could be too torn or stained. That is when recycling comes into place. It conserves natural resources and reduces the need for landfill space. So, what are the options?

+ **Mechanical recycling** of synthetics means that fibres are shredded mechanically. Once cleaned, the polyester materials are shredded into small pieces. This increases the surface area and prepares the material for further processing. The shredded pieces are then heated and melted. The melting process transforms the solid polyester into a molten form, which can be easily moulded into new products. The molten polyester is extruded through a die to form fibres or pellets, depending on the intended use of the recycled material. This step determines the shape and size of the final recycled product. After extrusion, the material is cooled and solidified. This stabilises the polyester, ensuring it retains its new form.

+ **Chemical recycling** of synthetics is a huge area of research, examples of companies doing this are Ambercycle and Loop. The sorted polyester materials are cleaned and sometimes shredded into smaller pieces. This step is crucial to ensure the chemical processes work effectively. The polyester is then subjected to various chemicals that break it down into its basic components, primarily monomers like ethylene glycol and terephthalic acid. There are a few common chemical recycling methods:

- + **Glycolysis:** This method involves using glycols to degrade the polyester to its monomers.
- + **Hydrolysis:** Water is used in this process to break down the polyester into monomers.
- + **Methanolysis:** Methanol is employed to convert polyester into dimethyl terephthalate and ethylene glycol.

The resulting monomers are purified to remove any impurities and residues. This step is essential for ensuring the quality of the recycled product. Once purified, the monomers can be polymerized to create new polyester. This step essentially reverses the initial production process of polyester, allowing for the creation of virgin-quality material.

+ **Separating Plastic based fibres from Synthetics** is nearly impossible to recycle into new yarns, because the quality of the plastic is reduced too much through the processing. There are a few startups looking into this, but the scale is extremely small, and it's still too cheap to produce virgin plastic. [Circ](#) recycles discarded clothing to produce the basis of petroleum- and plant-based fabrics. Circ's virgin-equivalent, market-grade dissolving pulp and petroleum monomers can be sold at the same cost as virgin materials to manufacturers who make fibres.

circularity
opportunities

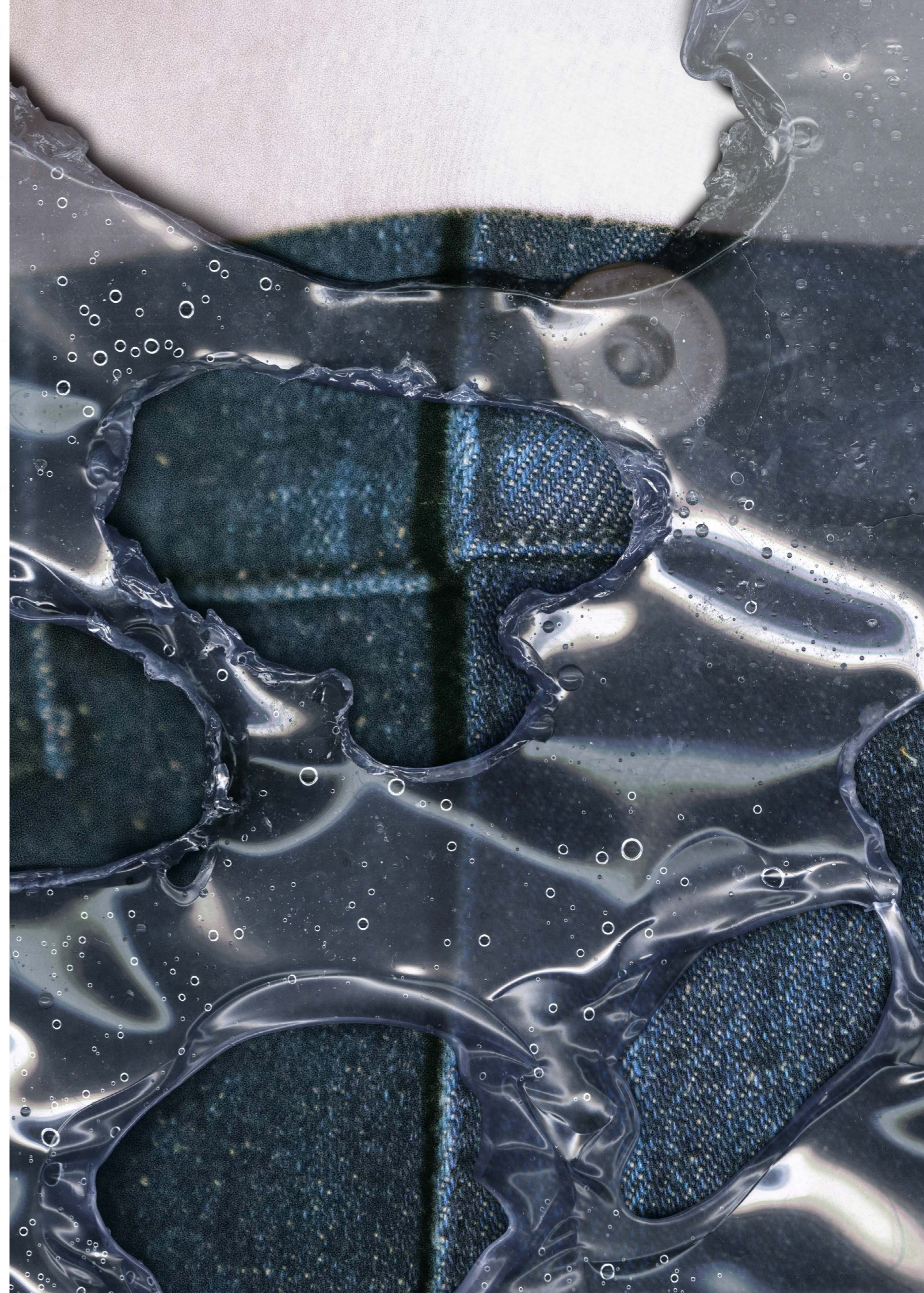
what can you
do about it

After having learnt all the intrications and issues of plastics in our fashion supply chains, you might feel hopeless, but there is actually a lot that you can do about it!

First things first, reducing all new clothes will reduce the amount of plastics extracted. Let's move towards a circular model where we design out waste and pollution, keep products and materials in use for as long as possible, and support a world that could produce less because items are circulated longer.

Here are 10 things that you can do to reduce the amount of plastics in your wardrobe and your life:

1. **Choose Natural Fibres:** Opt for clothing made from natural fibres like cotton, wool, linen and hemp instead of synthetic materials like polyester or nylon, which shed microplastics when washed.
2. **Prioritise Quality Over Quantity:** Invest in durable, high-quality clothing that lasts longer and reduces the need for frequent replacements, thereby minimising overall plastic consumption. For more information on what to look for in durable and high quality clothing, read more here.
3. **Avoid Fast Fashion:** Reduce reliance on fast fashion brands that produce cheap, disposable clothing typically made from synthetic materials. Instead, support locally made sustainable fashion brands that have more traceability on their production.
4. **Check Labels:** Before making a purchase, check clothing labels for materials. Choose items labelled as organic cotton, bio-based nylon, or other sustainable alternatives such as ZDHC certified chemicals.
5. **Repair and Upcycle:** Extend the lifespan of your clothing by repairing damaged items or repurposing them into new garments or accessories, reducing the need for new purchases and plastic packaging.
6. **Shop Secondhand:** Explore thrift stores, consignment shops, or online marketplaces for gently used clothing. Buying secondhand reduces demand for new production and helps divert textiles from landfills.
7. **Eco-Friendly Laundry Practices:** Try to use certified biodegradable laundry detergents and avoid fabric softeners and dryers, which often contribute to microplastics release. Look into bags that capture microplastics during laundry.
8. **Ask your favourite brands:** If brands are not releasing information, ask if there is any plastic in their products or how much total packaging they use in supply chains
9. **Fight Against Packaging:** Support brands that use minimal or plastic-free packaging for shipping and product storage, reducing the amount of plastic waste generated from your wardrobe. Always bring your tote to avoid taking with you any unnecessary packaging.
10. **Spread Awareness:** Share information about the environmental impact of synthetic fibres and the benefits of sustainable fashion with friends and family to encourage collective action!!





plastics
social
impact

PEOPLE IN THE PLASTIC SUPPLY CHAIN



An estimated **60 million** workers power the global garment industry, generating its billions in profit. The majority work inhumane hours and multiple jobs to make ends meet. *Roughly 80% of these workers are women.*

Cumulative global production of primary plastic between 1950 and 2017 is estimated at 9,200 million metric tonnes and is **forecast to reach 34 billion metric tonnes by 2050**. Plastics are utilised across many sectors, including construction, textiles, consumer products, transportation and electronics, all the way to produce packaging.

Synthetic fibres account for 1.35% of global oil consumption according to [Changing Market's Fossil Fashion report](#). This might not sound like a lot, but Nike publicly disclosed using 152,723 tonnes of polyester for the financial year of 2020. Brands' heavy reliance on polyester, nylon, acrylic and polyvinyl chloride (PVC), while also being encouraged to use them as circular solutions, has created estimates that show synthetic fibres reaching 73% of total fibre production by 2030, with 85% of the synthetic fibres being polyester.

Workers may be exposed to hazardous chemicals during all stages of plastic's lifecycle. This includes during the extraction of fossil fuels used to make plastics, the production of different plastics, and their final disposal, when they are recycled, incinerated or discarded.

Many of the processes in the making of plastic materials can be dangerous to human health due to the big machinery and chemicals needed. Plastics contain and leach hazardous chemicals that have been linked with cancers, birth defects and impairments to the immune, endocrine and reproductive systems.

It is estimated that **99% of plastic comes from fossil fuels** (Ciel 2019). Workers in the oil and gas industry may be exposed to hazardous chemicals during the extraction, transportation and processing of oil and gas. Extraction of oil and natural gas releases an array of toxic substances into the air and water, often in significant volumes. For example, crude oil and natural gas frequently contain trace quantities of mercury, which is released during extraction and refining. Harmful pollutants emitted from oil and gas operations can impact the respiratory, circulatory, reproductive, immune, neurological and digestive systems, in addition to the skin and eyes (Shonkoff et al. 2014).

Chemical exposures in the oil and gas industry include:

- + Respirable crystalline silica
- + Petroleum fumes, for example, benzene, butane and methane
- + Hydrogen sulphide
- + There is an additional risk of fire and explosion due to ignition of flammable vapours or gases released from wells, trucks or equipment



In the current set-up of the fashion industry, brands have extremely big supply chains, which makes it nearly impossible to know exactly what is going on in every factory. Hardly any brand knows where the plastic in its garments was extracted.

In the plastics supply chain, it is estimated that waste pickers collect and recover 60% of plastics for recycling, thus contributing significantly to avoiding plastic pollution (GlobalRec 2022). Although they provide a public service with economic, social and environmental benefits to their communities, they often suffer from poor working conditions, have low and insecure incomes, and lack social protections (ILO & WIEGO 2017).

Sustainability goes further than just within the factory.

A company that hires a large proportion of a community should support it through Corporate Sustainability Responsibility (CSR) projects that can also benefit the company itself in the longer term.

SOCIAL PROCUREMENT



Social procurement is the act of buying from a social enterprise, and there is a wide range of ways in which it can be implemented in the world of Fashion. All offices can apply it for their indirect spend, as explained [here](#), but it can also be part of the supply chain, as analysed in detail [here](#).

Social enterprises are businesses that put the interests of people and the planet ahead of shareholder gain, and are driven by a social and/or environmental mission. Social enterprises commit to reinvesting most profits into achieving their objectives. This is a fundamental difference between social enterprises and traditional businesses, which are accountable to shareholders and as such are primarily driven by these interests. It is entirely possible to source from social enterprises, therefore having a positive impact on people through purchasing, either business-to-business (B2B) or business-to-consumer (B2C). Rekut is an example of a social enterprise in the fashion industry, which is written about in detail [here](#).

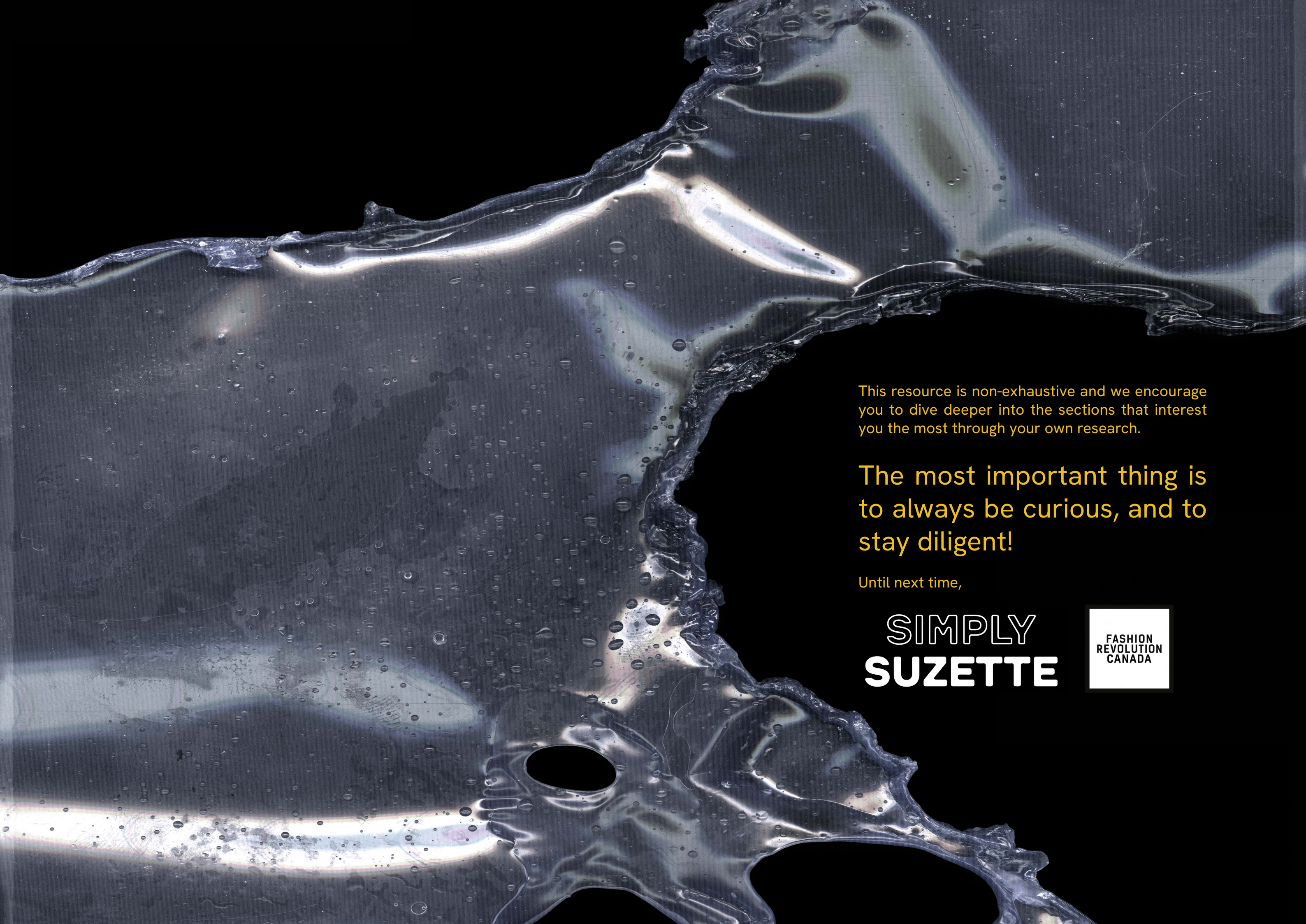
Social businesses have a key role to play in the global fight against plastic waste, especially given their innovative approaches and their ability to tackle both social and environmental

issues at once. For example, social businesses lead the way for protecting and uplifting informal waste pickers that are estimated to manage anywhere between 30 to 80% of waste in cities that are lacking proper waste infrastructures. Despite acting as an important link to a circular value chain for the plastic sector, waste pickers typically face poor working conditions, unstable pay, and social stigma, all of which social businesses work to improve through their impact models.

Social businesses cannot answer to the global fight against plastic waste alone; they need cross-sector partnerships and shared value models that can help them to scale their solutions.

Through social procurement, any company in the fashion supply chain can achieve positive social and climate impacts directly as part of daily business operations, rather than separately through charity or compliance programs.

All it takes is to choose social businesses as suppliers for materials, services, and even office supplies.



This resource is non-exhaustive and we encourage you to dive deeper into the sections that interest you the most through your own research.

The most important thing is to always be curious, and to stay diligent!

Until next time,

**SIMPLY
SUZETTE**

**FASHION
REVOLUTION
CANADA**