



# The Hidden Story of Plastics in Our Clothes

60% of clothing sold today contains plastic. It's a huge issue managing to fly under the radar. Here's what you need to know.



FIBERSHED



- over-reliance on fossil fuels
- global pollution of air, land, seas
- international conflict
- the continued growth of fast fashion

## Introduction

If you lived through the 1990s, you probably remember a catchy series of advertising campaigns from the American Plastics Council: “Plastics Make it Possible.” During TV commercial breaks, 90s audiences were treated to ads touting the modern miracles — secure food packaging! protective skateboarding equipment! shatter-resistant shampoo bottles! — made possible because of plastic.

It’s true: In many ways, plastic has been miraculous. Cheap and simple to manufacture, plastic introduced humanity to an easier way of life. But beyond convenience, what else has plastic made possible?

Many of us now know that the ramifications of a plastic world are dire. From the moment it’s born to the end of its useful life, plastic is harmful to our environment, destructive to precious ecosystems, and hazardous to human health.

What many of us may not yet know is how prevalent plastic has become in our clothing. Polyester, a plastic-based synthetic textile, is found in 60% of garments being sold today, and polyester production increased by nearly 900% between 1980 and 2014.

In this resource, we’ll reveal how plastic solidified its place as one of the most prominent materials in fashion, we’ll talk about what that means for all of us, and we’ll share some of the best solutions for getting us out of this mess.

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## PART 1

# The Beginning: Plastic is ‘Born’

The fact that 60% of clothing on retailers’ shelves today is made from plastic<sup>1</sup> may come as a surprise to many. We’re used to thinking of plastic in its more obvious applications — in food and beverage packaging, for example. But hidden plastics in our clothing present several issues that shouldn’t be ignored by consumers or policymakers.

**The story of hidden plastic in our clothes starts with how plastic is made. Let’s start at the very beginning.**



Most plastic is made from petroleum, a fossil fuel also known as crude oil. You’ve probably heard of petroleum before, but its origins may surprise you. Ancient organisms (think algae and water plants) that lived in Earth’s seas eventually died, sank to the sea floor, and were buried. Millions of years of pressure and high heat turned those organic materials into fossil fuels: petroleum, coal, and natural gas.

Deep underground, these fossil fuels aren’t harmful. They become harmful when humans extract them.

Crude oil reservoirs can be found throughout the world beneath land or bodies of water. In order to extract the crude oil, huge drills and oil pumps are required. In the U.S. alone, there are more than 1.5 million oil and gas production facilities<sup>2</sup>. These operations emit significant pollution into the air and waterways, impacting local communities, many of which are already under-resourced. Oil and gas facilities also require infrastructure that damages lands and ecosystems.

Hydraulic fracturing, “fracking,” can be even more dangerous to communities and the environment. Fracking requires manufacturers to drill deep holes and then set off underground explosions intended to break up materials that contain gas and oil. This process can pollute groundwater, damage wildlands, and cause catastrophic earthquakes.

In the case of underwater drilling, all-too-regular oil spills like the 2010 Deep Water Horizon disaster threaten millions of lives. The Deep Water Horizon spill caused four million barrels of oil to flow into the ocean over 87 days until it was stopped, threatening the health of several national parks, killing more than 1 million birds combined with massive casualties among other animal communities, and deeply damaging the economies of communities along the Gulf Coast.<sup>7</sup>

In order to transport oil from where it is extracted, pipeline projects cut across and scar vast swaths of land, posing threats to local ecosystems and communities during construction and in their operation. Indigenous communities have often borne the brunt of the negative effects of new pipelines on their lands and have led efforts to raise awareness of the threats these pipelines pose to critical water resources, gaining global attention for their organizing against the Dakota Access Pipeline ([Standing Rock](#)), [Line 3](#), [Line 5](#) and more pipeline projects around the world.

Because crude oil is in high demand and limited supply, violence throughout the world for decades has resulted from humans seeking to secure access to this resource. In the future, more difficult fossil fuel extraction will require significant energy paired with higher-polluting extraction methods.

To bring the story back to our clothes, here are a few harrowing statistics:

- In 2016, 65 million tons of plastic was produced for textile fibers<sup>3</sup>, representing close to 20 percent of the total plastic production for that year.<sup>4</sup>

Nearly 70 million barrels of oil are used each year to make the world’s polyester fiber<sup>5</sup>, which is now the most commonly used fiber in our clothing.

- Plastic production is predicted to double in the next 20 years.<sup>6</sup>



# Plastic in Fashion Timeline

## 40s

### Nylon Hosiery

Nylon, a petroleum-based fiber, was developed by DuPont in the 1930s. By the 1940s, it was popularized as a replacement for silk—which was especially hard to find during World War II—in women's hosiery.



## 50s

### Tulle

Full skirts were popular in the '50s, adding to the allure of tulle. While silk had been the traditional material of choice, nylon became an inexpensive and reliable substitute for manufacturing tulle.



### Elastane

### Undergarments

With the aim of making women's undergarments more comfortable, elastane (sold with names such as spandex and Lycra) hit markets in the late '50s. The stretchy fibers are made from polyurethane, a plastic material.



## 60s

### Psychedelic Fashion

The hippies of the '60s favored flowy, colorful fashion, which was often made from inexpensive polyester.

## 70s

### Disco & Leisure Suits

Flashy '70s fashion was largely plastic-reliant. Leisure suits were most often crafted from polyester, while stretchy dance fabrics were made from elastane. Sequins, of course, were a plastic staple.



## 80s

### Aerobics

The aerobically inclined decked themselves out with stretchy athletic apparel containing lots and lots of elastane.



# Plastic in Fashion Timeline



## 90s Polar Fleece

The polar fleece hit the big time in the '90s, despite their polyester makeup and terrible plastic-shedding problem.

## 2000s Fast Fashion Explosion

The first H&M location in the U.S. opened in April 2000. At the same time, the *New York Times* wrote that consumers had recently become more likely to hunt for bargains and dismiss department stores, stating that it was now “chic to pay less.” These “bargain” garments make substantial use of plastic fibers.



## 2010s Jegging & Athleisure

Stretchy clothing was the name of the game in the 2010s, with elastane used in everything from jeans to jumpsuits.



## 'Sustainable' Fashion

With heightened environmental concerns, brands were quick to hop on the “sustainable” fashion bandwagon. But their solutions were often misguided or deceptive, incorporating recycled plastic that only served to create more plastic pollution in the long run.

## 2020s Plastic, Plastic Everywhere

While some forward-thinking brands have committed to creating garments without plastic, the vast majority—including those who say they're eco-conscious, like Patagonia—have not. Finding garments that don't contain plastic can be challenging<sup>8</sup>.



## PART 2

# Plastic Fibers Are Formed

Polyester is formed from PET (polyethylene terephthalate) pellets, which are made of ethylene glycol and terephthalic acid — both petroleum-derived compounds. These two raw materials are combined under high temperatures and low vacuum pressure, eventually forming long strands of PET, which are subsequently cut into pellets.

According to the Council of Fashion Designers of America (CFDA), “To make polyester fibers, PET plastic pellets are melted and extruded through tiny holes called spinnerets to form long threads, which are then cooled to harden into a fiber. This process is called melt spinning. The shape and quality of holes can be altered to create fibers with different qualities.”<sup>9</sup>

This process couldn't be further from natural. But here are just a few more reasons why the production of synthetic fibers like polyester should concern you (all pulled and lightly edited from the [CFDA](#)):

- Polyester requires lots of energy to produce, releasing large amounts of greenhouse gases into the atmosphere. In 2015, polyester produced for clothing emitted 282 billion kg of CO<sup>2</sup> — nearly three times more than cotton.
- Water pollution is a big problem in polyester production. Facilities producing polyester without treating wastewater have a high probability of causing environmental damage through the release of heavy metals and toxic chemicals.
- The polyester supply chain is extremely opaque, so sourcing your polyester fiber back to its raw material source is nearly impossible. Petroleum is one of the most difficult raw materials to trace back to the source.

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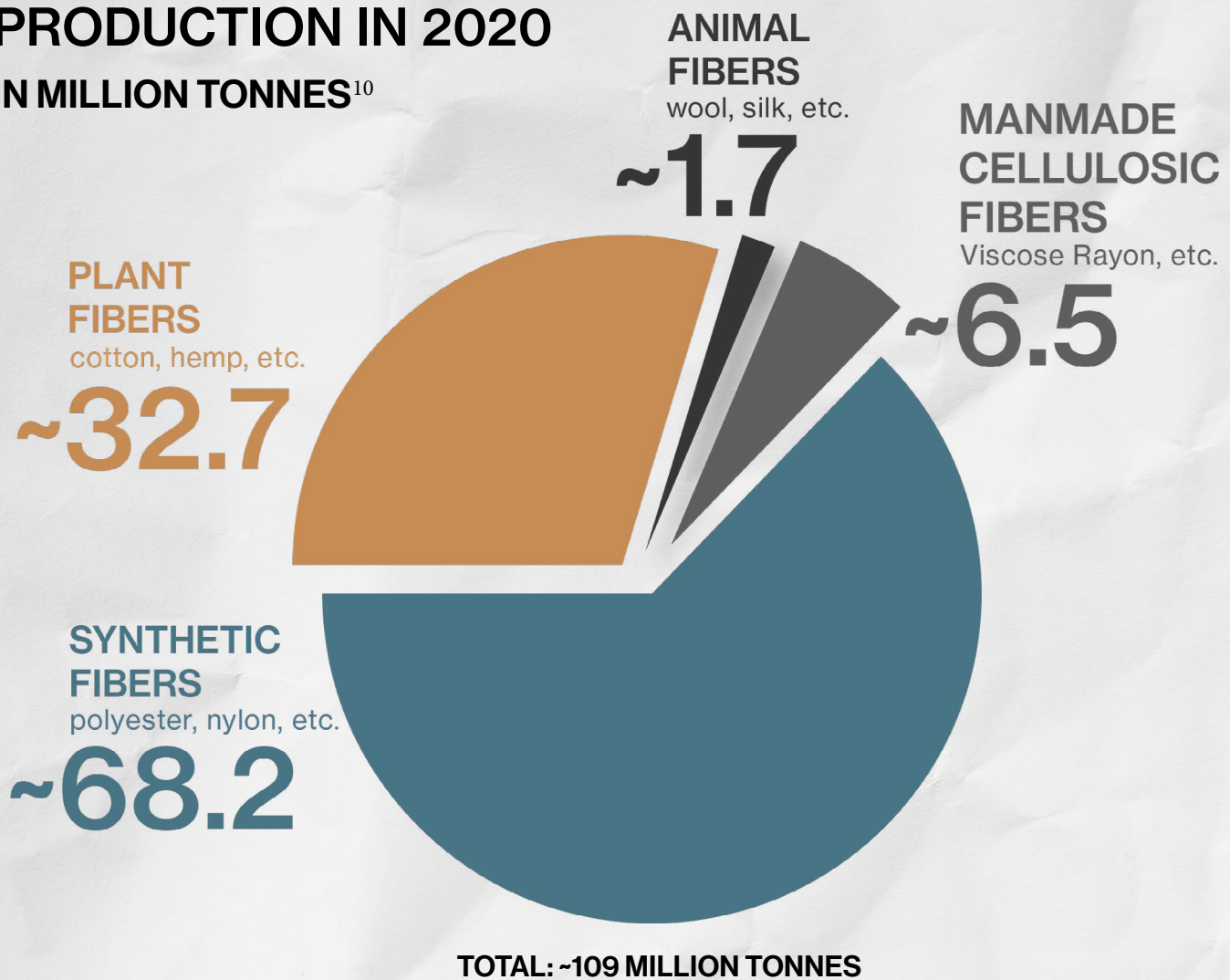
Facilities producing polyester without treating wastewater have a high probability of causing environmental damage through the release of heavy metals and toxic chemicals.





# GLOBAL FIBER PRODUCTION IN 2020

IN MILLION TONNES<sup>10</sup>



You can learn more about pollution from the manufacture of plastic pellets in this enlightening [presentation from shrimp-boat captain Diane Wilson](#), who found industrial wastewater runoff, in the form of plastic pellets and dust, poisoning her native Texas Gulf Coast. Her story explains a community’s ongoing battle to hold accountable a plastic manufacturing plant deemed a “serial offender” of the Clean Water Act by a Texas judge.

# 52%

of global fiber  
production was  
**polyester**

in 2020

## PART 3

# Plastic Is Used to Make Clothes

The most widely used petroleum-based fiber today is polyester. In 2020, 52% of global fiber production — 57 million tonnes — was polyester.<sup>11</sup> But polyester is far from being the only plastic synthetic fiber on the market.

Why do apparel brands rely on plastic fibers when they could be using natural ones? The main reason is, of course, cost. The market price for synthetic fibers is significantly less compared to natural fibers, creating a huge incentive for fashion brands to find ways to replace traditionally used natural fibers with synthetic ones, and to market this switch as something preferable.

But “cost” is a complicated concept. Producing synthetic fibers may have a low short-term cost (thanks in part to government subsidization of the fossil fuel industry), but the hidden costs of producing and using plastic are hardly small, as we learned above and will continue to discuss as we delve into how synthetic fibers break down. An additional hidden cost appears in the form of harm to garment workers, whose daily contact with these plastic fibers (which become microfibers — more on those in the next section) **threatens their health** and makes them more susceptible to lung cancer.

In contrast, if we consider everything that goes into creating natural fibers, we can see how higher market prices for these reflect many stages of labor and capital-intensive inputs: land and livestock care, shearing or harvesting, milling, and processing. Many of these production stages have the potential for important social and ecological benefits, such as improved ecosystem health, biodiversity, and healthy regional economies, but those benefits don't easily provide relief or balance for the associated costs in our current market structures.

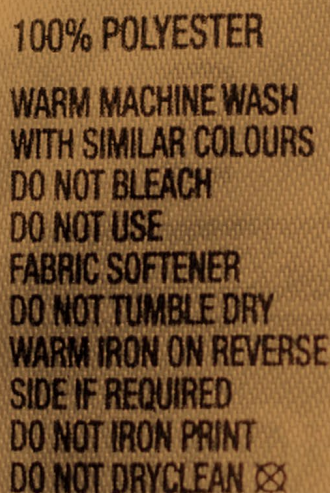
Just as a fast-food hamburger is often lower priced than a few organic tomatoes from a local farm, mass-manufactured clothing from anonymous global supply chains based on plastic fiber will reflect a lower retail price than its Earth- and community-friendly counterparts. It's a backward reality that should give consumers pause.

While, as we mentioned previously, more than half of clothing on retailers' shelves today contains plastic, that number spikes when considering fast-fashion brands specifically. A recent analysis of four popular UK-based fast-fashion brands<sup>12</sup> revealed that, on average, 80% of items listed on their websites contained plastic fibers. A whopping 89% of PrettyLittleThing's clothing contained plastics.

**In order to know how to avoid plastic in our clothing, it's helpful to learn how to read item descriptions and tags. So, which words in the fiber world indicate the inclusion of plastic?**

**Here's a quick rundown:**

- Polyester
- Nylon
- Acrylic
- Acetate
- Elastane (Lycra/Spandex)
- Olefin (Polypropylene)
- Vinyl



100% POLYESTER  
WARM MACHINE WASH  
WITH SIMILAR COLOURS  
DO NOT BLEACH  
DO NOT USE  
FABRIC SOFTENER  
DO NOT TUMBLE DRY  
WARM IRON ON REVERSE  
SIDE IF REQUIRED  
DO NOT IRON PRINT  
DO NOT DRYCLEAN ☒

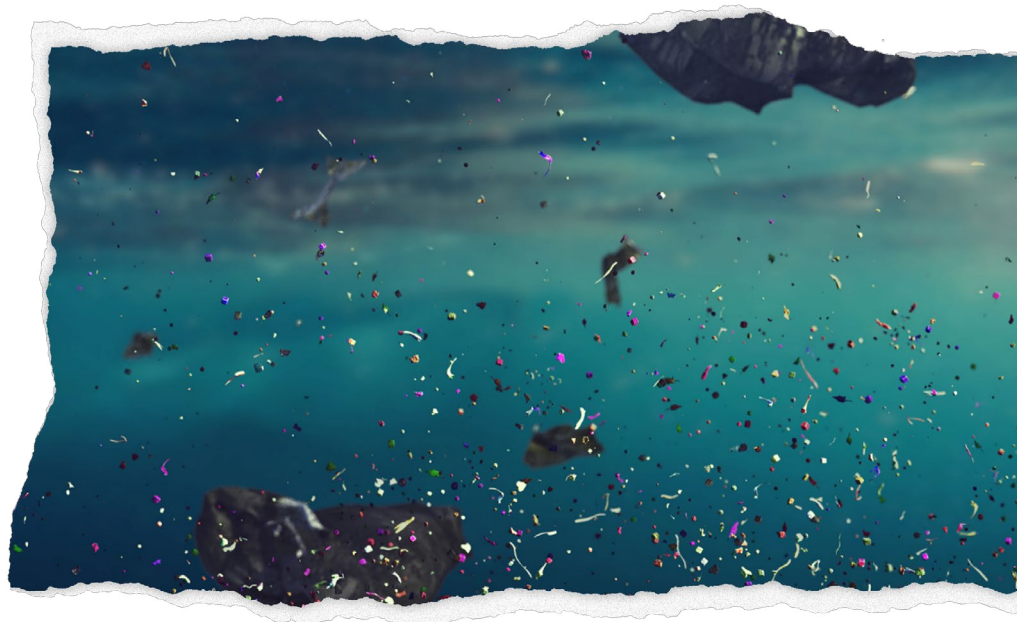
## PART 4

# What Happens as We Wear, Wash, and Discard Plastic-Based Clothes

The story of plastic in our clothes is miserable from the word “go.” But one of the saddest chapters of that story often flies under the radar: the chapter on what happens as we wear, wash, and discard plastic-based clothes.

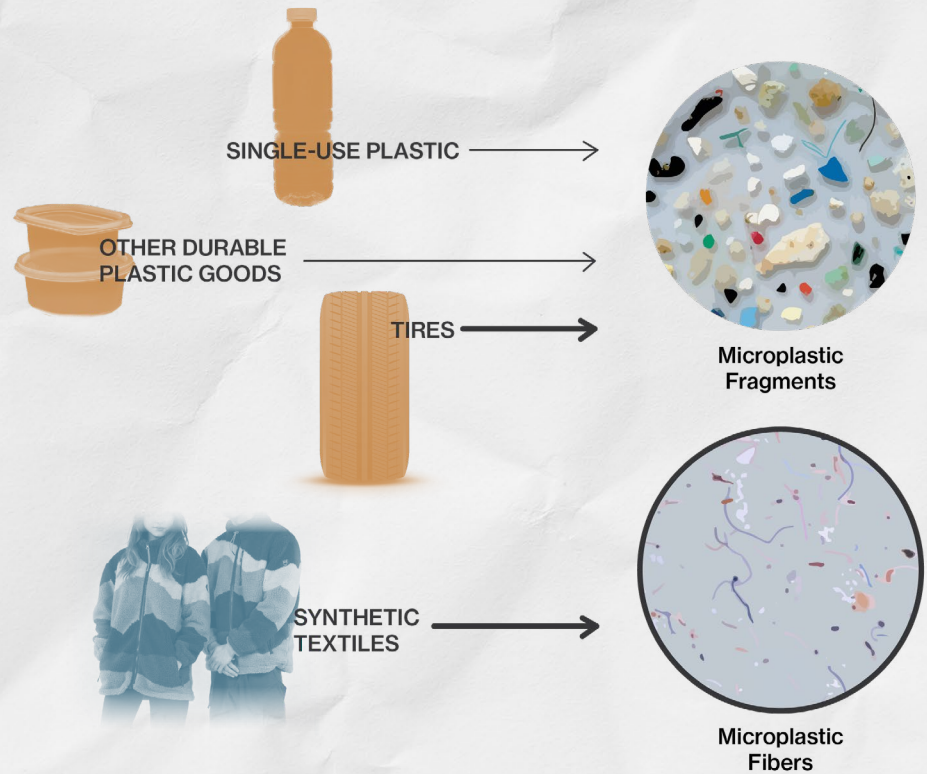
One major concern about plastics in clothes lies in the proliferation of microplastics, which are plastic pieces smaller than 5 millimeters but often microscopic. While many people know that microplastics can result from the breakdown of larger plastic (macroplastics) and tiny plastic spheres used in manufacturing and personal care products, most people don’t realize that a **majority of microplastic pollution is fiber**, primarily derived from clothing and textiles. These small plastic particles travel through our air, soil, and waterways.

Why are microplastics in our environment such a huge problem? First, they’re easily ingestible by many organisms thanks to their small size, and ingestion of the chemicals in microplastics can lead to serious health problems. Microfibers are also capable of adsorbing additional harmful pollutants. Because some of the smallest members of our food chain ingest these toxic chemicals, and because microplastics are floating in the air and water around us, avoiding the effects of microplastic pollution is extremely difficult.



# How Larger Plastic Items Degrade Into Microplastic Particles

Textiles made from plastic fibers are responsible for microplastic fiber shedding at every stage of their lives: when they're worn, washed, and disposed of.



**A primary source of microplastic pollution is synthetic fibers, produced and promoted by the apparel and textile industry.**

Textiles made from plastic fibers are responsible for microplastic fiber shedding at every stage of their lives: when they're worn, washed, and disposed of. These microplastics enter the air we breathe, the water we drink, and the food we eat. They've been found in some of the deepest depths of the ocean, in the placentas of unborn babies, in Arctic snow and Antarctic ice, in human blood, in deep tissue of human lungs, and in our rainwater. In fact, all plastic that has ever been manufactured (unless toxically incinerated), is still present within our Earth's biosphere and ocean.<sup>13</sup>

A study of microplastic pollution around the North Pole recently found that more than 73% of microfiber pollution can be traced back to polyester fibers that resembled PET from textiles.<sup>14</sup>

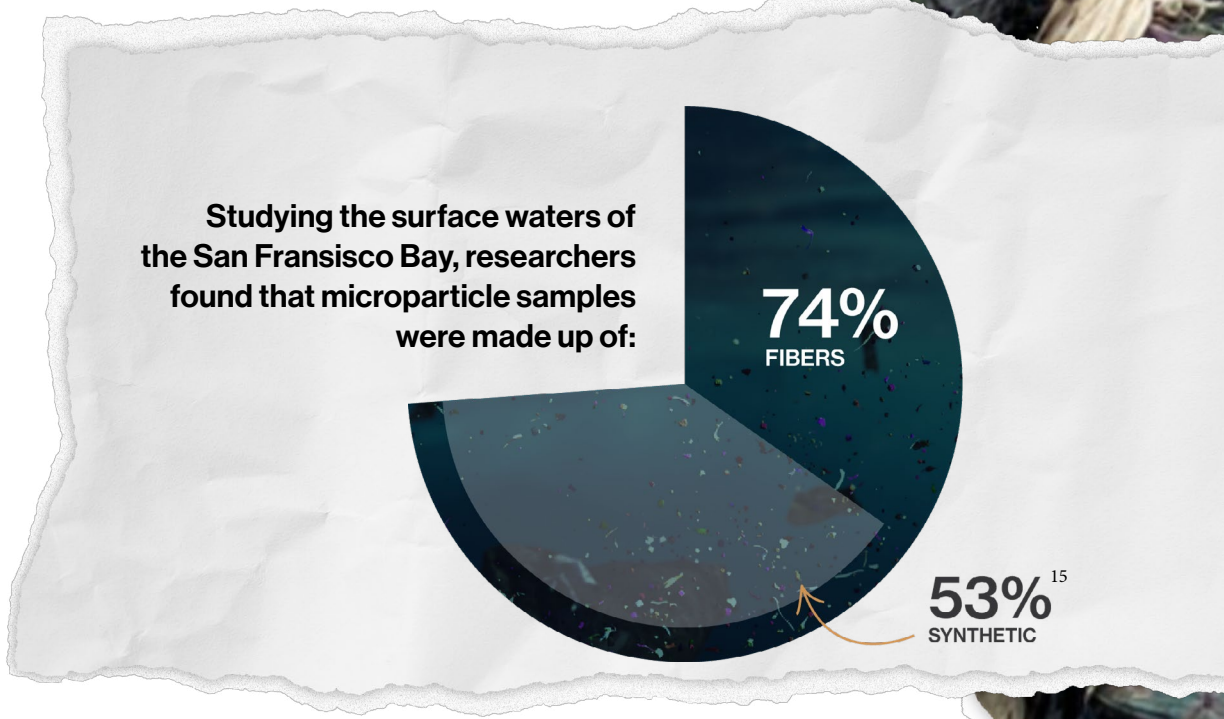
As mentioned above, PET (polyethylene terephthalate) is the chemical name for polyester, and it is also a clear, strong plastic used in food and beverage packaging. The increasing popularity of recycled polyester made from plastic bottles and sold as a "sustainable" textile material has led to vast amounts of microplastic pollution.

**Transforming a plastic bottle into an abradable textile immediately begins to transform that plastic into microplastic pollution — much faster and more widely dispersed than would happen otherwise. Additionally, recycled polyester has been shown to emit more microplastics than virgin polyester.**

Because textiles made from recycled plastic can't be recycled further (mixed fiber composition and lack of actual technological capacity make this essentially impossible), they all eventually enter our waste streams, doing damage along the way. As Veronica Bates Kassatly and Dorothee Baumann-Pauly report in [The Great Greenwashing Machine Pt. 2](#): "Mountains of waste are being generated in the global south by second-hand polyester clothing exported from the global North in the guise of 'recycling.' Chile and Ghana are prime examples." Beyond recycled-plastic textiles, enormous amounts of garments discarded by Western nations — many of them containing plastic — are shipped to other countries for disposal. In Accra, Ghana, 15 million used garments are imported weekly. ([Watch a conversation featuring Abena Cynthia Agyeibia, a textile retailer at the Katamanto Market in Accra.](#)) With no feasible way to sell or re-use all of this clothing, most of it ends up choking the land and waterways, while synthetic fibers break down and release plastic microfibers.

We often see synthetic fiber and textiles underemphasized when it comes to conversations about the systematic shifts required in the clothing industry to start truly addressing the microplastic pollution crisis.

However, there is a growing movement of individuals, brands, and organizations recognizing the threat of microplastics, and specifically evaluating consumer, brand and policy choices in order to combat this challenge. Synthetic fibers and textiles are one of the main sources of microplastic pollution, making the choice an easy one.

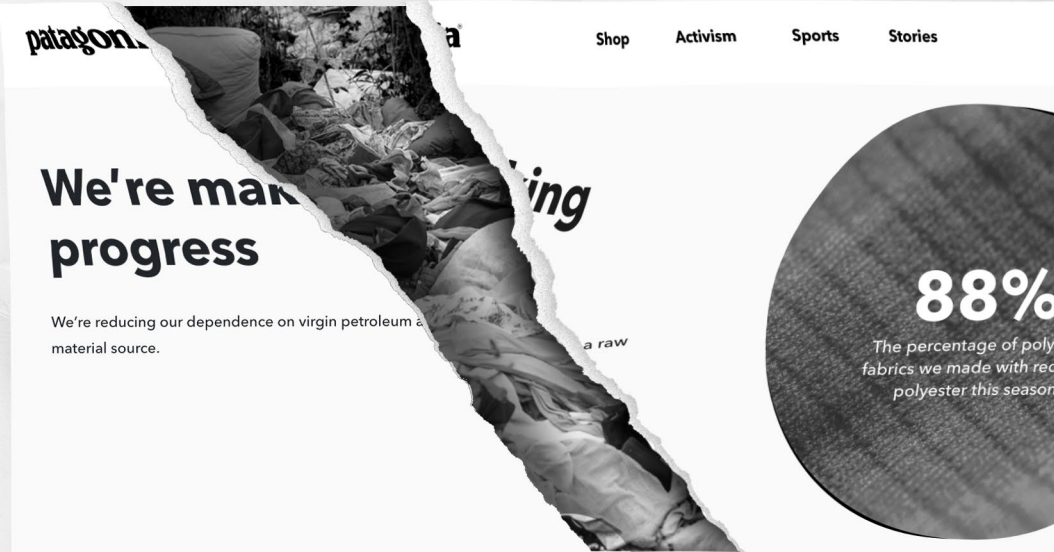
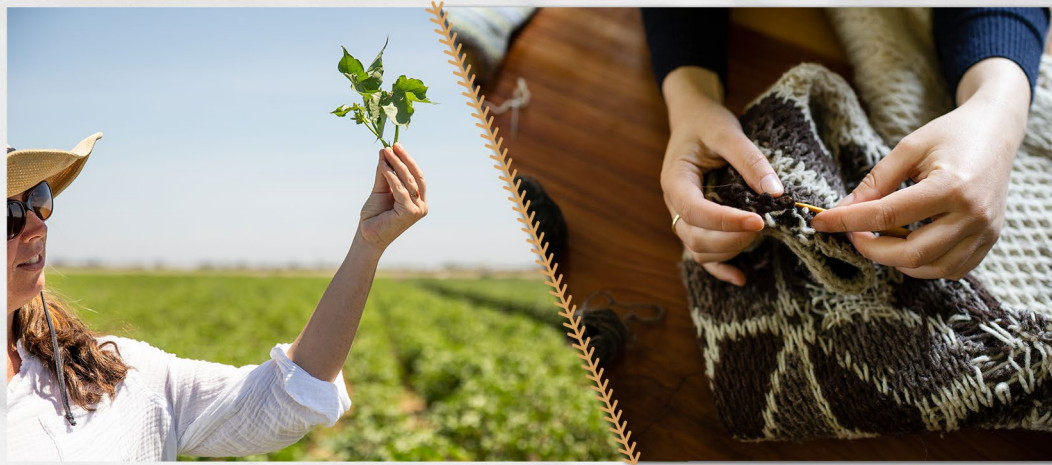


## PART 5

# Solutions: The Good & The Bad

While the hidden story of plastic in our clothes doesn't have the happiest of endings — yet! — we can each take steps toward abstaining from plastic-based clothes and holding the powers that be accountable for change.

First, it's important to note that some leaders and brands are touting solutions that aren't so great. Let's get past these **false solutions** before we move on to the good stuff.



## FALSE SOLUTIONS

### Recycled polyester or rPET

Recycling single-use plastics into polyester seemed like a fantastic idea before we understood how prevalent and damaging microplastic pollution would be. In addition, recycled polyester sheds microfibers at a higher rate than virgin polyester when it's used, worn, and washed. Moreover, the way rPET is produced and used makes it difficult or impossible to recycle for future uses.

### Fibers that claim to be eco-friendly but aren't

Proponents of **rayon and bamboo** fiber, for example, claim the material is environmentally conscious because it's made from plants. In reality, the cellulose used to manufacture rayon is often derived from threatened forests, and the chemical process used to create rayon and bamboo fibers is so toxic that they can only be manufactured outside of the U.S. due to government regulations.

## Engineering synthetic textile structures

Some leaders have suggested that solving the microfiber problem could come down to engineering fibers and textiles that don't shed as readily. Sure, that type of advancement could provide some mitigation given the overuse of synthetic fibers right now, but the continued use of synthetic textile products in any form will inevitably lead to eventual degradation into the environment. Why not focus technical textile capacity on enhancing the performance of biodegradable natural fiber materials to eliminate the need for synthetic fibers in most applications? We need investment in fiber and textile systems that cycle naturally from soil to soil without producing harmful impacts and byproducts. If we don't invest in strengthening and developing these systems now, we won't have the option of true solutions.

## Better washing machine and dryer filters

Washers and dryers that filter microplastics out of wastewater have become a favorite solution of some environmental advocates. We find this idea to be a bit of a distraction, and effective filtration is proving difficult to implement. As synthetic textiles shed microfibers at all times — not just when they're being washed — focusing too heavily on filters is a red herring that pulls the public's attention away from getting to the root of the problem.

Clever marketing tactics used by some of the world's most popular "transparent" fashion brands have the ability to convince customers that they're purchasing an environmentally friendly item, when the truth is very different. Before getting duped by these brands (including Patagonia and H&M), we recommend reading a bit more about what "sustainability" and "transparency" mean to them.





## READY TO MAKE REAL CHANGE?

**Here are some steps we can take to decrease plastic's chokehold on the apparel industry:**

### **Learn to mend clothing.**

Reduce your overall consumption of clothing and textile products. Overproduction and overconsumption driven by abundant and cheap plastic fibers feed the root of the fashion industry's human rights and environmental offenses. Want to extend the life of your favorite garment? [Learning to mend can be a game-changer.](#)

### **Buy less and wear natural fiber products.**

Only shop for new items when absolutely necessary. When you do make textile purchases, buy and wear natural fiber products, especially [those originating from land-based production systems that are working to restore](#) and build ecosystem and soil health.

### **Take care when planning your laundry day.**

Care for clothing gently to prolong its life and reduce ongoing microplastic emissions: wash clothing less often, use gentle cleaning products, cold water, and hang to air dry. ([Find some helpful tips starting on page 3 here.](#)) Research on laundry systems around the world has shown that natural fiber clothing requires less frequent washing.

### **Support government policy changes.**

Support development of government policies requiring greater transparency about textile and fashion system impacts on labor, environment, and communities; including Extended Producer Responsibility (EPR) programs that address microplastic emissions and plastic waste from synthetic textiles. Policy reform is necessary to level the playing field for natural fibers in the global textile system.

### **Support public investments.**

Support public investments in [healthy natural fiber production systems](#) and in rebuilding the natural fiber industry's regional and domestic processing infrastructure, including financial, technical, and regulatory support.

### **Find your local Fibershed Affiliate**

Find [your local Fibershed Affiliate](#) and get involved to help grow regional natural textile systems that support community and ecosystem health.



# Resources and References

- 1 [Fashion's tiny hidden secret | UN Environment Programme](#)
- 2 [Oil & Gas Threat Map](#)
- 3 [How Plastic Pollution is Being Woven into Fast Fashion Culture | New Security Beat](#)
- 4 [Making Climate Change Fashionable - The Garment Industry Takes On Global Warming | Forbes](#)
- 5 [The Plastics Pipeline: A Surge of New Production Is on the Way | Yale Environment 360](#)
- 6 [Microfibres from apparel and home textiles: Prospects for including microplastics in environmental sustainability assessment | Science Direct](#)
- 7 [The Gulf Oil Disaster and the Future of Offshore Drilling | National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling](#)
- 8 [Plastic in Fashion Through the Decades | Plastics Make It Possible](#)
- 9 [Materials Index: Polyester | CFDA](#)
- 10 [Preferred Fiber & Materials Market Report 2021 | Textile Exchange](#)
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- 12 [Fash Fashion's Plastic Problem | RSA](#)
- 13 [Production, use, and fate of all plastics ever made | ScienceAdvances](#)
- 14 [Pervasive distribution of polyester fibres in the Arctic Ocean is driven by Atlantic inputs | Nature Communications](#)
- 15 [7 Trillion Microplastic Particles Pollute the San Francisco Bay Each Year | WIRED](#)

## PHOTO CREDIT:

Paige Green (p. 1, 3, 15, 17, 19)  
Or Foundation (p. 14)



# FIBERSHED

Local Fiber, Local Dye, Local Labor

## **We develop regional fiber systems that build soil & protect the health of our biosphere.**

Our Mission: Fibershed is a non-profit organization that develops equity-focused regional and land regenerating natural fiber and dye systems. Our work expands opportunities to implement climate beneficial agriculture, rebuild regional manufacturing, and connect end-users to the source of our fiber through direct educational offerings. We are transforming the economic and ecologic systems that clothe us to generate equitable and climate change-ameliorating textile cultures.

## **We encourage you to learn more and join us!**

- [Visit Fibershed online to learn about what we do.](#)
- [Discover Fibershed producers and learn how to join the community.](#)
- [Learn about fibersheds throughout the world, and find one in your region.](#)
- [Support our Carbon Farm Seed Fund to support our community in restoring the land, harmonizing the carbon imbalance, and producing right livelihoods within a regenerative fiber system.](#)
- [Attend an event hosted by Fibershed or one of our partners.](#)
- [Read articles and stories from within the Fibershed community.](#)

