



**Too Hot for Knitwear:
Climate Crisis, Biodiversity
and Fashion Brands Using
Wool and Synthetics**

Acknowledgements

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A report by
the Center for
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and Collective
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Executive Summary

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Wool and synthetic fibers are responsible for serious harms to the planet, particularly the climate and biodiversity, yet they continue to be widely used in the fashion industry. While virgin synthetics are commonly recognized as an unsustainable material due to their fossil fuel origin, wool is often posited as the natural, eco-friendly alternative. However, wool is not a fiber simply provided by nature — it's a scaled product of modern industrial, chemical, ecological and genetic intervention that's a significant contributor to the climate crisis, land degradation, water use, pollution and biodiversity loss.¹ Furthermore, many wool fibers are blended with synthetics, compromising their capacity to biodegrade. Wool can also be dyed and processed with chemicals that render the fiber non-biodegradable and create toxic pollution, but brands are not transparent with information relating to wool processing.

Although the connection between synthetics and microfiber pollution is well established, many companies rely on recycled synthetics — which have some benefits over virgin, but still shed microfibers — as their core sustainable materials sourcing strategy. Wool and wool blend garments continue to be promoted as responsible and sustainable, while investment in genuine solutions and more future-proofed materials is lagging.

The Center for Biological Diversity and Collective Fashion Justice analyzed the Fall 2022 online catalogs of 13 top brands for the materials used in their knitwear and the information provided on the sustainability of those materials.

Key Findings:

- More than half (55%) of the wool items in our analysis were blended with
- synthetic fibers derived from fossil fuels. That's almost twice as many items as were 100% wool and 3 times more than those blended with animal and/or plant-based fibers.
- Only 19% of all analyzed knitwear contained reduced impact fibers, with the vast majority of these made of recycled synthetics that still cause environmental harm. Very little use of sustainable materials was found.
- High street brands were more than twice as likely to use synthetics in wool
- knitwear and 26 times more likely to offer 100% synthetic knitwear, though more than one-third (36%) of analyzed luxury knitwear used synthetics.
- While some brands had initiatives to reduce the use of hazardous chemicals, none provided information about chemicals and dyes used in wool processing that could affect the garment's end-of-life toxicity and biodegradability.
- Despite the availability of sustainable fibers that can meet the quality, aesthetic and performance needs of knitwear, nearly 90% of analyzed items used virgin wool, which comes with a high environmental cost, not to mention serious animal protection issues.

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Key Recommendations:

- Brands must take steps toward a just transition by setting specific targets to move beyond the use of virgin synthetics and wool.
- Environmental commitments and sustainability language must account for the impacts of synthetic and wool production, as well as the use of blended materials.
- The fashion industry should ramp up its efforts to create clear definitions and standards for sustainability claims to prevent greenwashing.
- Brands and the fashion industry should increase transparency around the chemicals and dyes used in processing wool fiber.

- Brands and the fashion industry must invest in producing fewer overall items and increasing the use of sustainable alternative materials derived from bio-based, recycled and plant-based sources.

The climate crisis is being exacerbated by fashion's use of fossil fuels for synthetics and its significant methane emissions tied to wool production. Climate change is a major driver of the wildlife extinction crisis, along with inefficient land use and other threats to biodiversity by the wool industry. While transformation cannot occur overnight, it's imperative that the fashion industry recognize the need to move beyond the use of both conventional synthetics and wool and toward more responsible fossil fuel and animal-free alternatives.

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Introduction

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Today fashion brands and material producers are attending leading climate conferences, constantly marketing sustainability claims and promoting new environmental targets. Protests relating to fashion's impact on the planet, people and other animals are growing,^{2,3,4} and Vogue Business data revealed that nearly 70% of surveyed consumers felt sustainability was an important consideration when buying clothes.⁵ New guidelines and legislation to prevent greenwashing in the industry have launched or are in development, while lawsuits against allegedly offending brands are battled across the United Kingdom, Europe and the United States.⁶

Amid all of the noise, the impact of wool on the planet is generally overlooked — or worse, greenwashed.

Wool is often misleadingly positioned as a natural and renewable alternative to problematic fossil-fuel derived synthetic fibers, while its own negative impacts are omitted and purposefully excluded from advertising.⁷

This report analyzes the online catalogs of top clothing brands to explore the pervasive and inherently unsustainable scale of both synthetic and wool fiber use across the fashion industry. As our analysis uncovers, not only are wool and synthetic materials used far more often than more sustainable fibers, but the consistent use of wool blended with synthetic materials — and the likelihood of wool being chemically washed, processed or dyed with substances impacting biodegradation — negate any potential benefits of using such a "natural" fiber.

Many companies continue to promote wool products as eco-friendly alternatives despite these contradictions, while failing to make meaningful commitments to transition toward truly sustainable materials and practices.

The solution to the woes of fashion's persistent use of wool is not simply to stop blending wool with fossil fuel materials, or to use biodegradable dyes. Nor is it to marginally reduce the use of these materials. To adequately address our interlinked climate and biodiversity crises, the fashion industry must shift beyond both fossil-fuel and animal-derived materials in fashion. This just transition is increasingly possible, as plant-based, recycled and other innovative and responsible alternatives enter the market.

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Wool: A Brief Overview

Our 2021 report *Shear Destruction: Fashion, Wool and the Biodiversity Crisis* outlines the impact of land-inefficient, methane emitting wool production on our climate, wildlife, habitat, biodiversity and waterways.⁸ It sparked a growing number of conversations with brands and across a number of fashion schools through Collective Fashion Justice engagement. But industry lobbyists and marketers, such as the Woolmark Company, continue to perpetuate the notion of wool as a 'responsible' choice.

In reality a knitted garment made from Australian wool can be responsible for over 27 times more emissions than a cotton one, and small ruminants around the world contribute as many CO₂e emissions to the atmosphere as 103 million cars do annually.⁹

Due to the enormous amount of land needed for wool production and the resulting deforestation, degradation, and conflicts with wildlife, native species including koalas, wolves, many bird species, dingoes, tortoises, native bighorn sheep and others are put at risk by wool production across Australia and the United States.¹⁰

Several companies note that they source Responsible Wool Standard certified materials. However, the Responsible Wool Standard fails to address any climate impact relating to wool, and has significant shortcomings relating to native predator protection, aquatic protections and other biodiversity considerations, as well as animal welfare.¹¹ Essentially, while the standard is an improvement upon conventional systems, it is still far from sustainable or ethical.

The industry also increasingly promotes "regenerative wool," a description that is touted for climate and other environmental benefits but lacks any standard definitions or accountability.¹²

Furthermore, there is no evidence carbon sequestration in animal production systems can be successful across the industry — or that it can fully offset the methane emissions released by sheep. Numerous peer-reviewed papers conclude similarly that grazing livestock are not a climate solution and the scale of animal production and consumption, regardless of the system, are leading causes of climate change and habitat loss.^{13,14,15}

Synthetics: A Brief Overview

The fashion industry's growing reliance on fossil fuels to produce synthetic materials is exacerbating the climate crisis. With 62% of all fashion materials today made from petrochemical synthetics,¹⁶ the textile industry is not aligned with IPCC calls for an urgent phase out of fossil fuels.¹⁷ The production of synthetics like polyester uses an approximate 342 million barrels of crude oil each year.¹⁸ This contributes to global temperature rises, harms to wildlife and ecosystems, and environmental racism.¹⁹

Fossil fuel-based fibers are not only environmentally harmful during production, but at a product's end-of-life. These fibers are not biodegradable, taking as long as 200 years to decompose.²⁰ Today 14 million metric tons of microplastics have built up on the ocean's floor, and fashion contributes to this problem when synthetic garments are washed, shedding microfibers.²¹ Even when recycled synthetic fibers are used, these end-of-life impacts persist.

This is troubling given the industry's increased promotion of recycled synthetics as a sustainable solution.



Wool Industry Greenwashing

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In September 2022 the Woolmark Company, the marketing body of the Australian wool industry, released a new campaign: "Wear wool not fossil fuels." The short video campaign opens dramatically, as people swim through pools of crude oil, their faces and bodies coated. The drenched figures pull off the sludge, revealing pure white wool knitwear and freshly clean faces. This opening scene is paired with an Ellen MacArthur foundation statistic on the intensive use of fossil-fuel derived synthetics in fashion: "Every 25 seconds an Olympic-sized pool of oil is used to make synthetic clothing."²² Woolmark goes on to promote the natural fiber that is wool, with all of its supposed benefits.

The striking imagery in this misleading advertisement uses the legitimate concerns around synthetic materials to convince people concerned for the planet that wool is the perfect solution.

This false dichotomy in which consumers must choose between harmful synthetics and "responsible" wool is created by omitting the harmful effects of the wool industry. The ads use imagery of wool-clad actors walking through rolling green hills and natural environments to imply that wool protects such ecosystems. In reality wool is highly land inefficient, with Australian wool requiring as much as 1,830 square meters more land per knit sweater compared to Australian cotton or Tencel lyocell.²³

"Wear wool not fossil fuels" is the latest in a long line of marketing efforts by the wool industry to twist concern for fashion's use of fossil fuels into a promotion of wool, another unsustainable material. The fashion industry must move beyond the funding and use of fossil fuels, but, despite the wool industry's implication otherwise, this does not mean turning to harmful animal-derived materials.

The wool industry fails to recognize the existence of more responsible alternative fibers like Tencel lyocell and organic cotton, along with options such as bamboo lyocell, hemp, and recycled fibers. Even more disingenuous, it ignores the pervasive and ongoing blending of wool and synthetic fibers in fashion.

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As the analysis in this report shows, the majority of knitwear products containing wool are blended with synthetic fibers. When “natural” fibers are blended with synthetic fibers, the biodegradability of the former is compromised. Even a small added amount of non-biodegradable fiber can impact overall biodegradation and can release harmful substances and chemicals into the ground if these products are discarded.^{24,25} As such, even if raw wool is processed in a way that maintains the fibers’ biodegradability, a wool and synthetic blend sweater will no longer effectively biodegrade.

In addition to blended fibers, there are several stages of wool processing that further erode claims of sustainability. Raw wool shorn off the backs of sheep is greasy and must be processed with detergents to be degreased.

This energy-intensive process commonly makes use of unnatural substances such as alkylphenol ethoxylates — known endocrine disruptors — that can feminize fish populations if released with scouring effluent into surrounding waterways.^{26,27,28}

While wool is often bleached and processed to protect against moth-eating, some wool is even coated in plastic resin.²⁹ Wool labeled as “superwash” — able to be put through a washing machine — is coated in fossil-fuel derived plastic, rendering the fiber non-biodegradable as if it were a synthetic itself. Similarly, if dyes containing heavy metals and other non-biodegradable substances are used to color wool, this can also destroy wool’s capacity to biodegrade and add to the pollution and other environmental costs of the garment.³⁰

While some of the analyzed brands are aligned with ZDHC, a program working to reduce the use of harmful chemicals, the companies did not provide information on whether substances impacting the biodegradation of wool were used in their processing.

Alternatives to Wool



The Performance Capabilities of Tencel

Tencel fiber is made from sustainably sourced, CanopyStyle approved wood cellulose processed in a closed-loop system.³¹ Laboratory research has shown that Tencel is hydrophilic, able to quickly absorb and release moisture. Recognized even by brands using wool,³² the fiber can absorb up to 20% water at 90% relative humidity.³³ This water vapor absorption capacity is reportedly similar to wool and aids in effective thermal regulation. As a result, Tencel can be effectively used for base layers, socks and other skin contact products that are sometimes thought only to be useful when made of wool.

Some of the key benefits of wool include the breathability of the natural fiber and its capacity to wick moisture, limiting sweat and dampness. It's also known for its capacity to be worn across a variety of seasons, as it regulates the body's temperature, keeping you cool or warm as needed. But it's not the only fiber with these qualities.

Meanwhile, Tencel is able to dry as much as three times faster than pure merino wool, while remaining strong and durable. Unlike wool, Tencel absorbs moisture into the core of fiber, ensuring the material has particularly strong antimicrobial benefits. Tencel is also easy to machine wash without the addition of plastic-coating, unlike wool.

Bamboo lyocell is made through a similar process and can also be made in a closed-loop system. Bamboo lyocell shares similar qualities and is derived from a fast-growing plant that doesn't require pesticides to grow efficiently.³⁴

Sustainably sourced cotton grown with the use of holistic management practices — low tillage, the use of cover crops, rotational cropping, low or no pesticide use³⁵ — can also be used as an alternative to wool when the use is for more aesthetic than temperate purposes, as can linen and hemp. Beyond traditional and sturdy plant-based alternatives, even more innovative and sustainable options, such as Spinnova, can be used in place of wool.³⁶

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In our analysis, several companies noted that they source cotton that meets the Better Cotton Initiative (BCI) standards, a program that works with farmers to adopt more sustainable production practices. While the Better Cotton Initiative is a step in the right direction beyond totally untraced conventional cotton, companies should use serious caution in over-relying on the Better Cotton Initiative. Research found that BCI allows high use of some harmful pesticides that are banned in the EU and has linked BCI supply chains to forced labor.³⁷ BCI cotton is also blended with non-certified fiber, so there's no guarantee how much of any garment was actually produced using more sustainable practices.

The most common effort among top analyzed brands using alternative materials was the use of recycled synthetic fibers.

Recycled fibers have some benefits over their virgin counterparts since they don't require additional extraction of raw materials and often require fewer resources to process into new garments. However, recycled synthetic materials like polyester, nylon, and acrylic have several drawbacks. Using recycled synthetic fibers doesn't address biodegradability at a garment's end of life or the problem of microplastic pollution.

Furthermore, textile-to-textile recycling for synthetics is very limited, and if plastic feedstocks such as PET bottles are transformed into textiles, they risk leaving a more circular economy and becoming waste faster than if they had been used for other purposes. Less than 1% of textiles are recycled into new textiles globally.

Without changing the lack of infrastructure to keep recycled synthetic textiles in a closed loop, and by continuing to rely on fossil fuel-based materials, focusing on recycled materials could inadvertently create a market for even more virgin plastic and plastic pollution.

While further material innovation to replace both wool and synthetics effectively is required, and work toward this goal continues today, it's positive that a number of options exist to help brands replace these fibers across several types of use.

Methodology

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The Center for Biological Diversity and Collective Fashion Justice analyzed the online catalogs of 13 top brands. The brands — Adidas, Burberry, Coach, Dior, Gucci, H&M, Hermes, Louis Vuitton, Nike, The North Face, Puma, Uniqlo and Zara — were chosen based on Brand Finance's April 2022 report on the most valuable apparel brands, representing both high street and luxury markets.³⁸ High street brands sell clothes that can be bought in easily accessible, mainstream stores, and which are designed for mass-market appeal and purchasing. Luxury or high fashion comes at a more exclusive price point and is marketed as higher quality, created by esteemed designers. We focused on the top 20 brands and excluded those that were primarily jewelry or accessory brands, that did not have online stores, or that represented parent companies rather than individual top consumer brands.

The U.S. online catalogs for these brands were searched between Sept. 15, 2022 and Nov. 17, 2022. Using each site's search feature, we conducted a search for "wool" and one for "knit." The listing for each item in the search results was analyzed for materials used, information on dyes and other treatments, and sustainability language.

The data collected was analyzed to assess how many sheep's wool items companies offered during this season, how often this wool was blended with other materials, the availability of information relating to how wool was dyed, and the prevalence of synthetic as well as more responsible alternative materials in similar items. In assessing how often wool was blended with synthetics, we did not distinguish between recycled or virgin synthetics or whether the blend was in the primary material or trim, since the presence of any synthetic fibers affects the biodegradability of the garment.

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To understand the current knitwear landscape we tracked how often reduced-impact fibers were used where wool, synthetics and blends of the two may have otherwise been featured. This lower-impact category includes plant-based alternatives like lyocell materials derived from wood and bamboo cellulose, organic cotton and other plant fibers, or recycled fibers. Reduced-impact is defined as having a lower ecological impact compared to materials that are animal-based (e.g. wool or mohair), derived from fossil-fuels (e.g. polyester, nylon and acrylic), or that are likely to have been grown with large amounts of pesticides (e.g. conventional cotton). However, it does not necessarily mean that these fibers are sustainable at the currently inflated scale of the fashion industry or as long-term solutions without further innovation.

We also reviewed the websites and sustainability reports for each brand to identify their environmental commitments and the language used to describe wool and synthetics. Each brand was emailed asking for additional information on chemicals used in the wool scouring process and super washing or other garment protection processes, dyes and any related certifications, and commitments or strategies on materials sustainability.

The results for each brand are detailed in the brand analysis section of this report. Due to the nature of online catalogs and the rapid rate at which fashion seasons change — particularly among high street brands — this report is not intended to provide a specific analysis of a single season for any brand, but rather a snapshot of trends observed across the industry.

Results

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Despite its environmental harm, wool continues to dominate the knitwear category for brands beyond the ultra-fast fashion, synthetic-filled landscape, with some brands having over a hundred items containing the material.

Our analysis found that across leading high street brands Adidas, H&M, Nike, Puma, Uniqlo, and Zara, garments labeled as containing wool were, on average, made of less than 50% wool. The North Face was the exception, with a still low average of just 53% wool in their wool products. Most of these "wool" garments were blended with synthetic materials.

Although luxury brands (Burberry, Coach, Dior, Gucci, Hermes, and Louis Vuitton) had a higher average percent of garments with wool, ranging from 54% to 79%, the majority of analyzed wool garments were blended with fossil fuel derived materials such as polyester, acrylic, elastane, polyamide and similar fibers.

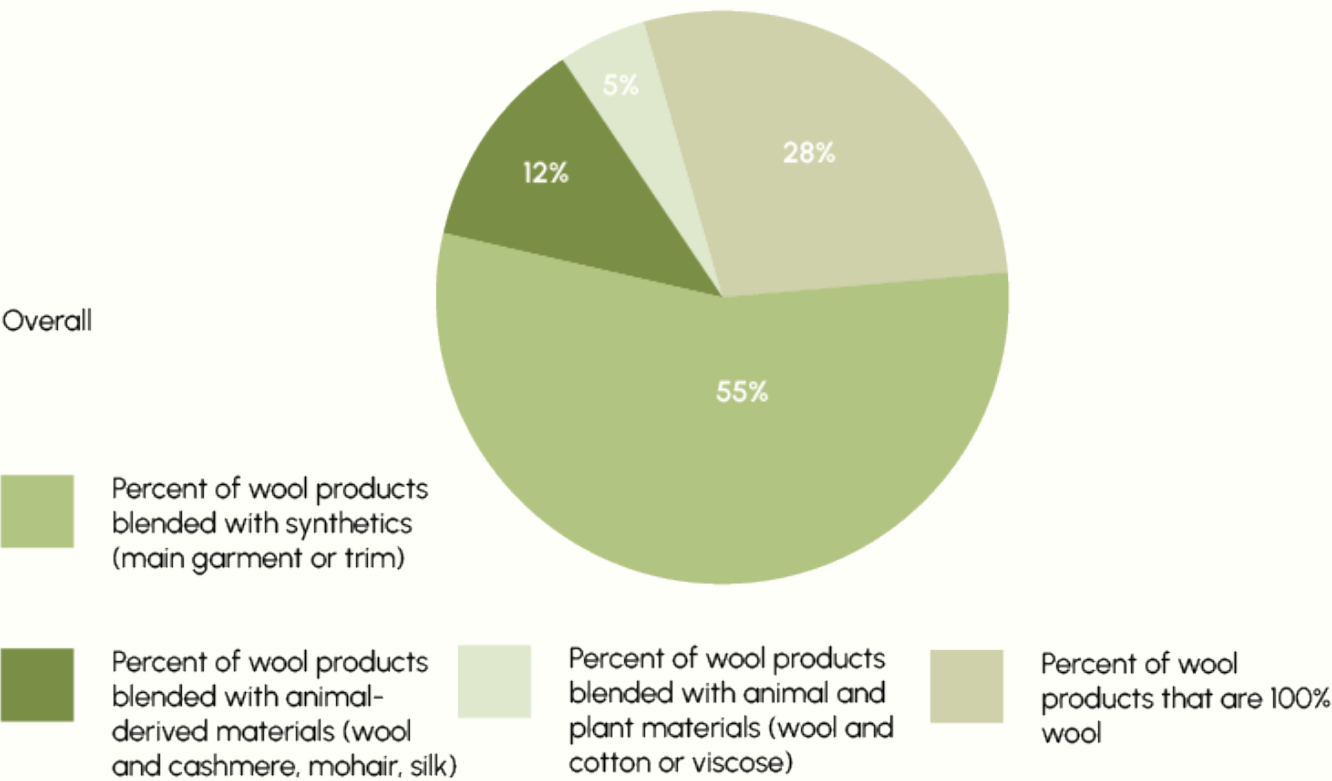
Many luxury brand garments were alternatively blended with other animal-based fibers that come with their own environmental harms, like cashmere, silk, viscose (a partly natural and partly man-made plant-based material often created through chemical-intensive processing that can be tied to deforestation), or unidentified "other materials."

However, our analysis found there were 3 times as many wool items blended with synthetics than those blended with animal and/or plant-based fibers. Only 19% of all analyzed knitwear contained reduced-impact fibers, with the vast majority being recycled synthetics, which come with their own set of environmental problems.

Key Results:

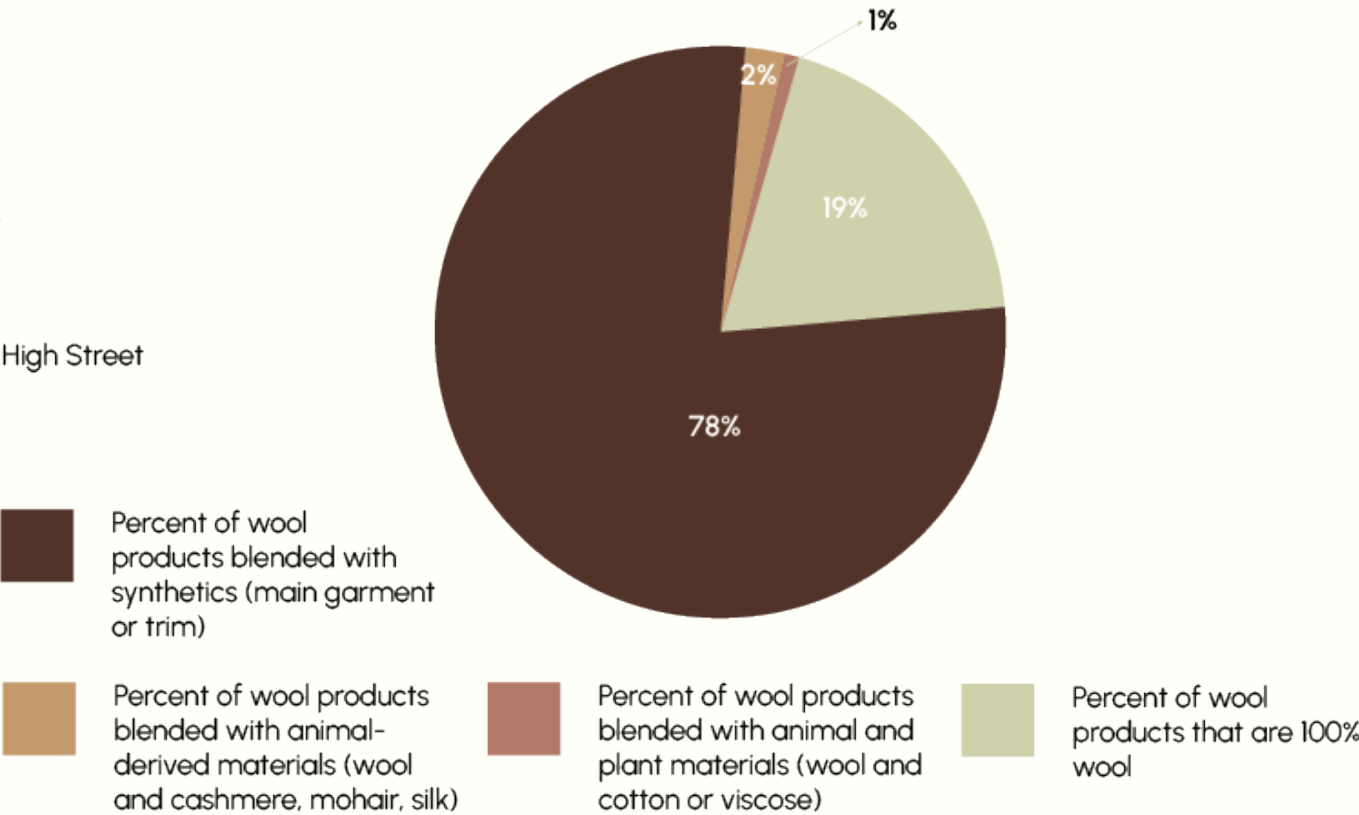
A total of 785 knitwear items were analyzed across 13 brands. The majority of wool products contained other types of fibers. These products were more than three times as likely to be blended with synthetic materials than with other animal-derived or plant materials.

More than three-quarters of high street items made of wool were blended with synthetics. Although fewer luxury items were blended, they were still more likely to be blended with synthetics than with animal or plant materials.

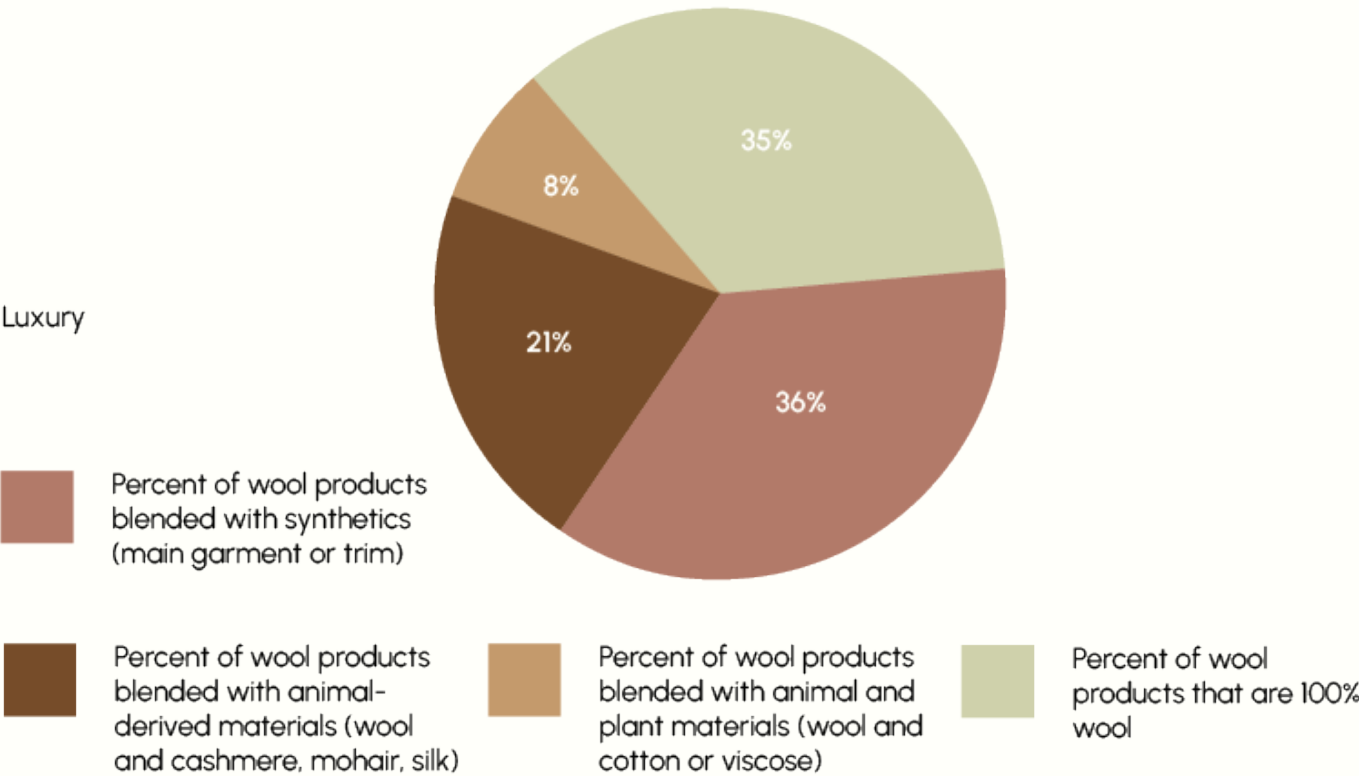


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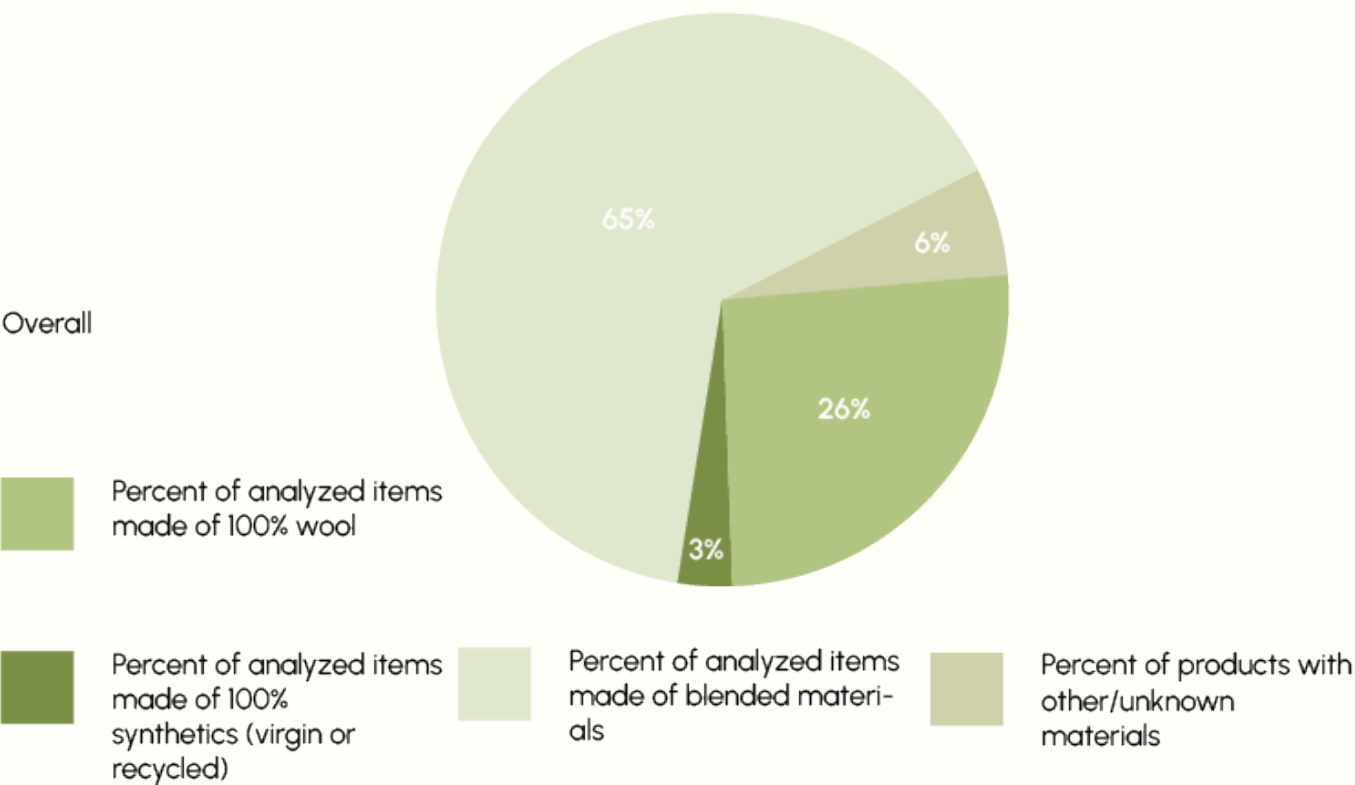
High Street



Luxury

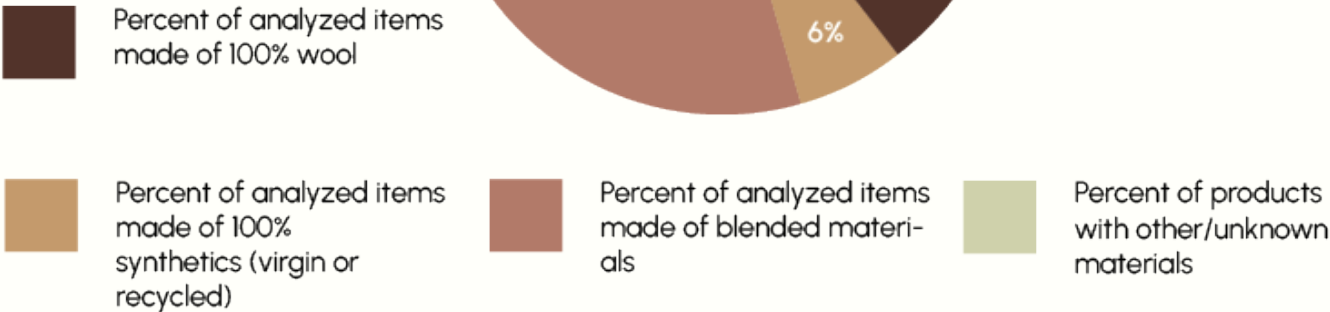


Only about a quarter of the knitwear items analyzed were made of 100% wool. Although luxury brands were more likely to have 100% wool products, they were just as likely to have wool items blended with synthetic materials.

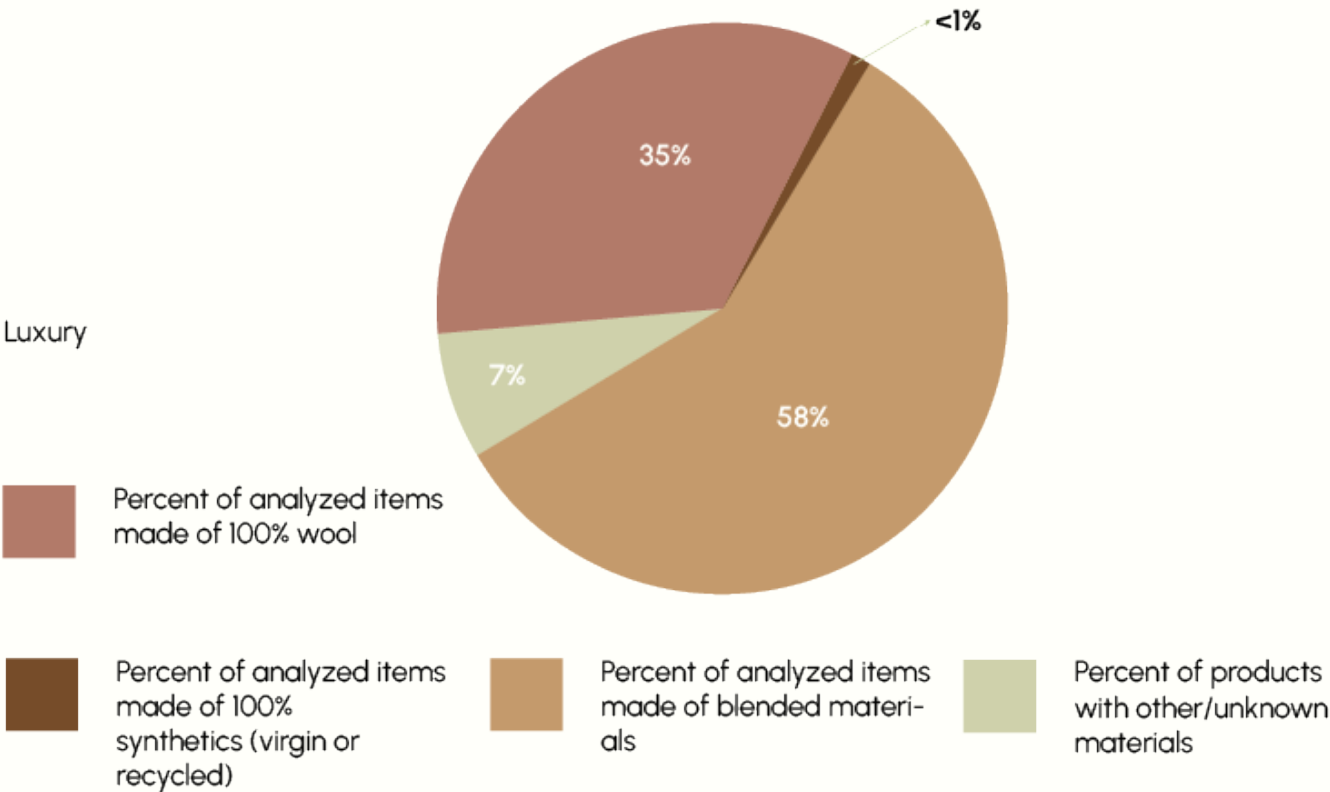


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High Street



Luxury



Many wool and wool-blend items were offered in colors other than "natural," with no information provided on the types of dyes used to assess the environmental impact of production or disposal of the garments. Even in relation to 100% wool items, none of the brands provided information on the processing of their wool that could have confirmed total biodegradability. Numerous garments containing wool from high street brands were listed as machine washable, suggesting the use of plastic coated "super-washed wool" designed for machine washing.

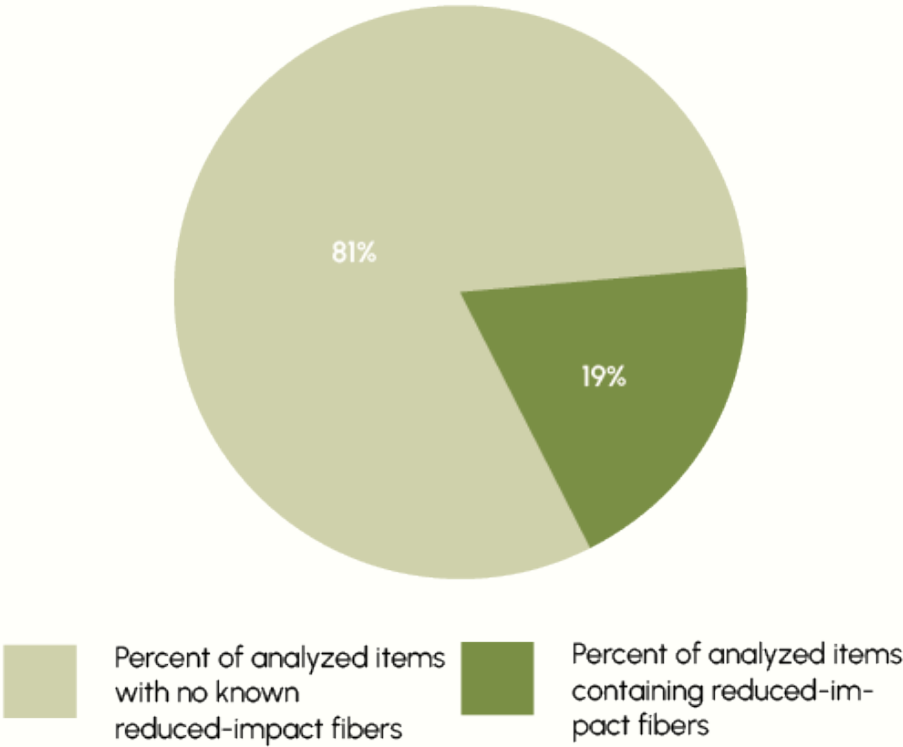
The high prevalence of wool, as well as wool and synthetic blend garments, contradicts the sustainability goals of many of these brands and the urgent need for the industry as a whole to reduce its environmental impact. The prevalence of 100% synthetic garments across the fashion industry is equally concerning.

Synthetic fibers are among the most widely used materials by high street brands; however, since 100% synthetic items are often not classified as knitwear, the ubiquity of this material is not fully reflected in these results.

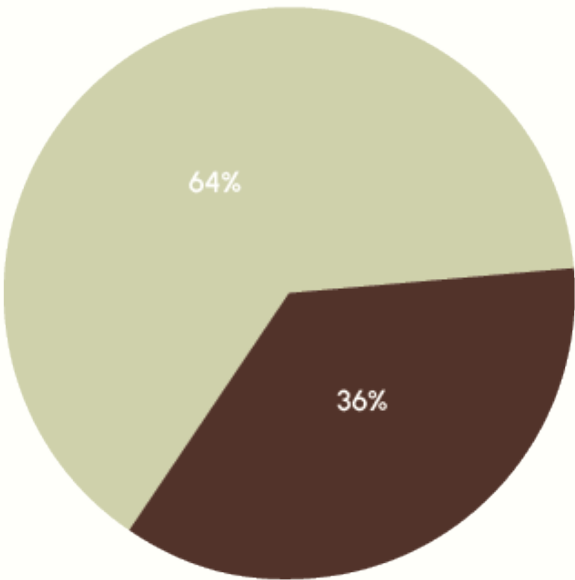
Even so, 7 out of the 13 brands analyzed had at least one 100% synthetic item listed as knitwear. Synthetic blends are far more common in this category, with every brand analyzed using synthetic fibers in their knitwear. The percentage of searched items that had materials derived from fossil fuels ranged from 41% to 100% among high street brands and 16% to 85% among luxury brands.

Contrastingly, as we looked toward the more positive, reduced-impact fibers used by these brands, we found that the use of plant-based, recycled and other such fibers was significantly lower than those using materials derived from fossil fuels.

Overall

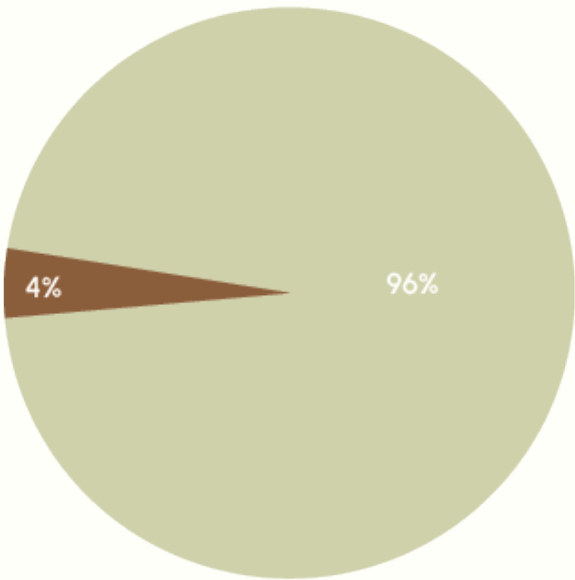


High Street



Percent of analyzed items containing no known reduced-impact fibers Percent of analyzed items containing reduced-impact fibers

Luxury



Percent of analyzed items containing no known reduced-impact fibers Percent of analyzed items containing reduced-impact fibers

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Six brands did not list any reduced-impact fibers in their knitwear (Coach, Dior, Hermes, Louis Vuitton, Puma and Uniqlo) with Burberry and Gucci using these fibers in 5% and 8% of the searched items, respectively. The North Face had the most items listed with reduced-impact fibers at 73%. However, only three of those items were made from entirely reduced-impact fibers; the others were all blended with synthetics.

The rest of the brands listed these materials in 27% to 38% of the searched items, with these fibers often making up 50% or less of the overall product.

This number may be higher for some brands, like Adidas, that have made company-wide commitments to reduce the use of virgin materials but may not specify the origin of materials in item listings.

However, all five of the brands (Adidas, H&M, Nike, The North Face and Zara) that had reduced-impact fibers listed in more than 10% of their items heavily relied on recycled synthetic fibers, which have numerous drawbacks and are not the answer to creating a more sustainable fashion industry.



Brand Analysis



Adidas Analysis

Background

Adidas is a high street brand focused on sportswear. While the brand is best known for sneakers, it has a large and popular collection of garments too.



Knit/wool search results: 10 items

Percent of items containing wool: 80%

Percent of items containing 100% wool: 0%

Average percent of wool in blended products: 47%

Percent of knit items containing 100% synthetic fibers: 10%

Percent of wool items blended with synthetics: 100%

Percent of items using reduced-impact fibers: 30%*

Reduced-impact fibers used: recycled nylon, recycled polyester, recycled tricot, unspecified recycled content

*Based on information provided by the company on the pervasiveness of recycled polyester in its products, this number may be higher than what was indicated on the item listings.

Material sustainability claims for analyzed fibers

Adidas has pledged to use only recycled polyester whenever possible by 2024 and that 9 out of 10 items will contain sustainable materials by 2025. It also highlights product development efforts to replace fossil fuel-based materials with alternatives derived from sustainable sources including mushrooms, cellulose, food waste and plant waste. Its sustainability webpage does not provide information on wool sourcing or treatment.³⁹

Adidas was one of only two brands that responded to inquiries with substantive information. Company representatives noted that more than 90% of the polyester used in its products is recycled. Although product listings do not provide information on dyes, Adidas does not allow harmful azo dyes in products and uses water-based and non-solvent dyes wherever possible. The company does not test its few wool products for biodegradability, instead prioritizing circularity. They wrote, "In our view,

biodegradability is not a sustainable end-of-life solution for clothing, instead, we aim for durability and recyclability."⁴⁰

The verdict

Adidas demonstrates a commitment to durability and recyclability, but it should strive to accelerate its shift beyond virgin synthetics toward similar high-performance, lower-impact alternatives. Adidas is actively working to address the issue of microfiber pollution in fashion as part of the Microfibre Consortium,⁴¹ which shows its understanding of the limitations of recycled synthetics, and the need to improve in this area. The brand's use of recycled materials must become more considerate of product end-of-life impacts, something the brand has improved within its "Made to be Remade" collection.⁴²

Since the brand's use of wool is limited, this should make a transition beyond these climate- and biodiversity-harmful materials less challenging to complete in a short-term period.

While the brand prioritizes durability over biodegradability, the two do not have to be mutually exclusive. Processes and dyes that do not impact biodegradation often also do not impact durability.

Burberry Analysis

Background

Burberry is a longstanding British luxury fashion house producing ready-to-wear garments. It's particularly well known for its coats, leather accessories and footwear.



Knit/wool search results: 143 items

Percent of items containing wool: 90%

Percent of items containing 100% wool: 38%

Average percent of wool in blended products: 68%

Percent of knit items containing 100% synthetic fibers: 0%

Percent of wool items blended with synthetics: 48%

Percent of items using reduced-impact fibers: 5%

Reduced-impact fibers used: linen

Material sustainability claims for analyzed fibers

Burberry is investing in "regenerative wool" production, though most of its wool products are not stated as such. The brand claims to improve soil carbon capture and biodiversity on farms.⁴³ With a commitment to reduce its overall emissions contribution, the brand is working to improve its material sourcing, including 100% certification of key raw materials such as certified recycled nylon and polyester and Canopy green rated viscose.⁴⁴ Burberry did not respond to inquiries for further information on materials sustainability commitments or its wool sourcing, processing, or dyes.

The verdict

While any agricultural management practice improvements are valuable, Burberry's efforts toward "regenerative wool" fail to acknowledge the significant contribution of methane from ruminant animals to the climate crisis, as well as the inherent land inefficiency of wool and its harms to biodiversity. Burberry should prioritize investment into more environmentally beneficial, fossil fuel-free alternatives to wool. Its use of recycled synthetics is an improvement, but end-of-life impacts for all products must be further considered by the brand, as they have begun to be for their trench collection, which offers repair services and extended care information. The brand must improve its capacity to supply information on its dyeing and treatment of fibers, and how this impacts biodegradation.

Coach Analysis

Background

Coach is an American luxury fashion house best known for its leather goods. The brand also produces ready-to-wear garments. It is owned by Tapestry.



Knit/wool search results: 23 items

Percent of items containing wool: 96%

Percent of items containing 100% wool: 50%

Average percent of wool in blended products: 79%

Percent of knit items containing 100% synthetic fibers: 0%

Percent of wool items blended with synthetics: 27%

Percent of items using reduced-impact fibers: 0%

Reduced-impact fibers used: N/A

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Material sustainability claims for analyzed fibers

Due to its limited use of wool compared to leather and other materials, no wool-related claims are made in Tapestry's 2022 Corporate Responsibility Report,⁴⁵ and no information on environmental impacts at the farm-level or during processing is provided. While the brand uses recycled synthetics in some of its bags and provides sustainability information for those products, no such information exists for its knitwear collection. Coach did not respond to inquiries for further information on materials sustainability commitments or its wool sourcing, processing, or dyes.

The verdict

While Tapestry has a biodiversity strategy and climate strategy in place, those strategies do not acknowledge the negative impact of wool production.⁴⁶ With a small portion of wool products, Coach could easily transition beyond the use of this material. This transition should also move beyond fossil fuel derived synthetics toward materials that can help advance its biodiversity and climate goals. The brand should invest in the exploration of lower impact materials for its knit and wool products, as none were found in this analysis.

Dior Analysis

Background

Dior is a LVMH owned luxury fashion brand from France. The brand offers leather accessories and shoes, cosmetics, and ready-to-wear garments.

Dior

Knit/wool search results: 87 items

Percent of items containing wool: 100%

Percent of items containing 100% wool: 24%

Average percent of wool in blended products: 75%

Percent of knit items containing 100% synthetic fibers: 0%

Percent of wool items blended with synthetics: 23%

Percent of items using reduced-impact fibers: 0%

Reduced-impact fibers used: N/A

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Material sustainability claims for analyzed fibers

Dior's website includes vague claims about how wool contributes to "eco-design" and "the protection of natural resources."⁴⁷ No information to support this claim is provided. No other information is provided about wool or synthetic material sourcing on its website. Dior did not respond to inquiries for further information on materials sustainability commitments or its wool sourcing, processing, or dyes.

The verdict

Dior claims it helps to protect natural resources, but its use of wool exacerbates our global climate and biodiversity crises. Dior must provide more information to the public on its sustainability targets and include targets to shift from the use of wool and fossil fuel derived materials toward lower-impact fibers.

Gucci Analysis

Background

Gucci is an Italian high-end luxury brand selling popular handbags, accessories, ready-to-wear garments, and shoes.



Knit/wool search results: 99 items

Percent of items containing wool: 92%

Percent of items containing 100% wool: 55%

Average percent of wool in blended products: 58%

Percent of knit items containing 100% synthetic fibers: 0%

Percent of wool items blended with synthetics: 30%

Percent of items using reduced-impact fibers: 8%

Reduced-impact fibers used: linen, unspecified "eco features"

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Material sustainability claims for analyzed fibers

Gucci has an "eco features" label that appears on products that are both 100% wool and blended with synthetics. The products with this label state that the brand promotes "the use of alternative materials for lower environmental impact such as recycled, regenerated, organic or bio-based materials." However, the product listings didn't specify which fibers, processes, or percentage of materials the statement applies to. Gucci also funds regenerative projects for wool, and although the company says it will use third-party verification to measure soil carbon there is no clear description of the standards or metrics for how it will achieve the other core tenets of regenerative agriculture including biodiversity and ecosystem health.^{48,49}

Gucci's parent company, Kering, acknowledges the wool industry's significant contribution to land and ecosystem degradation, as well as threats to native wildlife, in its "standards and guidance for sustainable production." Despite this information, Kering's standards focus on attempting to reduce the impact of an inherently inefficient material rather than improving alternative material sourcing.⁵⁰

Gucci did not respond to inquiries for further information on materials sustainability commitments or its wool sourcing, processing, or dyes. Kering is engaged in work to address the issue of microfiber pollution in fashion as part of the Microfibre Consortium,⁵¹ which shows its understanding of the limitations of recycled synthetics and the need to improve in this area.

The verdict

While the brand aims for 100% traceability for raw materials, traceability does not equate to sustainability. Gucci needs to reduce its reliance on high-impact materials like wool and improve transparency around its use and definition of lower-impact materials. Gucci's investment into regenerative animal production projects could be more effectively spent by shifting investment into innovation on sustainable materials that are free from both animal and fossil fuel inputs.

H & M Analysis

Background

H&M is one of the largest fast fashion companies in the world, selling an enormous quantity of garments, shoes, accessories and other products.



Knit/wool search results: 96 items

Percent of items containing wool: 92%

Percent of items containing 100% wool: 23%

Average percent of wool in blended products: 20%

Percent of knit items containing 100% synthetic fibers: 7%

Percent of wool items blended with synthetics: 69%

Percent of items using reduced-impact fibers: 38%

Reduced-impact fibers used: recycled polyester, recycled acrylic, recycled polyamide, recycled wool

Material sustainability claims for analyzed fibers

H&M promotes its efforts to offer product recycling; however, it does not address the amount of product created, the large portion of unsustainable materials used, the use-stage impacts of its synthetic knitwear, or the microfiber impacts of blended and processed wools.

The brand uses a small amount of wool, with some of it certified by the Responsible Wool Standard, which includes some environmental requirements. The brand also promotes its engagement to move toward "regenerative wool" and its use of recycled wool but does not specify if it is pre- or post-consumer recycled wool.

^{52,53} H&M responded to a request for further information by sharing links to its corporate website and sustainability pages, which do not provide additional detail on wool sourcing, processing, or the use of dyes.

The verdict

H&M is actively working to address the issue of microfiber pollution in fashion as part of the Microfibre Consortium.⁵⁴

Despite promoting climate goals, H&M continues to use a large portion of fossil fuel derived materials. Importantly, H&M's material sustainability progress must be paired with a degrowth strategy in order for the brand to demonstrate any genuine environmental responsibility. The brand's promotion of "regenerative" wool for biodiversity protection is misguided at best, and investment would be better spent toward degrowth and material innovation investment.

Hermès Analysis

Background

Hermès is a leading French luxury fashion house dating back to 1837. Known best for its exotic skin and leather accessories, the brand also offers ready-to-wear garments.



Knit/wool search results: 37 items

Percent of items containing wool: 68%

Percent of items containing 100% wool: 52%

Average percent of wool in blended products: 71%

Percent of knit items containing 100% synthetic fibers: 3%

Percent of wool items blended with synthetics: 16%

Percent of items using reduced-impact fibers: 0%

Reduced-impact fibers used: N/A

Material sustainability claims for analyzed fibers

Hermès claims it's reduced greenhouse gas emissions by choosing "sustainable materials."⁵⁵ It has also adopted a target to source, when possible, from suppliers certified through the Responsible Wool Standard,⁵⁶ which has some limited environmental standards attached to it. Hermès did not respond to inquiries for further information on materials sustainability commitments or its wool sourcing, processing, or dyes.

The verdict

Hermès adopts the wool industry rhetoric that its raw materials are a "natural, renewable source" and that their use of animal-based materials avoids the use of synthetics "based on petroleum chemistry." Among the analyzed knitwear, the only non-animal based fiber used was cotton, which was found in just 8% of items. Twice as many items were blended with synthetics. Although the company mentions the possibility for environmental harm in wool production, it fails to recognize that the industry is inherently harmful to the land, climate and biodiversity. Aligned with its biodiversity goals,⁵⁷ the company should conduct a dedicated biodiversity study and site-level assessments to its wool supply chain. Hermès must use its preference for natural fibers to shift toward lower-impact, innovatively farmed plant-based fibers.

Just as the brand has invested in a mycelium alternative to cow skin leather, investment in material innovation to support a transition beyond wool and synthetic fibers would benefit the company's sustainability targets.

Louis Vuitton Analysis

Background

Owned by LVMH, Louis Vuitton is another historically significant French fashion house known for leather goods, with a popular ready-to-wear collection of garments.



Knit/wool search results: 41 items

Percent of items containing wool: 76%

Percent of items containing 100% wool: 19%

Average percent of wool in blended products: 54%

Percent of knit items containing 100% synthetic fibers: 0%

Percent of wool items blended with synthetics: 68%

Percent of items using reduced-impact fibers: 0%

Reduced-impact fibers used: N/A

52

Material sustainability claims for analyzed fibers

Louis Vuitton acknowledges that not all natural materials are renewable, and says it is committed to sources "that have a regenerative impact on biodiversity." The company specifically names climate, deforestation, hazardous chemicals, air and water pollution, and animal welfare among its supply chain concerns. According to its website, 28% of polyester in its collections is certified recycled.⁵⁸

In 2020 Louis Vuitton used Responsible Wool Standard certified fibers, which have some environmental standards, for the first time in one of its collections and has used it since in other items. Its website states that, in 2021, nearly 50% of its wool came from supply chains with "responsible practices," but those practices were not further defined.⁵⁹

LVMH did not respond to inquiries for further information on materials sustainability commitments or its wool sourcing, processing, or dyes.

The verdict

Louis Vuitton says that most of its raw materials "come from nature," yet more than half of its wool knitwear was blended with synthetic fibers. Under its responsible sourcing information, the company says that it made a gown using Tencel for the 2020 Oscars Red Carpet Green Dress challenge.⁶⁰ Louis Vuitton should expand its use of reduced-impact fibers beyond the red carpet to its permanent collections in place of materials like wool that undermine its sustainability goals.

Nike Analysis

Background

Nike is a multinational corporation that produces sportswear. Best known for sneakers, the brand has a large collection of popular garments, too.



Knit/wool search results: 15 items

Percent of items containing wool: 67%

Percent of items containing 100% wool: 0%

Average percent of wool in blended products: 34%

Percent of knit items containing 100% synthetic fibers: 7%

Percent of wool items blended with synthetics: 90%

Percent of items using reduced-impact fibers: 27%

Reduced-impact fibers used: recycled polyester, organic cotton

54

Material sustainability claims for analyzed fibers

Nike plans to increase its focus on “environmentally preferred materials,” since 70% of its product carbon footprint comes from materials. For apparel, this is defined as shifting the content of its two primary materials — polyester and cotton — to recycled polyester, organic cotton and recycled cotton, particularly on “key high-volume fabrics and products.” Nike works to create closed-loop circular systems that include recycling factory waste and end-of-life items into new products. In 2021, the company claimed it was ahead of its plan to integrate more recycled polyester into products.⁶¹

Nike has several commitments related to reducing use of hazardous chemicals, but chemical and dye use specific to wool was not available.

No information on wool was provided in the company's impact report or on its website, and the company did not respond to inquiries for more information on materials sustainability or wool sourcing, processing, or dyes.

The verdict

Nike has a strong commitment to circularity but needs to move beyond solely relying on recycled synthetics which shed microfibers when washed and have limitations on their recyclability. Nike is committed to addressing the issue of microfiber pollution in fashion through its involvement in the Microfibre Consortium.⁶²

The company uses relatively little wool and since all the analyzed wool products were blended, Nike should set ambitious targets to phase out wool in favor of lower-impact materials. Nike acknowledges that shifting to recycled polyester presents minimal challenges since it's so similar to virgin polyester in quality, performance and aesthetic, but in order to meet its environmental goals, the company will have to rise to the challenge of innovation to bring truly sustainable materials to its collection.

The North Face Analysis

Background

The North Face is an outdoor clothing company owned by the VF Corporation that offers a range of jackets and other apparel. While not a luxury brand, it is considered “aspirational” due to its price point.



Knit/wool search results: 56 items

Percent of items containing wool: 81%

Percent of items containing 100% wool: 0%

Average percent of wool in blended products: 53%

Percent of knit items containing 100% synthetic fibers: 20%

Percent of wool items blended with synthetics: 100%

Percent of items using reduced-impact fibers: 73%

Reduced-impact fibers used: recycled polyester, recycled nylon, TENCEL lyocell

56

Material sustainability claims for analyzed fibers

The North Face has set an "ambitious goal" of ensuring "100% responsibly sourced apparel fabrics by 2025," with footwear and equipment on track to meet the same goal by 2030.⁶³ Its parent company,

VF Corporation, notes that material extraction, processing and production accounts for about 70% of its overall global CO2 emissions. VF Corporation highlights "regenerative" animal production as a part of their sustainable materials vision, as well as renewable and recycled materials. VF uses Responsible Wool Standard certified wool as well as "Smartwool," which they claim to be "the world's first regenerative wool."⁶⁴

The North Face names its top materials as polyester, cotton and nylon, and doesn't mention wool on its materials sustainability webpage. It states that the polyester and nylon in its Fall 2022 collection was at

least 85% and 75% recycled, respectively. The brand website also says that it has begun experimenting with bio-based materials as part of its goal to use fewer virgin synthetics.⁶⁵ The North Face and VF did not respond to inquiries for further information on materials sustainability commitments or its wool sourcing, processing, or dyes.

The verdict

While The North Face has made the positive move of shifting away from some of the most harmful virgin materials for its apparel sourcing, the company must look beyond solutions that sound promising but do little to meaningfully address the industry's impact on climate, land, water and wildlife.

Every wool item analyzed was blended with synthetics; only one item was found that used Tencel lyocell, and the rest relied on recycled synthetics for reduced-impact fibers. Blended wool fibers are not

effectively biodegradable and recycled synthetics continue to shed microfibers, undermining the sustainability of these products. The North Face seems to have moved away from its collection of "climate beneficial wool," which Fast Company referred to as "wool that fights climate change" — a dubious claim given the serious climate and land costs of wool production. However, VF continues to promote wool as a "regenerative" solution to the climate crisis, despite the reality of commercial grazing systems as counter to climate and biodiversity protection.^{66,67}

The North Face is another brand working to address the issue of microfiber pollution in fashion as part of the Microfibre Consortium.⁶⁸ The company must prioritize its exploration of sustainable bio-based materials and invest in plant-based systems, which are more land efficient and less climate intensive than wool and synthetics, as well as positively benefiting biodiversity.

Puma Analysis

Background

Puma is a multinational corporation producing athletic and casual footwear, as well as apparel and accessories.



Knit/wool search results: 6 items

Percent of items containing wool: 50%

Percent of items containing 100% wool: 0%

Average percent of wool in blended products: 27%

Percent of knit items containing 100% synthetic fibers: 20%

Percent of wool items blended with synthetics: 100%

Percent of items using reduced-impact fibers: 0%

Reduced-impact fibers used: N/A

Material sustainability claims for analyzed fibers

Puma states that material production accounts for more than 50% of the company's environmental impact. It also acknowledges the harm caused by materials production to biodiversity and has set targets to reduce pollution and deforestation in its supply chain.⁶⁹ The company uses very little wool, and as such its 2021 sustainability report notes that it has not yet implemented Responsible Wool Standards in its materials sourcing but has a target of 100% certified wool by 2025. It also has a target to increase its use of recycled polyester to 75% in apparel and accessories.⁷⁰ Puma did not respond to inquiries for further information on materials sustainability commitments or its wool sourcing, processing, or dyes.

The verdict

Given how little wool Puma uses — both by its own admission and our analysis — the company would be better served to phase out wool and replace it with lower-impact, next-gen materials rather than relying on the Responsible Wool Standard, which cannot eliminate the negative impacts of virgin wool sourcing.

Puma is also working to address microfiber pollution as part of the Microfibre Consortium.⁷¹ Similar to other athletic-wear brands, Puma needs to recognize the limitations of recycled synthetics as a long-term solution to the environmental harms of the fashion industry, and instead invest in materials innovation and prioritize shifting to materials that cause minimal harm during use and at the end of life.

Uniqlo Analysis

Background

Uniqlo is a Japanese casual wear company, under the parent company of Fast Retailing. It is estimated to operate over 1,500 stores worldwide.



Knit/wool search results: 37 items

Percent of items containing wool: 89%

Percent of items containing 100% wool: 67%

Average percent of wool in blended products: 46%

Percent of knit items containing 100% synthetic fibers: 5%

Percent of wool items blended with synthetics: 30%

Percent of items using reduced-impact fibers: 0%

Reduced-impact fibers used: N/A

Material sustainability claims for analyzed fibers

Uniqlo's sustainability report does not mention the use of wool once,⁷² despite its significant environmental impacts. Uniqlo promotes its use of post-consumer recycled polyester, which is derived from plastic bottles, as well as its participation in the "Microfibre Consortium," which aims to address microplastic pollution in the fashion industry.

Fast Retailing, the parent company of Uniqlo, was one of only two companies that responded to inquiries with substantive information. The company noted that increasing the use of recycled synthetics is a priority in its target to use 50% recycled materials by 2030,⁷³ and as of 2022, 16% of its polyester is recycled.⁷⁴ The company also said that recycled and organic cotton was used in its fall/winter collections, however, these materials were not used in the knitwear products included in this analysis.

Fast Retailing's responsible procurement webpage has some animal welfare standards for wool but does not mention the material's environmental impact.⁷⁵ The parent company also shares its chemicals policy, which applies to wool products and includes initiatives to reduce the use of hazardous chemicals, but does not address chemicals and dyes that might affect the biodegradability of garments.⁷⁶

The verdict

With no reduced-impact fibers used in Uniqlo's assessed products, the most beneficial step the brand could make would be to commit to increasing the use of lower-impact fibers such as recycled cotton, Tencel, hemp and others, while phasing out high-impact fibers such as virgin synthetics and wool. Uniqlo is a part of the Microfibre Consortium.⁷⁷

Zara Analysis

Background

Zara is owned by Inditex, considered the largest fast fashion company in the world. It sells a wide range of apparel, shoes and other products.



Knit/wool search results: 135 items

Percent of items containing wool: 100%

Percent of items containing 100% wool: 12%

Average percent of wool in blended products: 25%

Percent of knit items containing 100% synthetic fibers: 0%

Percent of wool items blended with synthetics: 86%

Percent of items using reduced-impact fibers: 33%

Reduced-impact fibers used: recycled polyester, recycled acrylic, recycled polyamide, recycled wool, linen, Ecovero

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Material sustainability claims for analyzed fibers

Inditex announced in 2019 that 100% of Zara collections would be made with "sustainable fabrics" by 2025.⁷⁸ The company's sustainability goals are broken down on its website and feature a commitment toward 100% recycled polyester by 2025, along with some commitments for other fibers.⁷⁹ Between 15% and 50% of Zara's collections are made with recycled wool and cotton from pre-consumer sources.⁸⁰

Composition information on products made from wool-synthetic blends state that the brand works to monitor programs that ensure compliance with its environmental health standards. However, the statement is vague and no further information is provided. The brand's sustainability policy also does not refer to material sourcing requirements.⁸¹

Zara did not respond to inquiries for further information on materials sustainability commitments or its wool sourcing, processing, or dyes.

The verdict

As with other fast fashion brands, Zara must incorporate degrowth strategies into its business to ensure meaningful action for the environment. The high use of synthetics in fiber blends is concerning as blended fibers are difficult to recycle and have consequences related to both user-stage and end-of-life impacts. Zara should ensure its work to use recycled fibers is not in isolation from broader progress to address these impacts. Zara's use of virgin wool is not transparent, with no information about raw material sourcing, scouring or dyeing available, even by request. Zara should continue to invest in reduced-impact fibers and do so by prioritizing plant-based and biodegradable fibers over destructive wool and synthetics.

Conclusion and Recommendations

Fashion's top brands — both high street and luxury — have an enormous influence on trends, the market, supply chains, and the wider industry's environmental impact. Most of the analyzed brands tout sustainability initiatives. Many of them address materials sourcing and some of them acknowledge the industry's role in biodiversity destruction. However, the pervasive use of wool and synthetic blends, the lack of attention to how wool processing and dyeing affects the life cycle impact of garments, and the intense focus on recycled synthetics rather than truly sustainable, innovative materials, undercuts the industry's environmental progress.

These factors are further exacerbated by the rapid overproduction of styles in fast fashion brands.^{82,83} However, luxury brands are not off the hook either, as they also use synthetics in more than one-third of their wool items, on average, and offer more wool knitwear overall.

Not a single brand acknowledged the inherent costs to climate, land, water and biodiversity in wool production.

In order for fashion's knitwear production to shift toward more genuine sustainability, it must move beyond both virgin wool and fossil-fuel derived materials. The fashion industry's ability to meet its own environmental goals and the sustainability expectations of customers depends on an honest, transparent assessment of how materials are used and marketed.

Individual brands and the industry as a whole must take the following steps to commit to meaningful materials sustainability goals that can advance fashion that's better for people and the planet:

Brands must take steps toward a just transition by setting specific targets to move beyond the use of virgin synthetics and wool.

Both virgin fossil fuel-derived synthetics and wool are inherently unsustainable fibers.

The fashion industry must implement materials reduction strategies that recognize the urgent need to move beyond these fibers to combat the climate and biodiversity crises.

Environmental commitments and sustainability language must account for the impacts of synthetic and wool production and the use of blended materials.

The fashion industry's sustainability messaging often positions wool as the preferable alternative to synthetics without addressing the environmental impacts of wool or the fact that it's frequently blended with synthetics. Eliminating this contradiction between how wool is marketed and how it's actually produced and used is critical to reducing industry greenwashing.

The fashion industry should ramp up its efforts to create clear definitions and standards for sustainability claims to prevent greenwashing.

Many brands rely on terms that are poorly defined and unverifiable like "responsibly-sourced" or "regenerative," which can mislead customers about materials sourcing and undermine the sustainability progress of the industry. Until the fashion industry sets standards for accountability and clear definitions, brands should avoid making unverifiable claims about materials sourcing.

Brands and the fashion industry should increase transparency around the chemicals and dyes used in processing wool fiber.

Although wool is a "natural" fiber, chemicals are used throughout the process of turning it into a finished garment, including during the scouring, super washing, and dyeing processes. However, none of the product listings for analyzed garments addressed this.

The chemicals used in producing clothing have an enormous impact on workers and the environment and reducing their burden must be part of the industry's sustainability efforts. Brands and the fashion industry must invest in producing fewer overall items and increasing the use of sustainable alternative materials. All brands, but particularly those fueling the fast fashion crisis, must commit to streamlining their collections to reduce overproduction and waste. As part of this effort, they must phase out the use of wool and fossil fuel-derived materials and invest in fibers with a lower environmental footprint, including lyocell, bamboo, organic cotton, and other plant- and bio-based materials.



References

- 1 Feldstein, S., Hakansson, E., Katcher, J. and Vance, U.. (2021). Shear Destruction: Wool, Fashion and the Biodiversity Crisis. Center for Biological Diversity and Collective Fashion Justice. Available at: <https://www.collectivefashionjustice.org/shear-destruction>.
- 2 "Yoga for Coal-Free Fashion" yoga protest in Vancouver. Stand.earth. (2022, November 4). Retrieved March 14, 2023, from <https://stand.earth/insights/yoga-for-coal-free-fashion-yoga-protest-in-vancouver/>.
- 3 Tianwei Zhang, L. N., Zhang, T., Nordstrom, L., Burns, E., & Roshitsh, K. (2022, October 20). Protesters hit Harrods, Santa Maria Novella Parties in New York, Burberry partners with Minecraft. WWD. Retrieved March 14, 2023, from <https://wwd.com/fashion-news/fashion-scoops/protesters-harrods-santa-maria-novella-parties-new-york-burberry-minecraft-1235396326/>.
- 4 Hare, S., Watson, G., & Phipps, A. (2022, July 22). Nottinghamshire Rabbit Farm Under Pressure from anti-fur activists. BBC News. Retrieved March 14, 2023, from <https://www.bbc.com/news/uk-england-nottinghamshire-62258678>.
- 5 Cernansky, R. (2021, August 5). Customers care more about sustainability post-lockdowns. now what? Vogue Business. Retrieved March 14, 2023, from <https://www.voguebusiness.com/sustainability/customers-care-more-about-sustainability-post-lockdowns-now-what>.
- 6 Deeley, R. (2022, August 4). How brands should navigate fashion's greenwashing crackdown. The Business of Fashion. Retrieved March 14, 2023, from <https://www.businessoffashion.com/articles/sustainability/how-brands-should-navigate-fashions-greenwashing-crackdown/>.
- 7 Hakansson, E. (2022, September 23). Woolmark's latest advertisement: Green-washing and Ethics-washing. Collective Fashion Justice. Retrieved March 14, 2023, from <https://www.collectivefashionjustice.org/articles/woolmark-ad-green-washing-and-ethics-washing>.
- 8 Feldstein, Hakansson, et al. Shear Destruction: Wool, Fashion and the Biodiversity Crisis.
- 9 Ibid.
- 10 Ibid.
- 11 Hakansson, E. (2022, May 26). Is the responsible wool standard cruelty free? is the ZQ wool certification free from harm? Collective Fashion Justice. Retrieved March 14, 2023, from <https://www.collectivefashionjustice.org/articles/wool-standards-explained>.
- 12 Feldstein, Hakansson, et al. Shear Destruction: Wool, Fashion and the Biodiversity Crisis.

- 13 Nordborg, M. (n.d.). Holistic management a critical review of Allan Savory's grazing method. EPOK. Retrieved March 14, 2023, from https://publications.lib.chalmers.se/records/fulltext/244566/local_244566.pdf.
- 14 Hawkins, H.J. (2017). A global assessment of Holistic Planned Grazing compared with season-long continuous grazing: meta-analysis findings. *African Journal of Forage Science*, 34:2, 65-75, DOI: 10.2989/10220119.2017.1358213.
- 15 Grazing Facts: Further Reading. Center for Biological Diversity. (n.d.). Available at: <https://grazingfacts.com/further-reading>
- 16 Synthetics. Collective Fashion Justice. (n.d.). Retrieved March 14, 2023, from <https://www.collectivefashionjustice.org/synthetics>.
- 17 Levy, G. (2023, March 2). IPCC report 2022: We need to phase out fossil fuels now. *Climate Nexus*. Retrieved March 17, 2023, from <https://climatenexus.org/climate-issues/science/ipcc-climate-change-2022-report-3-3/>.
- 18 Polyester. CFDA. (n.d.). Retrieved March 17, 2023, from <https://cfda.com/resources/materials/detail/polyester>.
- 19 Synthetics. Collective Fashion Justice.
- 20 Stanes, E. R., & Gibson, C. R. (2017). Materials that linger: An embodied geography of polyester clothes. Retrieved March 17, 2023, from <https://ro.uow.edu.au/cgi/viewcontent.cgi?httpsredir=1&article=4097&context=sspapers>.
- 21 Microplastics from textiles: towards a circular economy for textiles in Europe. European Environment Agency. (2022, February 10). Retrieved March 17, 2023, from <https://www.eea.europa.eu/publications/microplastics-from-textiles-towards-a>.
- 22 Ellen MacArthur Foundation. (n.d.). A new textiles economy: Redesigning Fashion's Future. Retrieved March 19, 2023, from <https://ellenmacarthurfoundation.org/a-new-textiles-economy>.
- 23 Hakansson, E. (n.d.). Fibre Land Use Comparisons. Circumfauna. Retrieved March 19, 2023, from <https://circumfauna.org/fibre-land-comparisons>.
- 24 Biodegradability in fashion: All you need to know. Manteco. (2023, January 13). Retrieved March 19, 2023, from <https://manteco.com/biodegradability-in-fashion-all-you-need-to-know/>.
- 25 Egan, J., & Salmon, S. (2021). Strategies and progress in synthetic textile fiber biodegradability - SN applied sciences. SpringerLink. Retrieved March 19, 2023, from <https://link.springer.com/article/10.1007/s42452-021-04851-7#citeas>.
- 26 Sun, C., & Baird, M. (2015). The Determination of Alkyl Phenol Ethoxylates in Wool-scouring Effluent. Taylor & Francis. Retrieved March 19, 2023, from <https://www.tandfonline.com/doi/abs/10.1080/00405000.1998.11090906>.

- 27 Acir, I.-H., & Guenther, K. (2018). Endocrine-disrupting metabolites of alkylphenol ethoxylates – a critical review of analytical methods, environmental occurrences, toxicity, and regulation. *Science of The Total Environment*. Retrieved March 19, 2023, from <https://www.sciencedirect.com/science/article/pii/S0048969718312439>.
- 28 Norris, D. O., Bolden, A. L., & Vajda, A. M. (2017, December 2). The occurrence of intersex fishes in Boulder Creek, Colorado, is a recent phenomenon. *General and comparative endocrinology*. Retrieved March 19, 2023, from <https://pubmed.ncbi.nlm.nih.gov/29203388/>.
- 29 Feldstein, Hakansson, et al. Shear Destruction: Wool, Fashion and the Biodiversity Crisis.
- 30 Holgate, B. (2022, May 26). Microfibre pollution in fashion: Are synthetics all to blame? *Collective Fashion Justice*. Retrieved March 19, 2023, from <https://www.collectivefashionjustice.org/articles/microfibre-pollution-in-fashion-are-synthetics-all-to-blame>.
- 31 Issues in cellulosic material supply chains. *Collective Fashion Justice*. (n.d.). Retrieved March 19, 2023, from <https://www.collectivefashionjustice.org/uncertified-cellulose>.
- 32 Watters, W. (2017, June 1). Material study: TENCEL®. *Western Rise*. Retrieved March 19, 2023, from <https://westernrise.com/blogs/journal/material-study-tencel>.
- 33 Firgo, H., Schuster, K. C., Suchomel, F., & Männer, J. (2006). The functional properties of TENCEL® - A Current Update - ResearchGate. *ResearchGate*. Retrieved March 19, 2023, from https://www.researchgate.net/publication/237548338_THE_FUNCTIONAL_PROPERTIES_OF_TENCELR_-_A_CURRENT_UPDATE.
- 34 Wool alternatives. *Collective Fashion Justice*. (n.d.). Retrieved March 19, 2023, from <https://www.collectivefashionjustice.org/wool-alternatives>.
- 35 Issues in conventional cotton supply chains. *Collective Fashion Justice*. (n.d.). Retrieved March 19, 2023, from <https://www.collectivefashionjustice.org/conventional-cotton>.
- 36 Katcher, J. (2022, November 24). Spinnova. *Circumfauna*. Retrieved March 19, 2023, from <https://circumfauna.org/wool-circumfauna/spinnova->.
- 37 Synthetics Anonymous: Fashion brands' addiction to fossil fuels. *Changing Markets*. (n.d.). Retrieved March 19, 2023, from https://changingmarkets.org/wp-content/uploads/2021/07/SyntheticsAnonymous_FinalWeb.pdf.
- 38 Brand Finance. (2022). Brand Values, Profiles & Global Rankings. *Apparel 50*. Retrieved March 19, 2023, from <https://brandirectory.com/download-report/brand-finance-apparel-50-2022-preview.pdf>.

39 Sustainability: Sustainable Fashion: Adidas Official Shop. adidas UK. (n.d.). Retrieved March 19, 2023, from <https://www.adidas.com/us/sustainability>.

40 Email from the Director Sustainability Direction at Adidas. (2022, November 3). "Re: Sustainability Inquiry." Received by Center for Biological Diversity intern.

41 Our signatories to The Microfibre 2030 Commitment. The Microfibre Consortium. (n.d.) Retrieved March 28, 2023, from <https://www.microfibreconsortium.com/signatories>.

42 More sustainable materials and circular services. Adidas. (n.d.). Retrieved March 19, 2023, from <https://www.adidas-group.com/en/sustainability/environmental-impacts/more-sustainable-materials-and-circular-services/>.

43 Burberry introduces carbon insetting and Autumn/Winter 2020 Runway show certified carbon neutral. Burberry. (2020, February 17). Retrieved March 19, 2023, from <https://www.burberryplc.com/en/news/corporate/2020/burberry-introduces-carbon-insetting-and-autumn-winter-2020-runw.html>.

44 Product: Responsible Craftsmanship. Burberry. (n.d.) Retrieved March 28, 2023, from <https://www.burberryplc.com/en/responsibility/product.html>.

45 Tapestry. (n.d.). The Fabric of Change Corporate Responsibility Report FY2022. Retrieved March 19, 2023, from https://assets.tapestry.com/tapestrycorp/assets/docs/2023/Tapestry_FY22_CR_Report.pdf.

46 Ibid.

47 Dior sustainability - news and events - news & défilés. Dior. (n.d.). Retrieved March 19, 2023, from https://www.dior.com/en_au/fashion/news-savoir-faire/folder-news-and-events/dior-sustainability.

48 Gucci Equilibrium Impact Report 2021. Gucci. (2021). Retrieved March 28, 2023, from <https://equilibrium.gucci.com/impactreport-2021/>.

49 Presenting Gucci's Nature-Positive Climate Strategy. Gucci. (2021, January 26). Retrieved March 28, 2023, from <https://equilibrium.gucci.com/natural-climate-solutions-portfolio-projects/>.

50 Kering Standards: Standards & guidance for sustainable production. Kering. (2022). Retrieved March 29, 2023, from <https://keringcorporate.dam.kering.com/m/75995a4c6ddb4a42/original/Kering-Standards-for-raw-materials-and-manufacturing-processes.pdf>.

51 Our signatories to The Microfibre 2030 Commitment. The Microfibre Consortium.

- 52 Materials. H&M Group. (2023, March 17). Retrieved March 19, 2023, from <https://hmgroup.com/sustainability/circularity-and-climate/materials/>.
- 53 Biodiversity. H&M Group. (2023, March 16). Retrieved March 19, 2023, from <https://hmgroup.com/sustainability/circularity-and-climate/biodiversity/>.
- 54 Our signatories to The Microfibre 2030 Commitment. The Microfibre Consortium.
- 55 Responsible Sourcing. Hermès Finance. (n.d.). Retrieved March 19, 2023, from <https://finance.hermes.com/en/responsible-sourcing/>.
- 56 Sectors Brief. Hermès Finance. (2021, December). Retrieved March 19, 2023, from https://assets-finance.hermes.com/s3fs-public/node/pdf_file/2022-04/1650470880/hermes_sectorsbrief_december2021.pdf.
- 57 Universal Registration Document: Non-Financial Performance Statement. Hermès Finance. (2021). Retrieved March 19, 2023, from https://assets-finance.hermes.com/s3fs-public/node/pdf_file/2022-02/1645172680/hermes_20220218_results2021_cp_vanglaise.pdf.
- 58 Sourcing responsibly. Louis Vuitton. (n.d.). Retrieved March 19, 2023, from <https://us.louisvuitton.com/eng-us/magazine/articles/sourcing-responsibly>.
- 59 Ibid.
- 60 Ibid.
- 61 Breaking Barriers: FY21 NIKE, Inc. Impact Report. Nike. (2022). Retrieved March 19, 2023, from https://purpose-cms-preprod01.s3.amazonaws.com/wp-content/uploads/2022/03/17210319/FY21_NIKE-Impact-Report.pdf.
- 62 Our signatories to The Microfibre 2030 Commitment. The Microfibre Consortium.
- 63 Sustainability. The North Face. (n.d.). Retrieved March 19, 2023, from <https://thenorthface.com.au/explore-sustainability/sustainability-sustainability.html>.
- 64 Materials. VF Corporation. (n.d.). Retrieved March 19, 2023, from <https://www.vfc.com/responsibility/planet/materials>.
- 65 Materials. The North Face. (n.d.). Retrieved March 19, 2023, from <https://www.thenorthface.com/en-us/sustainability/materials>.

66 Peters, A. (2018, September 12). These jackets are made from wool that fights climate change. Fast Company. Retrieved March 19, 2023, from <https://www.fastcompany.com/90234633/these-jackets-are-made-from-wool-that-fights-climate-change>.

67 Hakansson, E., & Roberts, S. (2022, December 12). How "sustainable" Wool wipes out wildlife and pumps out emissions. Sentient Media. Retrieved March 19, 2023, from <https://sentientmedia.org/sustainable-wool-pollution/>.

68 Our signatories to The Microfibre 2030 Commitment. The Microfibre Consortium.

69 Forever better. Puma. (n.d.). Retrieved March 19, 2023, from <https://about.puma.com/en/forever-better>.

70 Sustainability. Puma Annual Report. (2021). Retrieved March 19, 2023, from <https://annual-report.puma.com/2021/en/downloads.html>.

71 Our signatories to The Microfibre 2030 Commitment. The Microfibre Consortium.

72 Uniqlo. (2021). Caring for the Environment. Sustainability Report. Retrieved March 19, 2023, from <https://www.uniqlo.com/jp/en/contents/sustainability/report/2021/planet/>.

73 Email from Disclosure Team, Sustainability. Fast Retailing Co., Ltd. (2022, December 1). "Re: Fast Retailing: Response to your inquiry." Received by Center for Biological Diversity intern.

74 News & updates. Fast Retailing. (2022, December 16). Retrieved March 19, 2023, from <https://www.fastretailing.com/eng/sustainability/news/2211161500.html>.

75 Responsible Procurement. Fast Retailing. (2021, December 24). Retrieved March 19, 2023, from <https://www.fastretailing.com/eng/sustainability/products/procurement.html>.

76 Chemical Management. Fast Retailing. (2023, January 27). Retrieved March 19, 2023, from <https://www.fastretailing.com/eng/sustainability/environment/chemical.html>.

77 Our signatories to The Microfibre 2030 Commitment. The Microfibre Consortium.

78 Conlon, S. (2019, July 17). Zara clothes to be made from 100% sustainable fabrics by 2025. The Guardian. Retrieved March 19, 2023, from <https://www.theguardian.com/fashion/2019/jul/17/zara-collections-to-be-made-from-100-sustainable-fabrics>.

79 Sustainability. Inditex. (n.d.). Retrieved March 19, 2023, from <https://www.inditex.com/itxcomweb/en/sustainability>.

- 80 Inditex Annual Report. Inditex Memoria. (2021). Retrieved March 19, 2023, from https://static.inditex.com/annual_report_2021/en.html.
- 81 Inditex. (2022, November 3). Policy: Sustainability. Retrieved March 19, 2023, from https://www.inditex.com/itx-comweb/api/media/f76be860-a238-41c3-8c45-fe6a82133094/QI_2022_Results.pdf?t=1656777943584.
- 82 Mass consumerism. Collective Fashion Justice. (n.d.). Retrieved March 19, 2023, from <https://www.collectivefashion-justice.org/mass-consumerism>.
- 83 At what cost? Unravelling the harms of the fast fashion industry. Center for Biological Diversity. (n.d.). Retrieved March 28, 2023, from https://www.biologicaldiversity.org/programs/population_and_sustainability/sustainability/fast_fashion.



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