NTMN - 8/6/2025

Fashion is Plastic

The Role of Clothing and Textiles in the Plastic Problem

Sarah Mosher 2025

What we will talk about

1. Scope of the problem

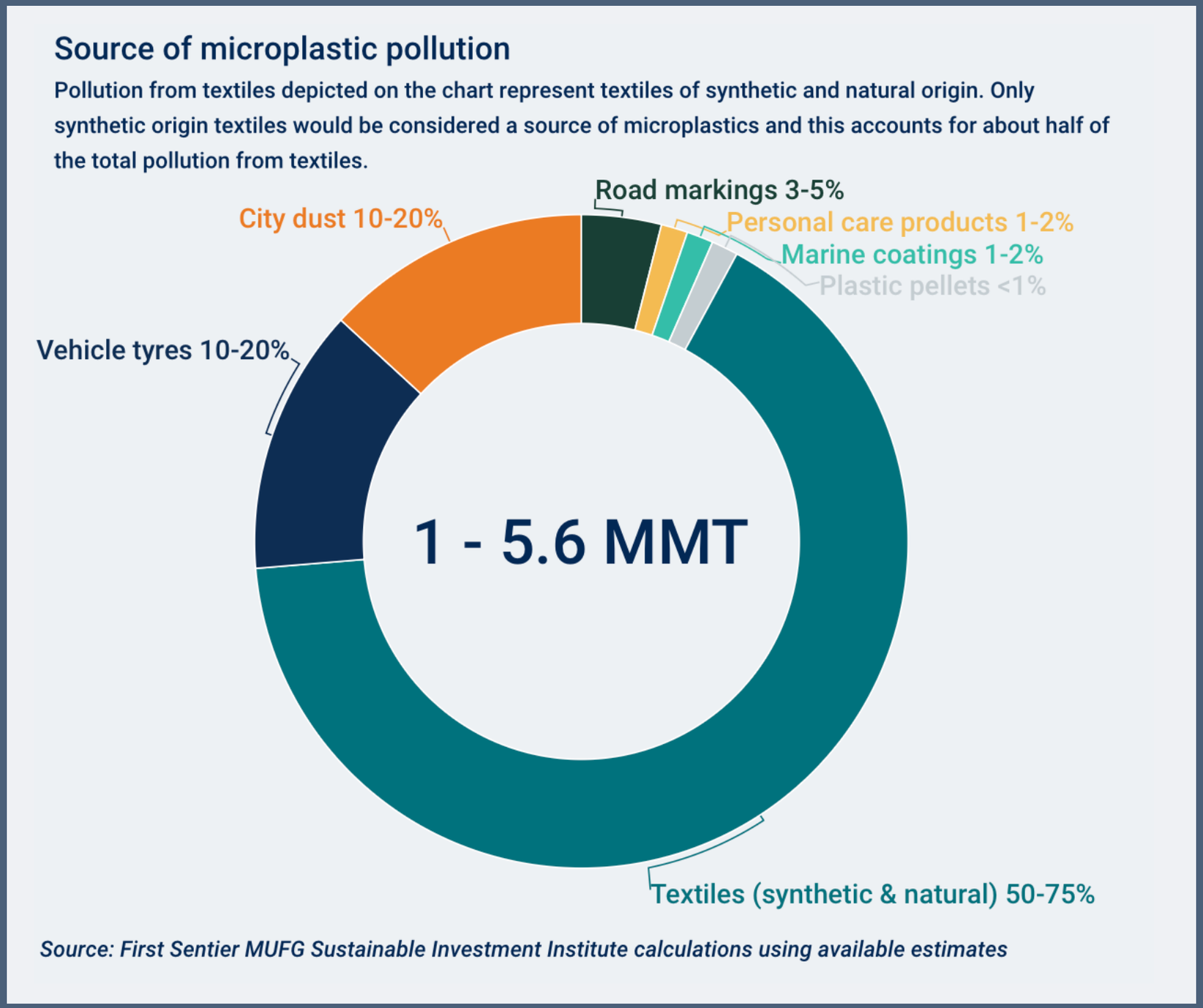
2. Specific concerns about synthetic textiles
    a. Prevalence of synthetics
    b. Chemicals inherent in synthetics
    c. Lack of end of life options

3. Individual actions to take

4. Solution wish list

The Scope of the Problem

Microplastic Sources

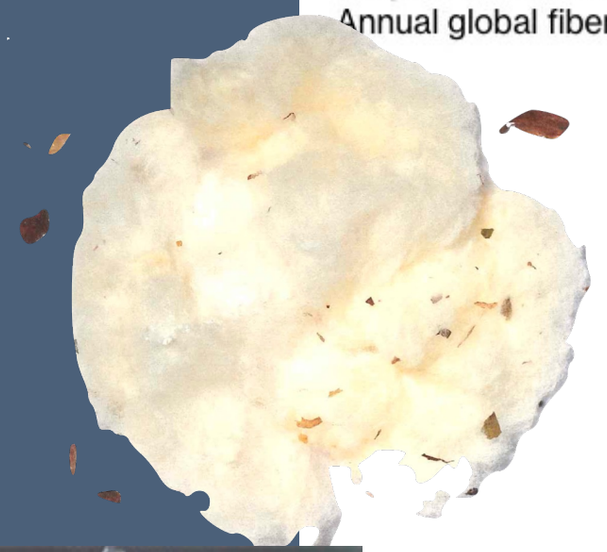


https://www.firstsentier-mufg-sustainability.com/insight/sources-of-microplastics-and-their-distribution-in-the-environment.html

Increase in petrochemical materials

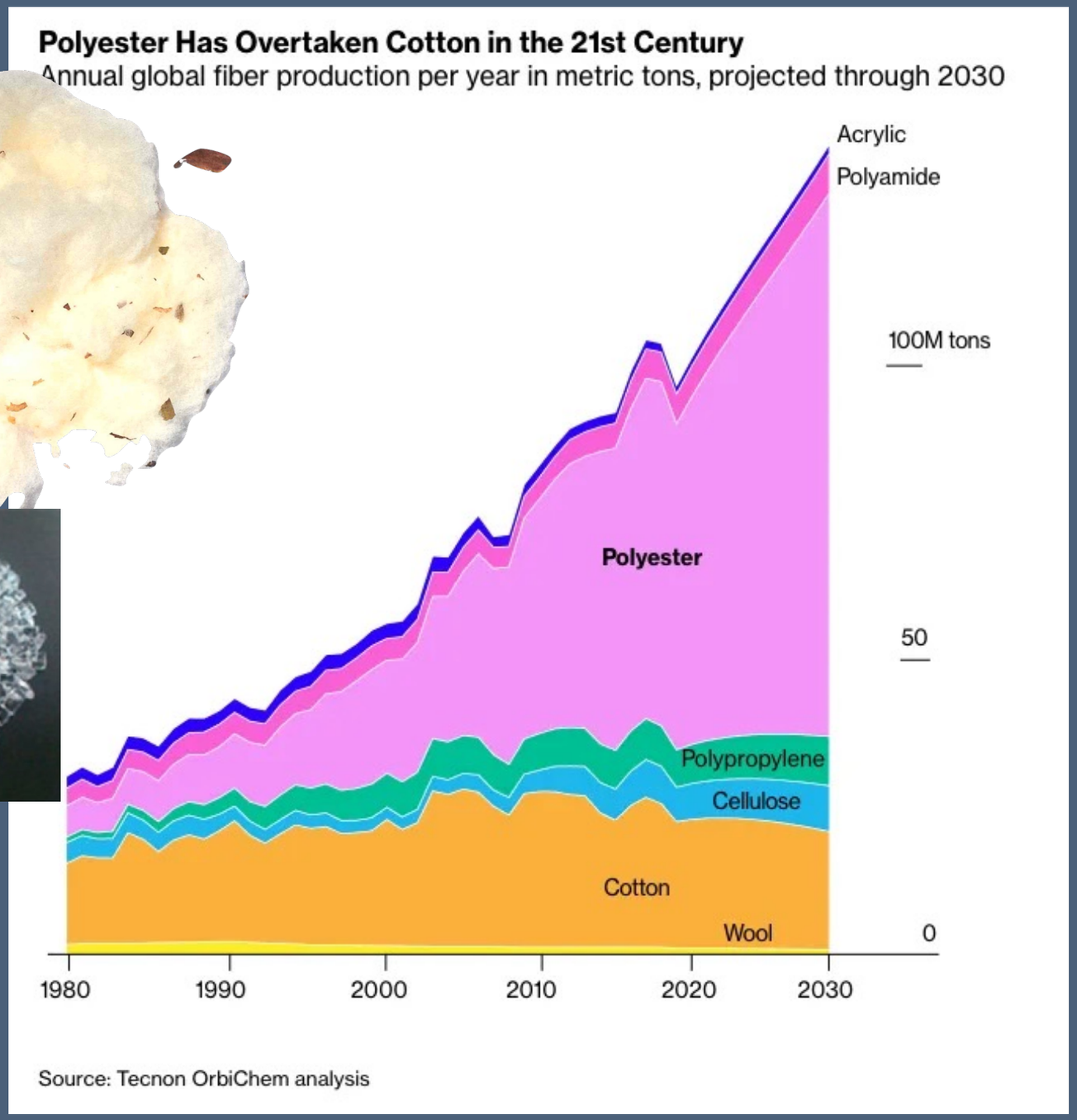
Clothing is agriculture or petrochemicals!

- Natural Fibers (Cotton, wool, silk, etc)
  - Cotton occupies 2.6% of cultivated land but uses 16% of insecticides.



- Synthetic Fibers (Polyester, Nylon, etc).

- Polyester is 57% of global fiber productio and recycled polyester use is trending down.



Specific Concerns about Synthetics

Production Methods

Raw material to textile

- Synthetics are made from oil and are products of the petrochemical industry. They face high environmental costs from extraction of the raw oil, high energy consumption in the refinement process, and large outputs of CO2 throughout.

- Water usage is a significant cost in the production process, being needed for cooling, and drawing resources from the residents who live near these production facilities.

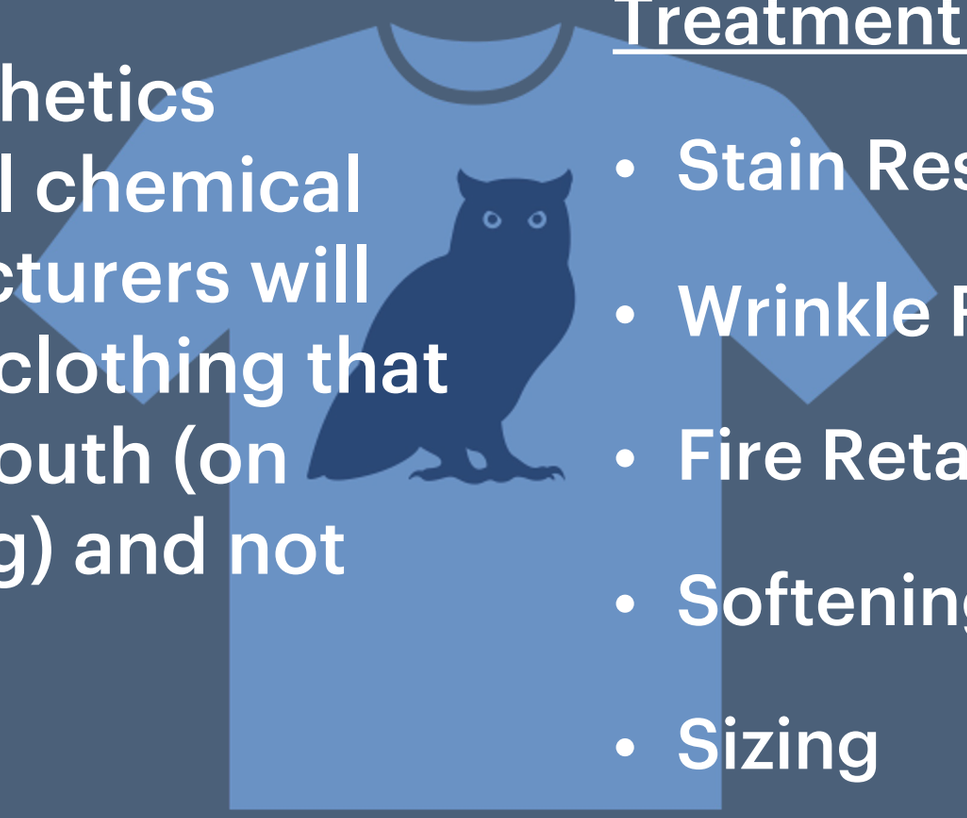
Concerns of Synthetics

Coloration with Azo Dyes

- **Dyes for synthetics can include Azobenzene (Azo) Disperse dyes which are highly toxic, and make up 70% of the 9.9 million tons of dye used annually in the fashion industry. (Overdahl et al. 2021)**
- There are no safe alternatives to these dyes as the other options are also known to have negative effects.
- Testing has shown that these chemicals slough off of clothing and end up in household dust which means we are breathing and ingesting these chemicals as well as any other contaminates in the clothing.

Décor and Treatment on Synthetics

Printing onto synthetics requires a harmful chemical process. Manufacturers will only test areas of clothing that might go in the mouth (on children's clothing) and not even always then.



<u>Treatment of Fabrics/Garments</u>

- **Stain Resistance**
- **Wrinkle Resistance**
- **Fire Retardants**
- **Softening**
- **Sizing**

Use of environmental chemicals in clothing

Chemicals are integrated in clothing in many different ways

Heavy Metals

(cadmium, lead, mercury)

Found in dyes and leather tanning

PFAS

Making clothing waterproof and stain proof

Plasticizers

(phthalates, BPA)

Found in clothing containing a polyester/spandex blend

Formaldehyde

Used to keep clothing wrinkle-free and shrink-free

Azobenzene

Found in Dyes, and applied prints

Flame Retardants

Used to fireproof clothing, especially baby clothes

When Chemicals are regulated, specific chemicals are individually regulated based on years of longitudinal studies.

New chemicals with similar properties are not regulated until scientific evidence has been produced. The default is to include the chemicals for how it can benefit the manufacture process, and to later regulate it if harm is proven.

Food and cosmetics have ingredient labels now, but clothing only mentions broad classifications of fibers (cotton, Polyester, etc) and not the specifics which would include dyes, treatments, etc)

Concerns of Synthetics

Microplastics

- Microplastics continue to release throughout the life of the textile
- Synthetic textiles will continue to breakdown into microplastic in landfills and can be carried into the environment

One piece of clothing can release 700,000 microfibers in a single wash

30% of ocean plastic pollution could come from microplastics

35% of this microplastic pollution comes from washing synthetic textiles

Daily Wear and Care

How clothing becomes part of you.

As fabrics break down they release chemicals and dyes imbedded in the fibers which can be breathed in or ingested.

Break down happens through daily wear, but accelerates through excess exposure to heat and friction.

Washing clothing after every wear, and in anything other than cold water accelerates breakdown releasing microplastics and chemicals into wastewater.

Using scented laundry products introduces additional hazardous chemicals to clothing and wastewater, most notably VOCs.

Drycleaning introduces chemicals that continue to off-gas

End of Life

Lack of Options

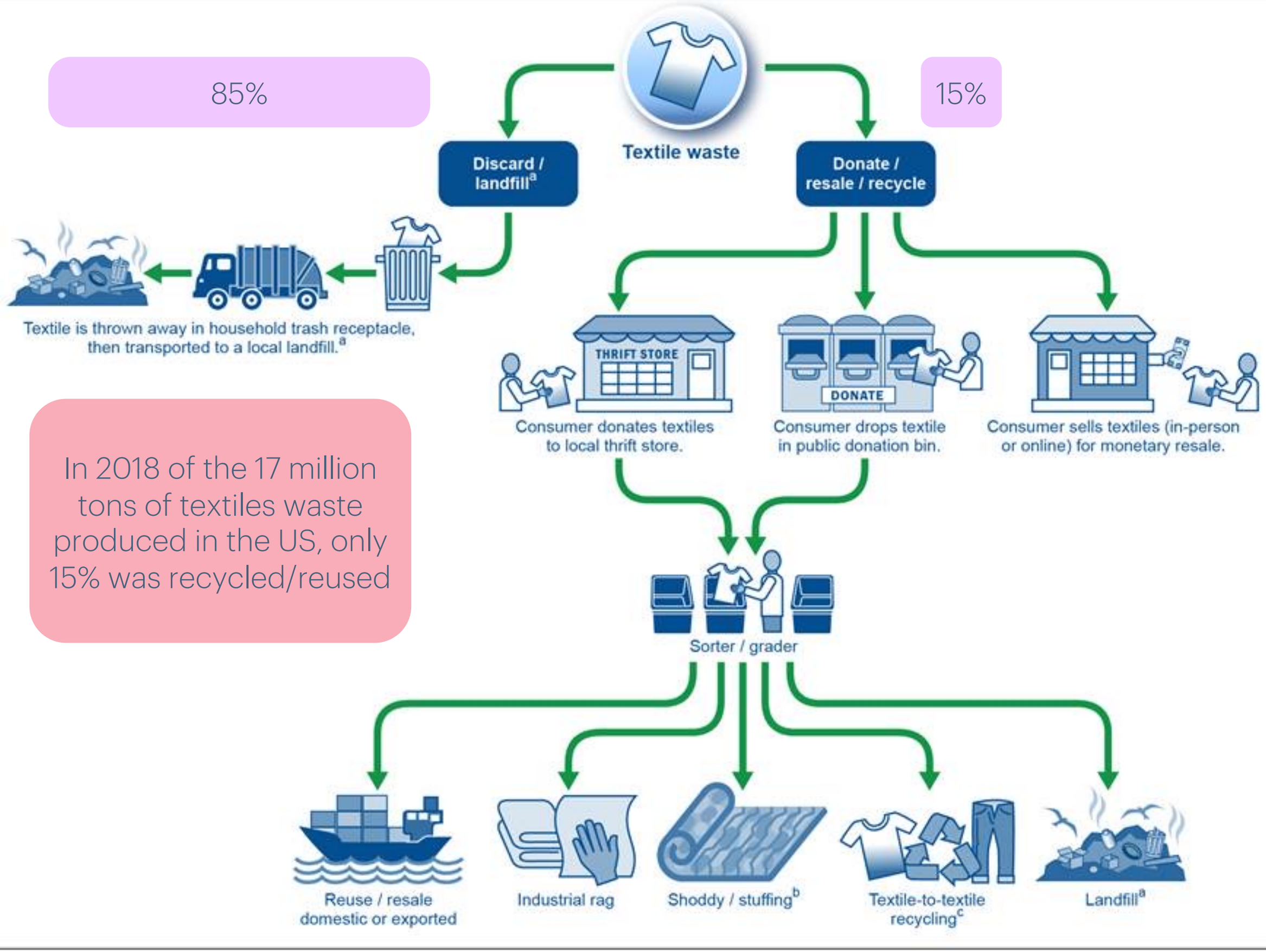
- Landfill - 85% of US textile waste
- Donation: Reuse, Landfill, “secondary Markets” which include second hand markets overseas
- Clothing specific dumping grounds (Atacama desert, Haiti, etc).
- Material to material Recycling **~1% globally**
- Decomposition time in ideal conditions:
  - Cotton (5 months)
  - Polyester (200 years)
  - Sequins and Spandex (Hundreds of years)

Photo @zeroxplastic

According to the website, State of Matter , “an estimated 11.3 million tons of textile waste ends up in U.S. landfills yearly, accounting for approximately 85% of all textiles. This equates to an alarming 81.5 pounds (37 kilograms) of textile waste per person, per year. In more tangible terms, 2,150 textile pieces are discarded per second across the country.” (As of Dec 2023)

85%

15%

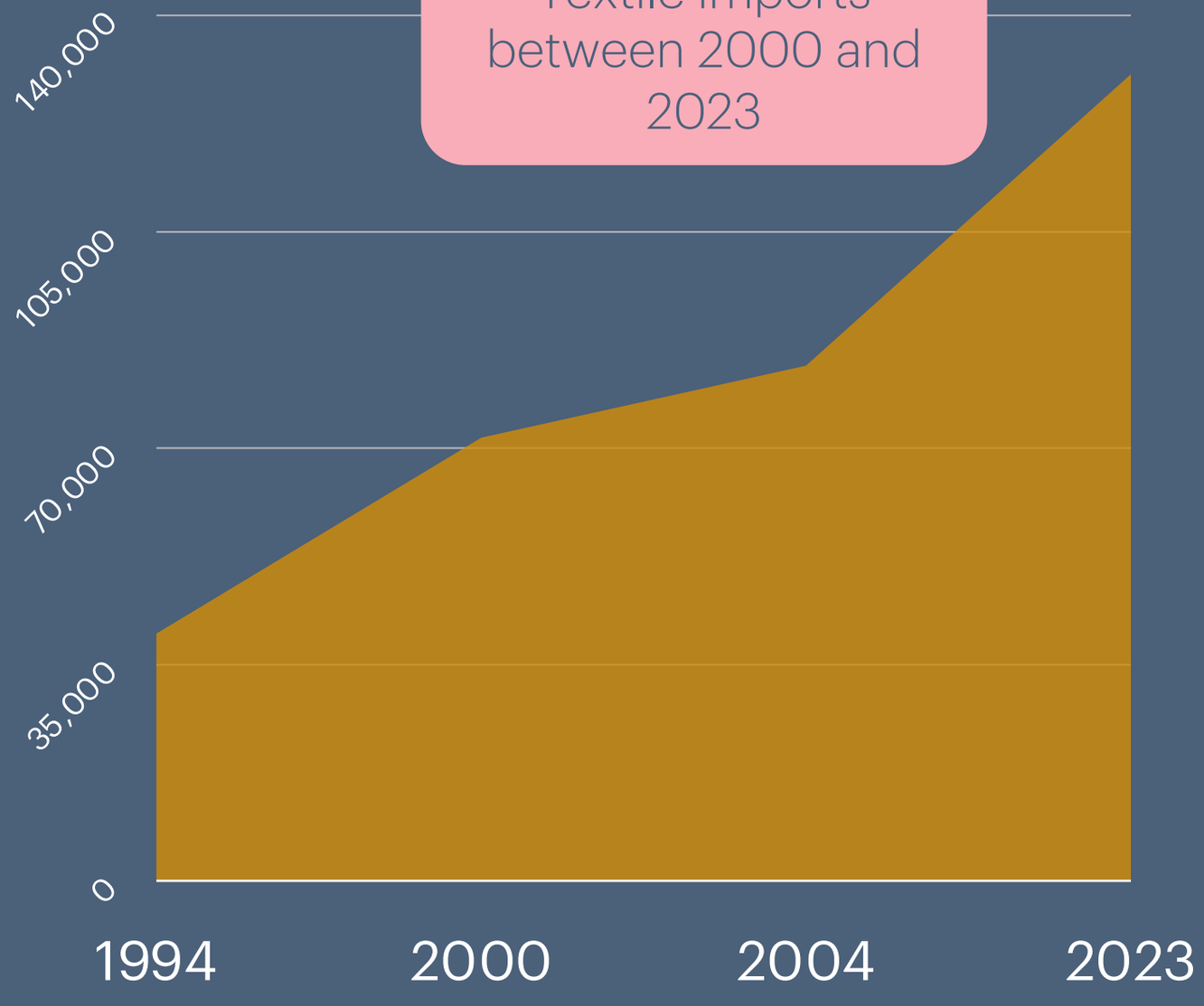


In 2018 of the 17 million tons of textiles waste produced in the US, only 15% was recycled/reused

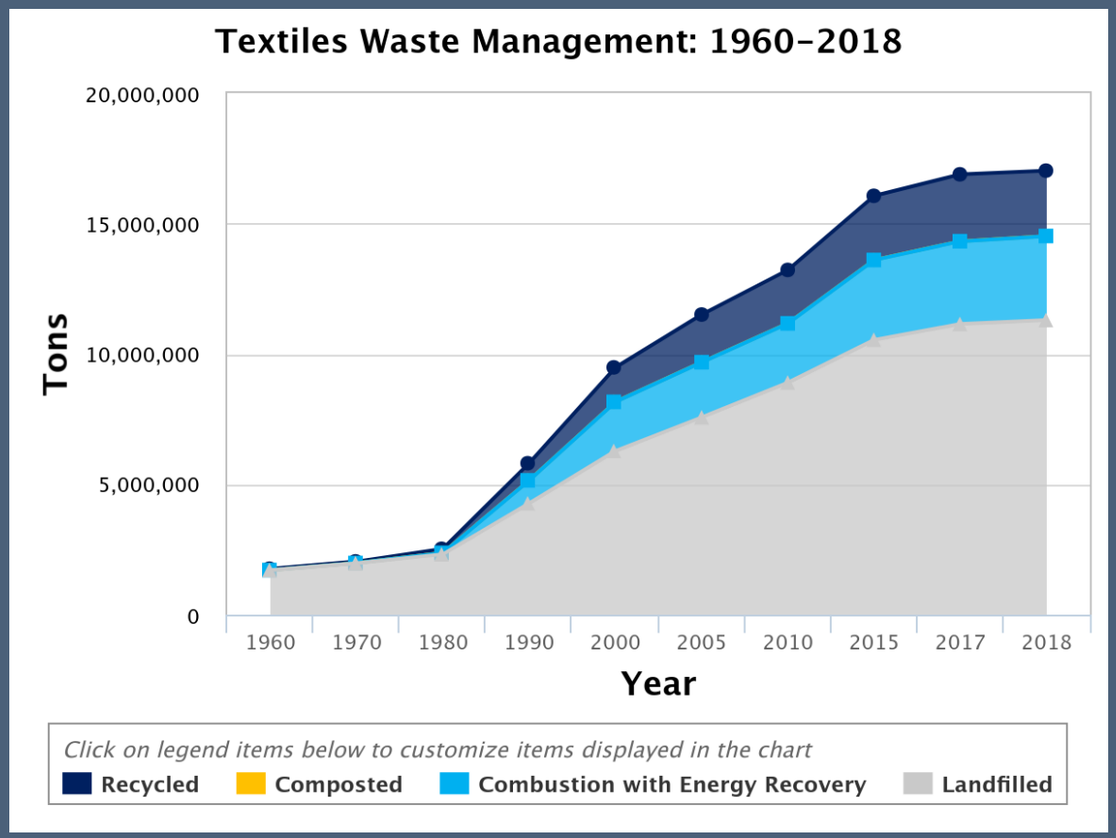
Sources: GAO adaptation of National Institute of Standards and Technology (NIST) graphic by N. Hanacek, *Textiles in a circular economy: An assessment of the current landscape, challenges, and opportunities in the United States (2022)*; GAO (illustrations). | GAO-25-107165

Consumption Driven Waste

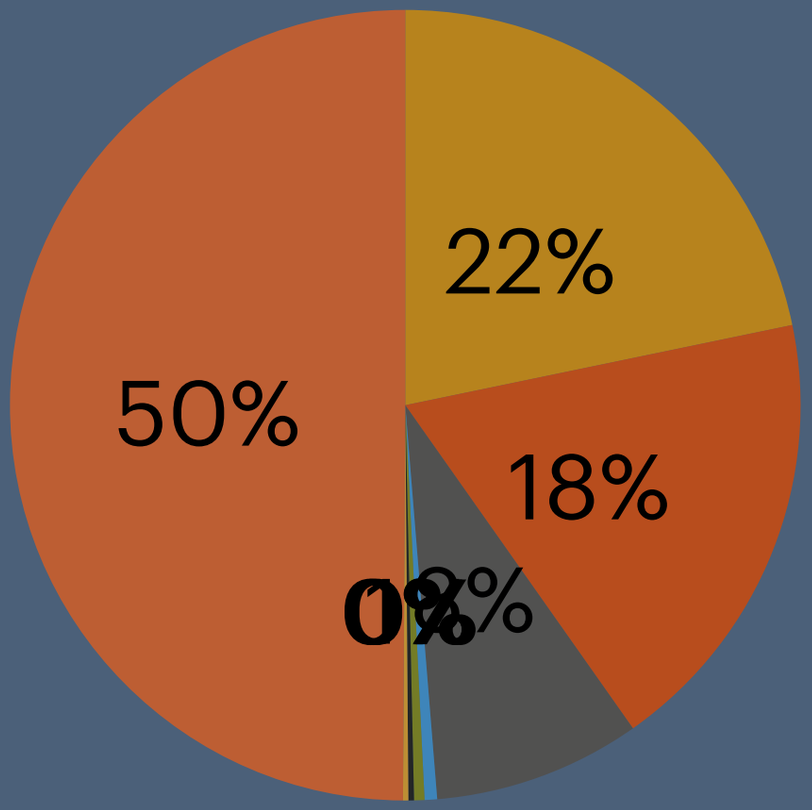
183% increase in US Textile imports between 2000 and 2023



US Textile Imports



Global Scale



- China
- US
- India
- Italy
- Germany
- France
- UK
- Remaining

BusinessWaste.co.uk

That’s a lot of waste!

Individual Actions

Your closet

Careful curation

- Reduce - Do you really need to buy that item?
- Reuse - Learn mending or find a tailor to help prolong the life of your clothing, shop second hand either in person or online, or participate in clothing swaps.
- Recycle - Donations can be matched to local organizations that need them (business attire to career closets, kids clothes to women's shelters, etc). Would you personally wear the item, or is it beyond repair? There are some places that actually recycle, but many places just bale clothing and send it overseas increasing the carbon footprint and this does not ensure re-use.

But I need new clothes!

Be intentional

- Most items of clothing are worn less than 8 times. Ask yourself, will I wear this at least 30 times? (Proposed by Eco-Age co-founder Livia Firth and journalist Lucy Seigle)
- Shop natural fibers and organic where you can, and especially for under layers
- Purchase existing items instead of new items, especially natural fibers.
- Research companies that are creating synthetic fabrics that shed less microplastic.
- Be patient with yourself, but be sure to ask the questions to build your clothing sustainability muscles.

Alternatives

Plastic alternatives

- “Vegan leather” is often plastic, but plant-based options are on the rise. Companies like BioLeather are creating leathers made from plants like tomatoes, mangos, and microbes.
- Textiles made from Hemp are great alternatives to water-thirsty cotton, and the ubiquitous polyester. Hemp is renewable and anti-microbial among other properties.
- Companies like Unless are making footwear without plastic.

Daily Wear and Care

Extend the life of your garment.

As fabrics break down they release chemicals and dyes imbedded in the fibers which can be breathed in or ingested.

Wash your clothing less often. Can you wear them more between washes?

Wash clothes in cold Water. Add a microplastic filter to your washer

Reduce the amount of laundry detergent, Don’t use fabric Softeners!

Wear under layers to prevent the need for dry cleaning, or research the fabrics to learn other cleaning methods.

Learn to Mend and Repair!

Care for your items and make them your own

iFixit Repair guides

Visible Mending to make it your own

Learn to Sew

-Continuing Ed classes in Sewing at Dallas College

-Alterations Specialist Certificate at Dallas College

Find Local Repair Options

-Dallas Denim Repair

-Reweaving Shoppe

Learn more

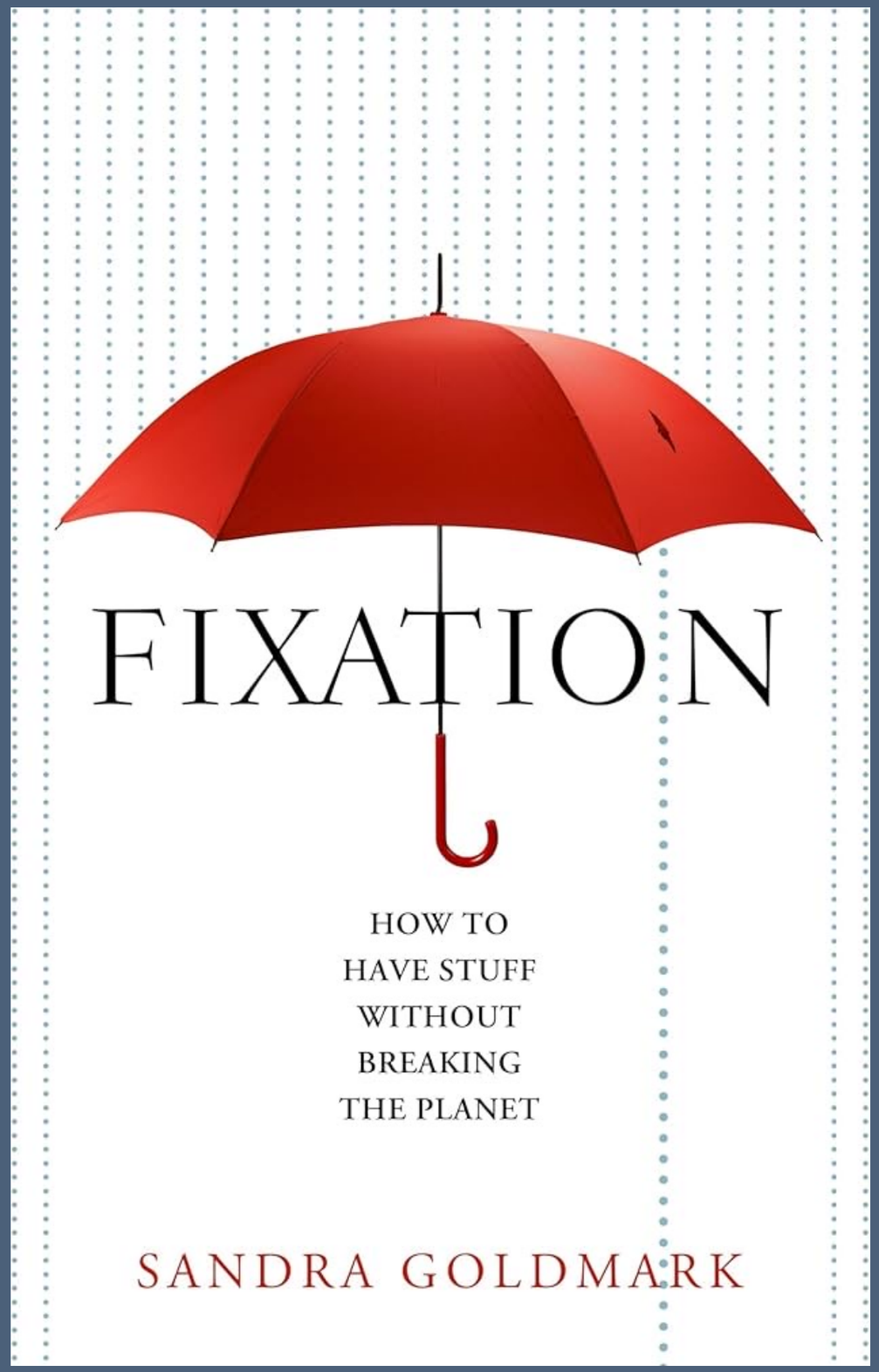
Some ways to explore these issues

- A great collection of research and resources hosted by University of Wisconsin. https://researchguides.library.wisc.edu/c.php?g=1444565&p=10733327

- Green America’s overview of plastic in Clothing. https://www.greenamerica.org/your-green-life/microplastics-lurking-your-laundry

- World Economic Forum on Microplastic challenges. https://www.weforum.org/stories/2025/02/how-microplastics-get-into-the-food-chain/

Reading Recommendations



Solution Wish List

Areas of opportunity

- **Studies**: Transparency. How much textile waste is there? What is the affect of these various chemicals?

- **Regulation**: Foreign and Domestic. Lobby for legislation that requires testing on garments, and sets limits

- **Pressure**: Pressuring Companies about sustainability has made inroads, keep applying pressure and educating others.

Example: Massachusetts

Banning textile in landfill

- “Effective in November 2022, Massachusetts banned textiles from disposal or incineration. (310 Mass. Code. Regs. 19.017(3).)”

- “When the agency began examining the state’s municipal solid waste streams, textiles were found to be 5 percent of the total weight of stream. Used textiles were also identified as a valuable commodity due to their reuse and recycling potential. The disposal ban on textiles includes clean and dry clothing, footwear, bedding, towels, curtains, fabric, and similar products. Nonprofit organizations and for-profit companies use collection systems, such as bins, to gather used textiles. The bins are located around the state. Some organizations also collect textiles via curbside collection.”

Governmental Work

Recent work in this area.

- Government Accountability Office (GAO): U.S. Representatives Chellie Pingree (D-Maine) and Rosa DeLauro (D-Conn.), alongside Senator Tom Carper (D-Del.) released the first Federal Report on Textile Waste just this past December.

- The EU implemented the European Green Deal in 2019 with wide reaching guidance and legislation to move towards climate neutrality. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en

Advocacy Work

A few ideas

- Work Locally to advocate for filtering of wastewater
- Ask companies to make improvements in textiles, in washing machines by adding filtration systems, and by asking questions about chemical usage.
- Support efforts at the State level to advocate for reduction of pesticide usage on cotton crops and protections for organic hemp and cotton growers. https://www.texasorganic.com/ https://www.texashempcoalition.org/
- Join efforts to ask for transparency and accountability in clothing imports and manufacturing. Groups like Fashion Revolution have campaigns and teams you can join. https://www.fashionrevolution.org/north-america/usa/

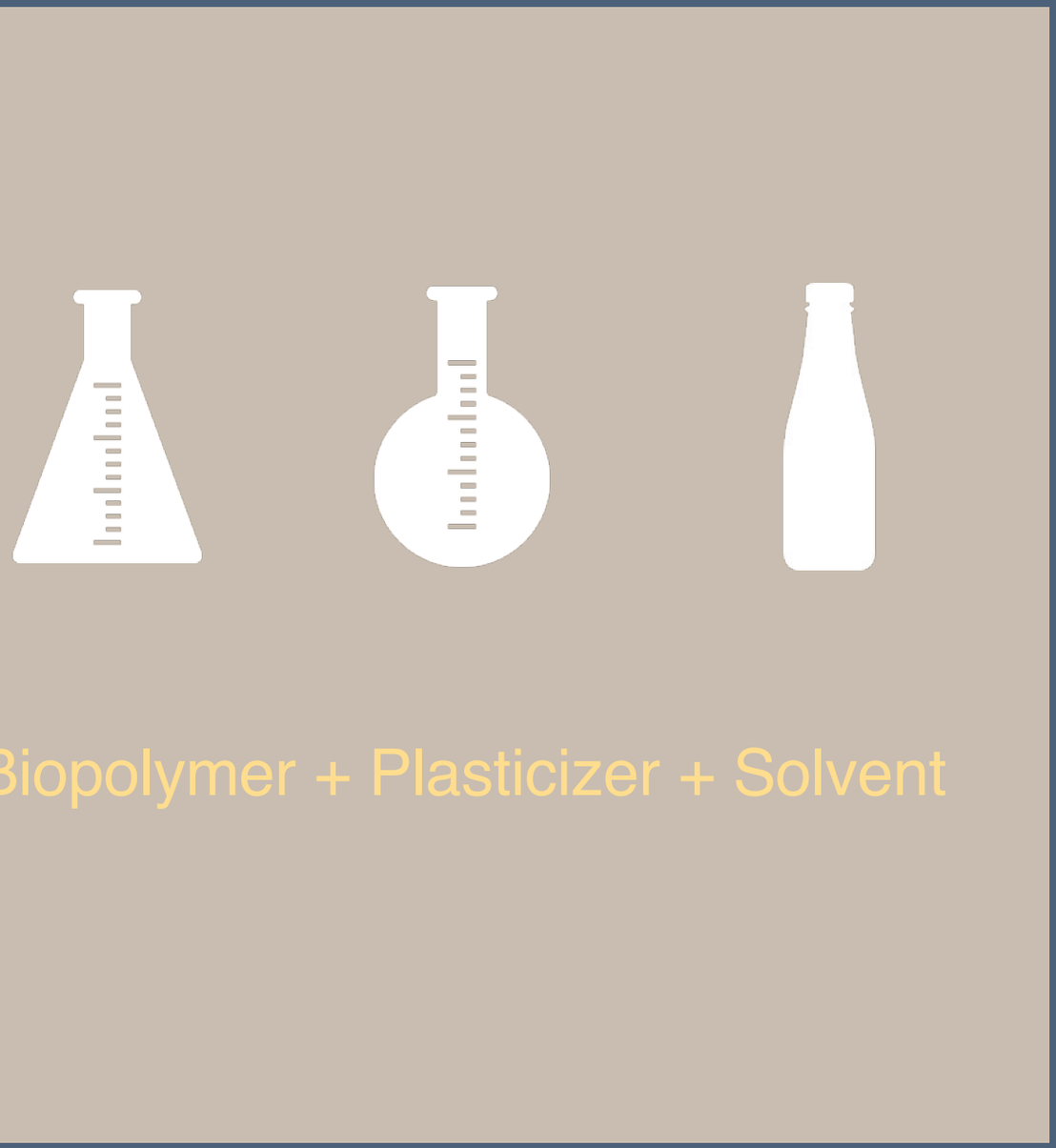
References

- https://theroundup.org/textile-waste-statistics/
- https://stateofmatterapparel.com/blogs/som-blog/10-scary-statistics-about-fast-fashion-the-environment
- https://fibershed.org/2024/12/12/u-s-government-releases-landmark-report-on-textile-waste-and-fast-fashions-environmental-toll/
- https://www.businesswaste.co.uk/your-waste/textile-recycling/fashion-waste-facts-and-statistics/
- https://www.sciencedirect.com/science/article/abs/pii/S0269749121008812
- https://pmc.ncbi.nlm.nih.gov/articles/PMC8257395/
- https://www.sciencedirect.com/science/article/pii/S0269749124011692
- https://www.pbs.org/newshour/science/laundry-is-a-top-source-of-microplastic-pollution-heres-how-to-clean-your-clothes-more-sustainably
- https://www.thesustainablefashionforum.com/pages/quick-question-what-is-polyester-and-is-it-really-that-bad-for-the-environment

Bioplastics

What are bioplastics?

Bioplastics are made with biopolymers derived from organic material and typically break down much faster and more completely than petrochemical plastics. Many are easily made in a home kitchen.



Biopolymer + Plasticizer + Solvent

Biopolymer

Plasticizer

Solvent

Gelatin

Starch

Glycerine

Water

Biopolymer

Gelatin

Starch

+

Vinegar

Vinegar strengthens the polymer bonds making the bioplastic stronger, and also prevents mold.

Examples of Variation

Plasticizer

+

Solvent

−

Using bioplastics in conventional theatre settings

September 2024

I am an Island

By Julia Lederer

- World premiere play
- Ecofeminist play about climate change set on an island.
- Child-like playful mood to contrast the heavy theme
- Considerations were made for sourcing materials to match the theme

I am an Island

By Julia Lederer

Grandma

Direction: Angela Gunner

Costumes: Sarah Mosher

Watering Hole Collective 2024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