

The Shocking Environmental and Human Health Impacts of Fabric and Leather Industries

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STORY AT-A-GLANCE

- › Each year, an estimated 80 billion garments are sold worldwide, and each year, Americans alone throw away 15 million tons of clothing – most of it having been worn just a few times
- › The “disposable clothing” trend completely disregards the toxic toll each garment takes on environmental and human health throughout the manufacturing and distribution processes involved in its creation
- › Leather tanning is a chemical-heavy process typically relegated to impoverished developing nations that lack toxic waste management regulations
- › The Buriganga River in Bangladesh has turned black from the toxins released from the Dhaka tannery district, as has the local river in Xintang, China, thanks to the denim industry, which dumps untreated dye water into it
- › In Pakistan, the fourth-largest cotton producer in the world, the cotton industry has polluted much of the groundwater, rendering it unsafe to drink

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Inexpensive clothing has become a serious pollution problem in more ways than one. Each year, an estimated 80 billion garments are sold worldwide, and each year, Americans alone throw away 15 million tons of clothing¹ – most of it having been worn just a few times. This is a trend that completely disregards the toxic toll each garment

takes on environmental and human health throughout the manufacturing and distribution processes involved in its creation.

Organic cotton, which is more sustainable, accounts for a mere 1% of the cotton grown across the globe. Sustainable **plant dyes** account for an even smaller portion of the global garment industry.

Great benefits could come from expanding the organic cotton and natural textile dye industries. Natural materials such as leather also have significant downsides. Leather processing has become incredibly chemical-intense, poisoning areas where locals are already struggling with widespread poverty and pollution.

The Toxic Side of Leather Tannery

The short video above by Daniel Lanteigne shows the impact the leather processing industry has had in Dhaka, Bangladesh, a country that has no regulations on toxic waste management. More than 20,000 people work and live in the Hazaribagh tannery district, where toxic chemicals from 200 tanneries flow freely through the open sewers lining the city streets. The Buriganga River has turned black from the toxins, and mounds of discarded leather scraps line its banks.

Yet people still use the river for clothes-washing and bathing on a regular basis. As one would expect, skin ulcers, respiratory problems and chest pains are common health complaints in the area. As noted in the video, "market profitability is causing both the government and the tanners to turn a blind eye to the environmental consequences and health hazards."

Bangladesh also does not regulate workers' conditions. Few, if any, are given any kind of protective gear and are in direct contact with the chemicals on a daily basis. Most tanneries do not even have ventilation or indoor lighting. Child labor is also commonplace and unregulated.

Garment Industry Poses Serious Threat to Waterways

An article by Heather Pringle and Amorina Kingdon in Hakai Magazine² highlights how the fashion industry is impacting waterways around the globe. Commenting on the leather industry, Pringle and Kingdon write:

"To transform perishable animal skin into durable leather, factory workers soaked animal hides in a series of toxic baths containing nearly 40 different acids and several heavy metals including chromium, a known carcinogen. The hides absorbed just 20 percent of these chemical brews: the rest was waste.

In all, Dhaka's tanneries discharged nearly 22,000 cubic liters of toxic effluent daily into the Buriganga River, which ultimately flows into the Bay of Bengal ...

Faced with an environmental disaster along the floodplain of the Buriganga River, the Bangladeshi government forced Dhaka's leather factories to move to a new industrial park in 2017, and it has promised to install an effluent treatment plant there. But the opening of the plant was delayed, and in February, residents raised fears that the transplanted tanneries were contaminating a second river, the Dhaleshwari."

Toxic runoff from cotton growers also poses a serious threat to water quality. In Pakistan, the fourth-largest cotton producer in the world, the cotton industry has polluted much of the groundwater, rendering it unsafe to drink. Cotton also gobbles up 20 trillion liters (5.28 trillion gallons) of the Indus River's precious water each year.

As a result of widespread water mismanagement, the Indus River now faces the same fate as the [Aral Sea](#), situated between Kazakhstan and Uzbekistan, which has been nearly drained for irrigation, obliterating the once-thriving fishing economy in the area. Aral Sea fishermen of old used to catch 40 tons of fish per year. Today, the area is littered with fishing vessels lying on dry land, and what used to be a thriving seaport is now nearly 50 miles (80 kilometers) from the water's edge.

US Tannery Waste Linked to Polluted Drinking Water

The toxic nature of leather tanning is equally evident in the U.S. In Michigan, fluorinated chemicals have polluted the municipal drinking water in Kent County. The source was traced back to the Wolverine World Wide tannery in Rockford, which disposed toxic sludge at the State Disposal Landfill in the mid-'60s. As reported by MLive.com:³

"Wolverine once made the iconic Hush Puppies shoe brand in Rockford using Scotchgard, a stain and water repellent that relies on per- and polyfluoroalkyl substances known as PFAS, (also called perfluorinated chemicals, or PFCs) as its chemical backbone. PFAS compounds were found in Plainfield Township water in 2013. The system serves about 40,000 customers ...

Kent County records state explicitly that Wolverine dumped sludge at the landfill during the years Tefft says he drove it there. Tefft, a former driver for Bell Pick-Up service, says he transported tannery sludge for 13 months in 1965 and 1966 from Wolverine to the landfill ...

Tefft also drove sludge to a former Wolverine dump site on House Street NE, where a plume of PFAS compounds are polluting private drinking water wells in Belmont. The Belmont contamination was just discovered this spring ... Both PFOS and PFOA are also present in House Street wells."

The Downsides of Denim and Synthetics

Denim — a cultural staple in the Western world — and modern synthetic textiles are also problematic. Most denim produced today is dyed using synthetic indigo dye made from fossil fuels. The faded "stonewash" look also typically involves the use of toxic chemicals. And, most leather tanneries and denim factories tend to be located in the developing world, where regulations and environmental protections are less stringent, if not nonexistent.

One of the largest denim producers in the world is located in Xintang, China, in the Pearl River Delta. Like the Buriganga River in Bangladesh, the local river in Xintang has turned black from the denim industry, which dumps untreated dye water into it. Greenpeace

tests reveal nearly 80% of water and sediment samples collected around Xintang and neighboring Gurao contain heavy metals.

Meanwhile, scientists now warn that **synthetic fabrics** such as acrylic, polyester and fleece shed microfibers when washed, and these microfibers end up threatening marine and human life alike by entering the ecosystem.⁴ As noted in Hakai Magazine,⁵ "... [M]icroplastics may choke zooplankton. Microfibers could then work their way up the food chain, as larger animals gobble up the plastic-stuffed zooplankton."

The fibers have also been found to cause starvation in crabs. Microfibers are used in more than 60% of all clothing made today, making the fashion industry a surprisingly significant source of plastic pollution in addition to chemical pollution.

Man-Made Fibers Pollute Fish Stocks

A 2015 study from the University of California, Santa Barbara (UCSB) directly linked plastics and man-made fibers to the pollution in fish.⁶ **Microfibers**, which are more prevalent than microbeads (found in face scrubs and similar items), are particularly dangerous as the fibers are easily consumed by fish and other wildlife, accumulating in the gut and concentrating in the bodies of other animals higher up the food chain.

Textile fibers are found in both marine and freshwater fish. When Abigail Barrows, former chief investigator for Global Microplastics Initiative, sampled over 2,000 marine and freshwater fish, 90% had microfiber debris in their bodies.

High concentrations of acrylic and polyester fibers are also found in beach sediment near waste water treatment plants.⁷ Making matters worse, these microscopic plastic fibers soak up toxins like a sponge, concentrating **PCBs**, pesticides and oil in ever higher amounts as you move up the food chain.

According to a PBS NewsHour report,⁸ which featured Barrows' research, 300 million microfibers from washed clothing enters the Atlantic Ocean via the Hudson River in New York each day. Remarkably, microfibers also enter our environment via air and rainwater.

Rainwater samples reveal up to 10 tons of microfibers descend upon the 1,098-square-mile region surrounding Paris, France, each year. According to urban hydrologist Bruno Tassin, University of Paris-Est, clothes shed fibers not only during washing, but during daily wear as well!⁹

The Dirty Side of Clean Clothes

Once you begin investigating the garment industry, you come to the sober realization that clothing is taking a severe toll on environmental and human health from start to finish, beginning with the toxic chemicals applied to cotton fields, continuing all the way through textile dyeing and tanning of leather, manufacturing, transportation, washing and, ultimately, disposing of each garment.

Following are some of the ways the simple everyday act of washing your clothes contribute to environmental pollution:

Flame-retardant chemicals — Worn against bare skin, such items could be a source of toxic exposure, but even in the best-case scenario, these items contribute to water pollution when washed, and flame retardants do not break down into safer chemicals in the environment.

They may travel great distances from the point of origin, accumulate in people and animals in the food chain and have long-term toxic effects.¹⁰ Exposure to these chemicals at a critical point in development may damage your reproductive system and cause deficits in learning,¹¹ memory, motor skills and behavior. Some have also been identified as carcinogenic.¹²

PFOA/PFOS — Virtually any garment promising to be stain- or water-resistant also contains hazardous chemicals such as **PFOA** and/or PFOS. Last year, Tennessee Riverkeeper filed a lawsuit against 3M Company under the U.S. Resource Conservation and Recovery Act after PFOA, PFOS and related chemicals were found in the Tennessee River's Wheeler Reservoir.

The suit "seeks to compel the immediate and thorough cleanup of the contaminants," according to EcoWatch.¹³ The U.S. Environmental Protection Agency has a safety level of PFOA/PFOS in drinking water of 0.07 parts per billion. Levels in the Tennessee River near the 3M site were found to be between 50,000 and 70,000 times higher than the EPA's safety advisory for these chemicals. As reported by EcoWatch:

"As even minimal exposure to PFOS and PFOA is linked to a variety of lethal health hazards, there exist virtually no safe levels of the chemicals in the environment.

Research strongly indicates PFOA and PFOS are potent carcinogens and they have also been tied to birth defects and adverse effects on childhood development, significantly decreased immune system function, liver tissue damage and a host of other serious health problems ...

'We don't mind 3M making profitable products – but, we cannot tolerate the defendants putting profit ahead of the health of people, the environment and the river,' David Whiteside, Tennessee Riverkeeper's founder and executive director, said."

Phthalates – While not typically associated with clothing, a pilot study found that cotton and polyester fabrics pick up both flame-retardant chemicals and plasticizers, such as phthalates from indoor air.¹⁴ Phthalates are chemicals used to make plastics more pliable.

They leach out from the plastics as the product ages, and are toxic to you and the environment.¹⁵ Phthalates have carcinogenic effects and affect reproduction¹⁶ and development.¹⁷ When clothing carrying the chemicals is washed, the chemicals enter wastewater and are released into the environment.¹⁸

Microfibers – Each washing of a synthetic fleece jacket releases 1.7 grams of microfiber. The older the jacket, the more microfibers are released.¹⁹ Tests reveal

acrylic fibers release the most microparticles.²⁰ Up to 40% of these microfibers leave the wastewater treatment plant and end up in the surrounding lakes, rivers and ocean.

To address the problem, scientists are calling for appliance companies to investigate the effectiveness of adding filters to catch the microfibers.²¹

Different types of machines may release different amounts of fibers and chemicals from your clothes, poisoning wastewater runoff and clogging the water supply with hormone-disrupting chemicals and plastics. Research found that top-loading machines release about seven times more microfibers than front-loading models.²²

Laundry detergents – Surfactants and phosphates (the latter of which is used to soften the water and suspend dirt) are among the most destructive pollutants, contributing to algae overgrowth and fish die-offs.

According to a report by Mother Earth News,²³ sodium nitrilotriacetate (NTA, an organic nitrogen compound) and organic polyelectrolytes could be used as substitutes for phosphates. Both are believed to be biodegradable, and overall would pose far less of a risk to the environment. Enzyme "pre-soak" stain removers may be among the worst, as they contain about two-thirds phosphate.

Fabric softeners – According to the "Guide to Less Toxic Products"²⁴ by the Environmental Health Association of Nova Scotia, fabric softeners often contain quaternary ammonium compounds, or "quats," and imidazolidinyl, both of which are known to release formaldehyde. Formaldehyde can cause joint pain, depression, headaches, chronic pain and a variety of other symptoms.

Studies suggest formaldehyde can damage your DNA and may even lead to cancer. For about 5% of people, quats are an extreme sensitizer that can cause a variety of asthma-like symptoms, and even respiratory arrest.²⁵ Fabric softeners also contain carcinogenic coal-tar dyes, ammonia and very strong fragrances.

A single fragrance can be made up of literally hundreds of chemicals, none of which have to be disclosed or tested for safety. Most are derived from petroleum products,

which means high potential for human toxicity. Fragrances are one of the leading causes of allergic reactions.

Dryer sheets – Next, you probably put your clothes in the dryer, which has its own ramifications for your health and environment. First, gas dryers exhaust contains carbon monoxide,²⁶ an odorless emission posing well-known health dangers, depending on the concentration in which it's inhaled. Consider this if your child's bedroom window is close to your gas dryer vent.

Scented dryer sheets are commonplace as well, and as your clothing dries, toxic vapors are released into your house, thereby compromising your indoor air quality – and out into the neighborhood. One study²⁷ that evaluated dryer vent emissions from 25 common brands of scented laundry products found that:

- More than 600 VOCs (volatile organic compounds) were emitted, and none of these chemicals were listed on any of the 25 product labels. However, clues to the presence of these VOCs include label listings such as "biodegradable surfactants," "softeners" or "perfume"
- Two of the VOCs are considered by the EPA to be carcinogenic (acetaldehyde and benzene) and unsafe at ANY exposure level
- Seven of the VOCs are classified as "hazardous air pollutants"
- The highest concentration of emitted VOCs was acetaldehyde, acetone and ethanol

The Road Ahead

We have a long road ahead of us, considering we need to clean up the entire supply chain – and alter public consciousness about fashion along the way. There's definitely something to be said for the **minimalist trend** where you own fewer but higher-quality items made in a sustainable way that you can wear for many years to come. To get you

started, here are some tips and suggestions for cleaning up your laundry and developing a more sustainable wardrobe:

Opt for organic cotton, hemp, silk, wool and bamboo fabrics. While such items typically cost more than nonorganic cotton and synthetics, buying fewer items will allow you to spend more on each item. On the upside, higher-quality organic items tend to last far longer with proper care, so you get your money's worth in the end.

Opt for items colored with nontoxic, natural dyes when possible. Businesses investing in organic farming and natural dyes include PACT (undergarments and loungewear), Boll & Branch (bed linens, blankets and towels), Jungmaven (organic hemp and cotton T-shirts), Industry of All Nations (clothing) and many others.

If you're just now making the transition to organic clothing, replacing your undergarments with a white undyed version would be a good place to start. Ideally, forgo color and buy items that have not been dyed.

Avoid screen-printed items, as they typically contain phthalates.

Look for the bluesign® certification,²⁸ which tells you the item has been manufactured with a minimal amount of hazardous chemicals, or none.

Avoid trademarked technical fabrics, as most are coated with chemicals that will eventually wash out.

Be mindful of when and how you wash synthetic clothing. Wash synthetic clothing as minimally as possible using a mild detergent. Line-dry instead of putting them in the dryer. The heat and agitation will break down fibers.

Handwashing or using the gentle cycle with cold water will also minimize the shedding of fibers, as will using a front-loading washing machine. Avoid fabric softeners and dryer sheets. They leave a film on the fabric that blocks the wicking ability of the fiber.

Install a microfiber filter on your washing machine.

In lieu of toxic detergents, opt for unscented, nontoxic alternatives. Soap nuts, for example, do a fine job of cleaning items that are not heavily soiled. Castille soap or Arm & Hammer Washing Soda are other DIY alternatives.

Fabric softeners are typically unnecessary, but if you feel you need it, try this DIY recipe from the Kid Feed blog:²⁹

"In a recycled gallon-sized vinegar jug, add 2 cups baking soda and 2 cups distilled white vinegar. When mixture finishes foaming, add 4 cups of hot water and essential oils (optional) to desired strength. (Try using 20 drops each of lavender and lemon.) Shake before each use, and add about 1 cup for large loads in the rinse cycle."

Dry your clothes naturally on indoor or outdoor drying racks.

If using a dryer, skip the dryer sheets. To prevent static cling, use wool dryer balls or a wad of aluminum foil instead, or simply remove your clothes from the dryer before they're completely dry. The remaining moisture helps prevent static cling. Let your clothes dry fully on a drying rack. Another trick is to launder natural and synthetic fabrics separately, as synthetics cause most of the static problems.

Sources and References

- ^{1, 2, 5} [Hakai Magazine September 26, 2017 \(Archived\)](#)
- ³ [M Live September 7, 2017](#)
- ⁴ [UT Daily Beacon September 5, 2017](#)
- ⁶ [EcoWatch September 30, 2015 \(Archived\)](#)
- ^{7, 21} [Outside June 20, 2016](#)
- ^{8, 9} [PBS NewsHour August 29, 2017](#)
- ¹⁰ [Greensciencepolicy.org, Flame Retardants](#)
- ¹¹ [Scientific American Mind, March 1, 2014](#)
- ¹² [EWG, "EWG's Tips to Avoid Flame Retardants"](#)
- ¹³ [EcoWatch June 26, 2016](#)

- ¹⁴ [Newswise.com, A Surprising Way Laundry Adds Flame Retardants to Surface Waters](#)
- ¹⁵ [Zero Breast Cancer, "Phthalates" \(Archived\)](#)
- ¹⁶ [Nytimes.com January 1, 1991](#)
- ¹⁷ [Curr Opin Pediatr. 2013 Apr; 25\(2\): 247–254., Abstract](#)
- ¹⁸ [Environmental Science & Technology 2016; 50\(17\): 9289-9297](#)
- ¹⁹ [GulfNews July 13, 2016](#)
- ²⁰ [Gizmodo September 28, 2016](#)
- ²² [Environ. Sci. Technol. 2016, 50, 21, 11532–11538, Abstract](#)
- ²³ [Mother Earth News November/December 1970](#)
- ²⁴ [Lesstoxicguide.ca, Fabric Softener](#)
- ²⁵ [Int Arch Occup Environ Health 2000 Aug;73\(6\):423-7](#)
- ²⁶ [Reviewed, "Clean Your Gas Dryer Regularly"](#)
- ²⁷ [Air Quality, Atmosphere and Health ISSN: 1873-9318 \(Print\) 1873-9326](#)
- ²⁸ [Bluesign System Certification](#)
- ²⁹ [Kid Feed Blog, Fabric Softener](#)