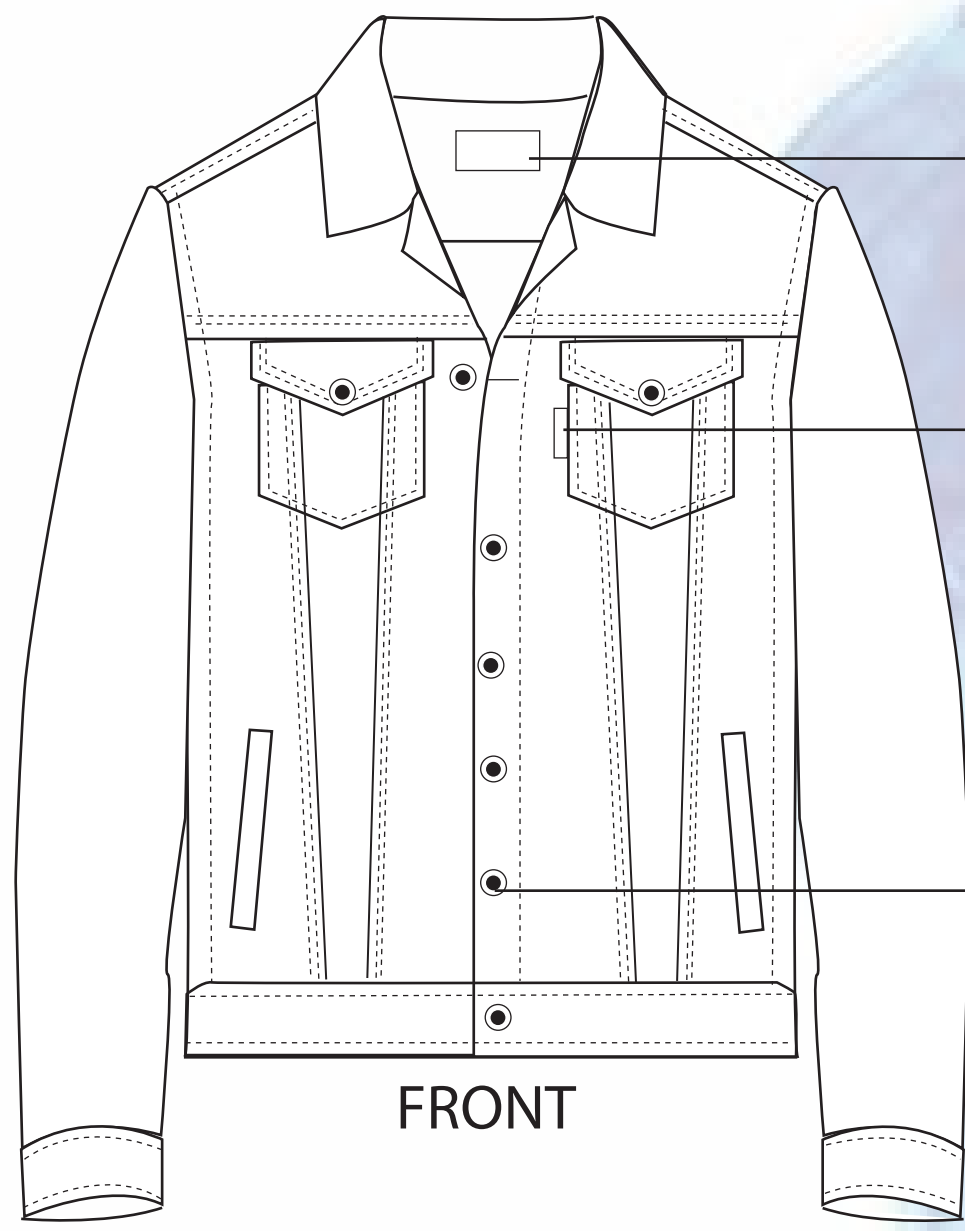
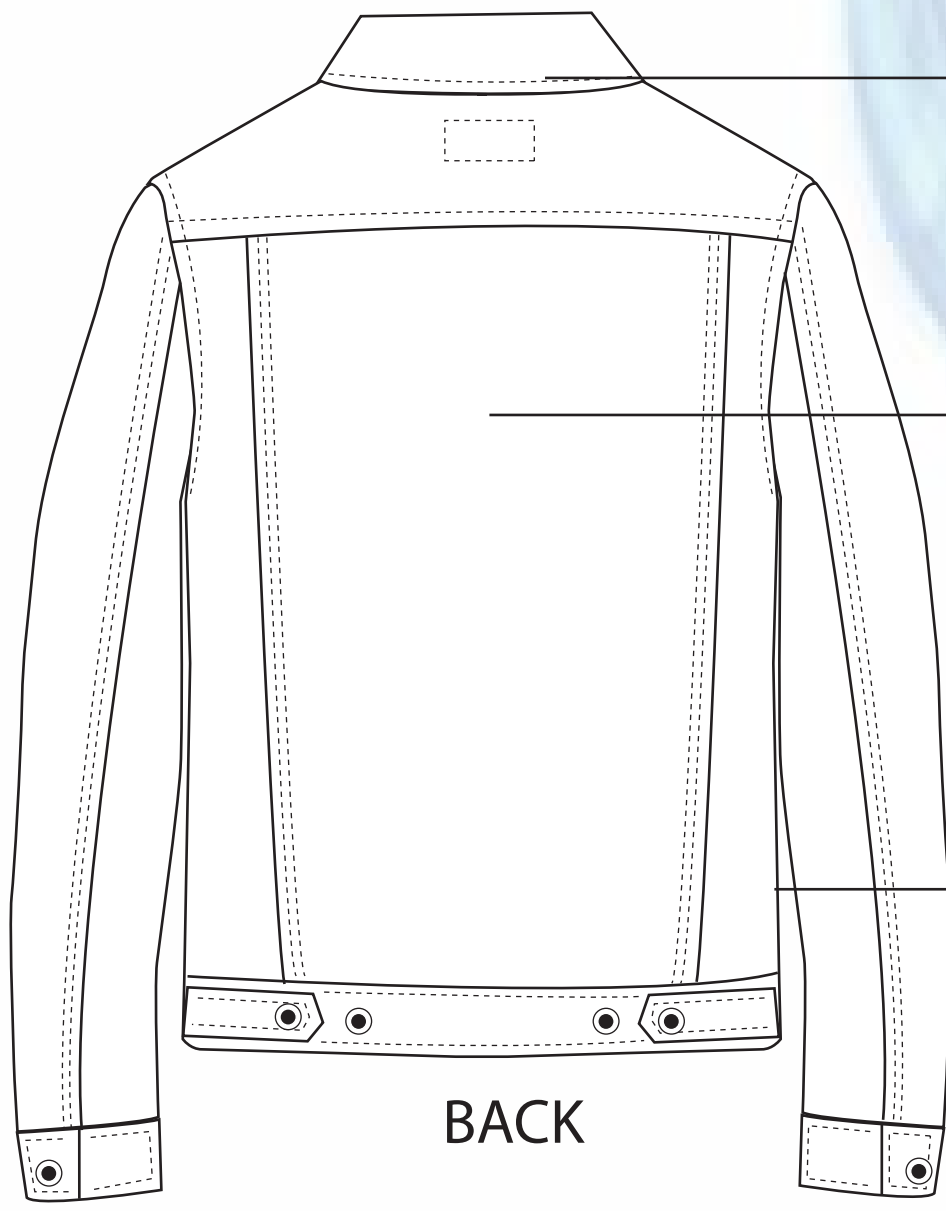


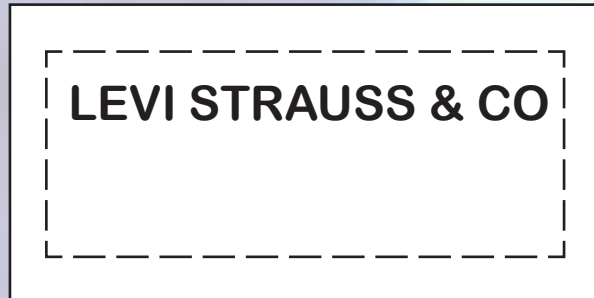
# TRACING VINTAGE DENIM: LEVI'S DENIM JACKET



FRONT



BACK



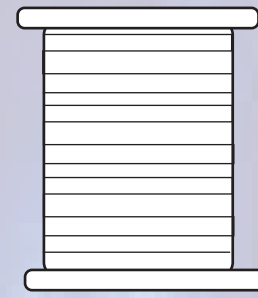
CB label (leather)



Front pocket tab (polyester)



12 brass buttons (bronze - copper/zinc)



Thread/top-stitching (polyester)



Denim (100% cotton)



Internal care label (polyester)



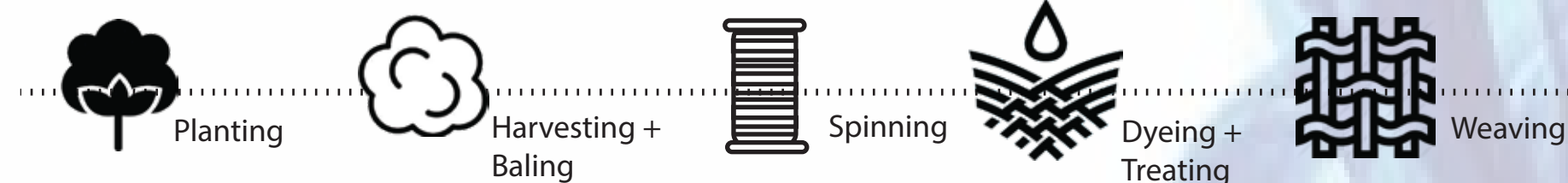
Levi Strauss is an American heritage brand that has been specializing in denim apparel since 1853.

This Levi's denim jacket was bought in 2017 from Awoke Vintage in Williamsburg, Brooklyn.

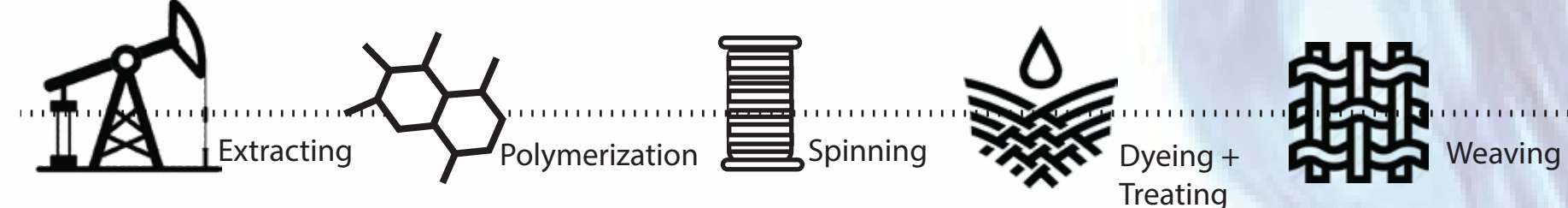
From research, it appears that this jacket was produced in the early 1980s. The lower case "e" on the red front tab and the care label reveal that the jacket was made after 1971, while the side/hand warmer pockets show that the jacket was produced around 1984, as it was the year Levi's produced jackets for the American Olympics team

As it is an older piece from Levi's, it is assumed that this jacket was made with conventionally grown cotton and high-impact synthetic dye. Today, Levi's manufacturing practices are more eco-conscious, therefore, the inputs would be slightly different. However, the fact that the jacket has been in use for 40+ years makes it a sustainable item overall, as it shows its durability, versatility and longevity.

## COTTON

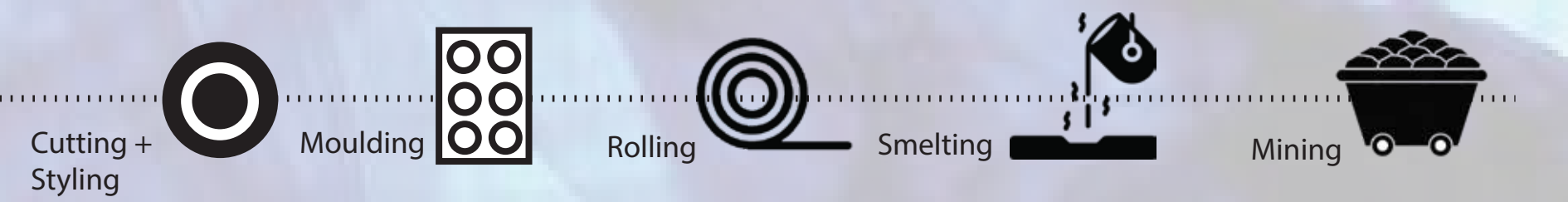


## POLYESTER

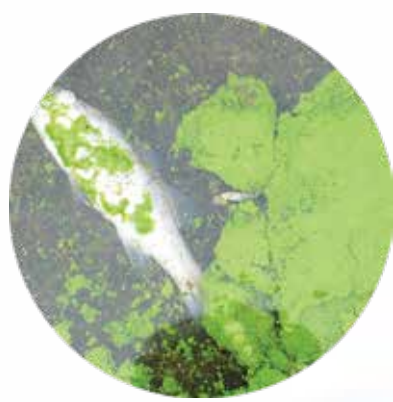


## LEATHER

## BRASS



## ECOLOGICAL DAMAGE



Excess fertilizer and pesticide used for cotton harvesting, as well as breeding cows for leather production harms local organisms, leads to runoff, eutrophication and eventually ocean dead zones.



A tremendous amount of methane, a potent greenhouse gas, gets released into the atmosphere from breeding cows for leather production. This contributes to global warming.

## HUMAN HEALTH



Cotton dust from denim production leads to respiratory issues, while exposure to chemicals during washing, dyeing and finishing of cotton + polyester can lead to chronic health conditions, like emphysema.



Chemical exposure from tanning leads to issues, such as irritation of the skin, eyes and airways. It can also lead to liver damage, digestive issues, reproductive problems and cancer.

## RESOURCE DEPLETION



Washing textiles with sodium hydroxide and detergents, as well as dyeing textiles with hydrosulphites, bleach and other toxins pollute local waterways immensely. This leads to reduced access to clean drinking water, too.



Large amounts of water used to grow cotton, maintain cows, and mine metals in the raw material phase, as well as during dyeing and washing in the production phase, leads to groundwater levels dropping and potentially drought.

## SOCIAL IMPACTS



Garment workers are frequently underpaid, leading to depression, debt, and the inability to receive quality education and adequate health care.



Mine workers in developing parts of the world often work in unsafe environments, with little protection and are underpaid. Mining also causes poor air quality for nearby communities.

## Research Questions

**Indigo dye:**  
Where was it grown and cultivated (India, Italy, US)?  
What kind of synthetic indigo dye does Levi's use?  
What dyeing practices has Levi's employed in order to make the dyeing process better for the environment?

**Cotton:**  
Were fertilizers and pesticides used on the cotton crops?  
Where was it grown and cultivated (US, India)?  
Does Levi's only use BCI cotton today?

**Leather label:**  
Why was leather used as a material for the CB label and is this still done today?  
Was it naturally tanned or not?

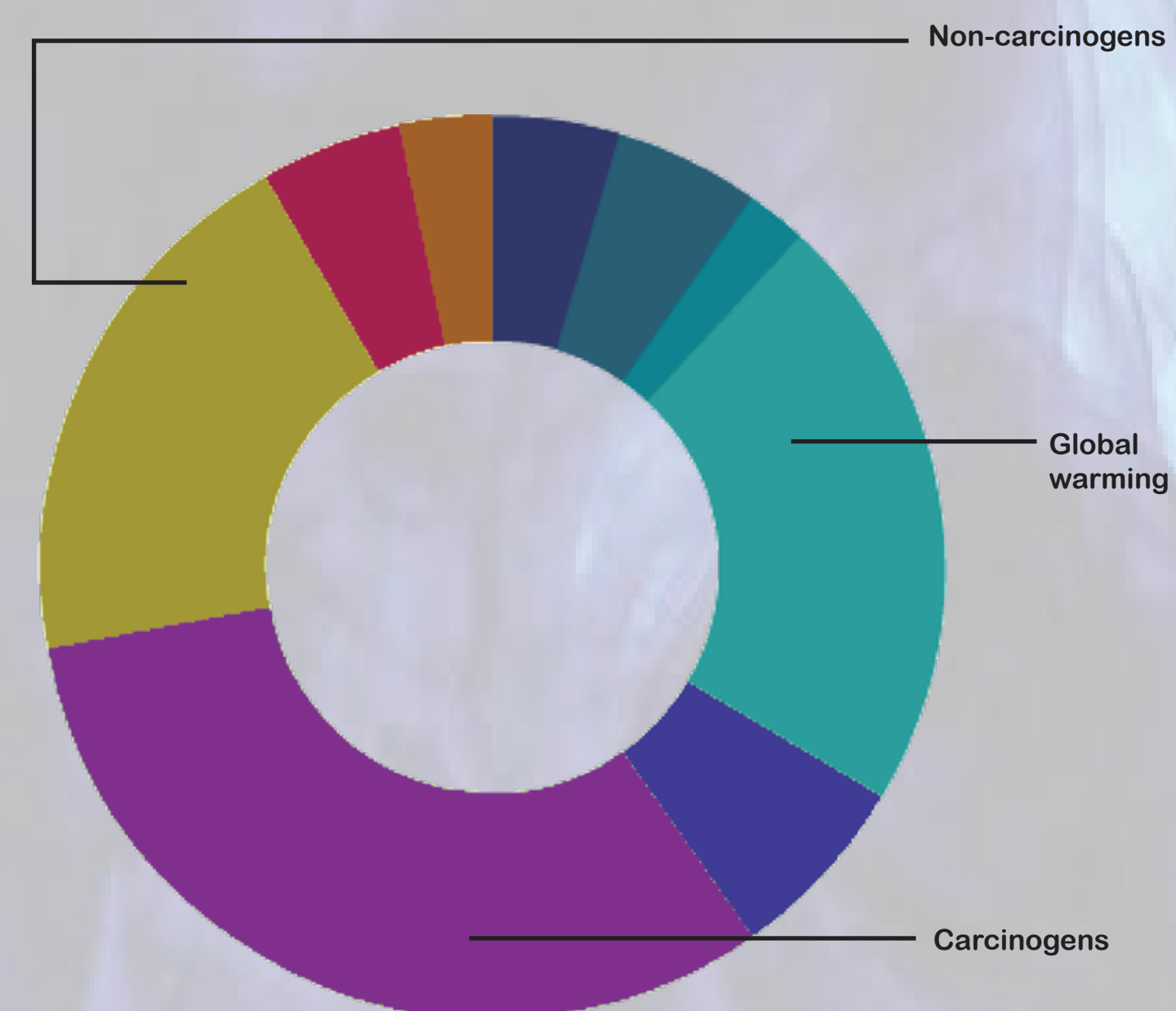
**Buttons:**  
Where were the brass buttons sourced and manufactured?

**General:**  
Where does the garment sewing take place and has it changed from the 1980s to now?  
How many denim products does the company produce annually?  
What is their market share in the denim apparel market?

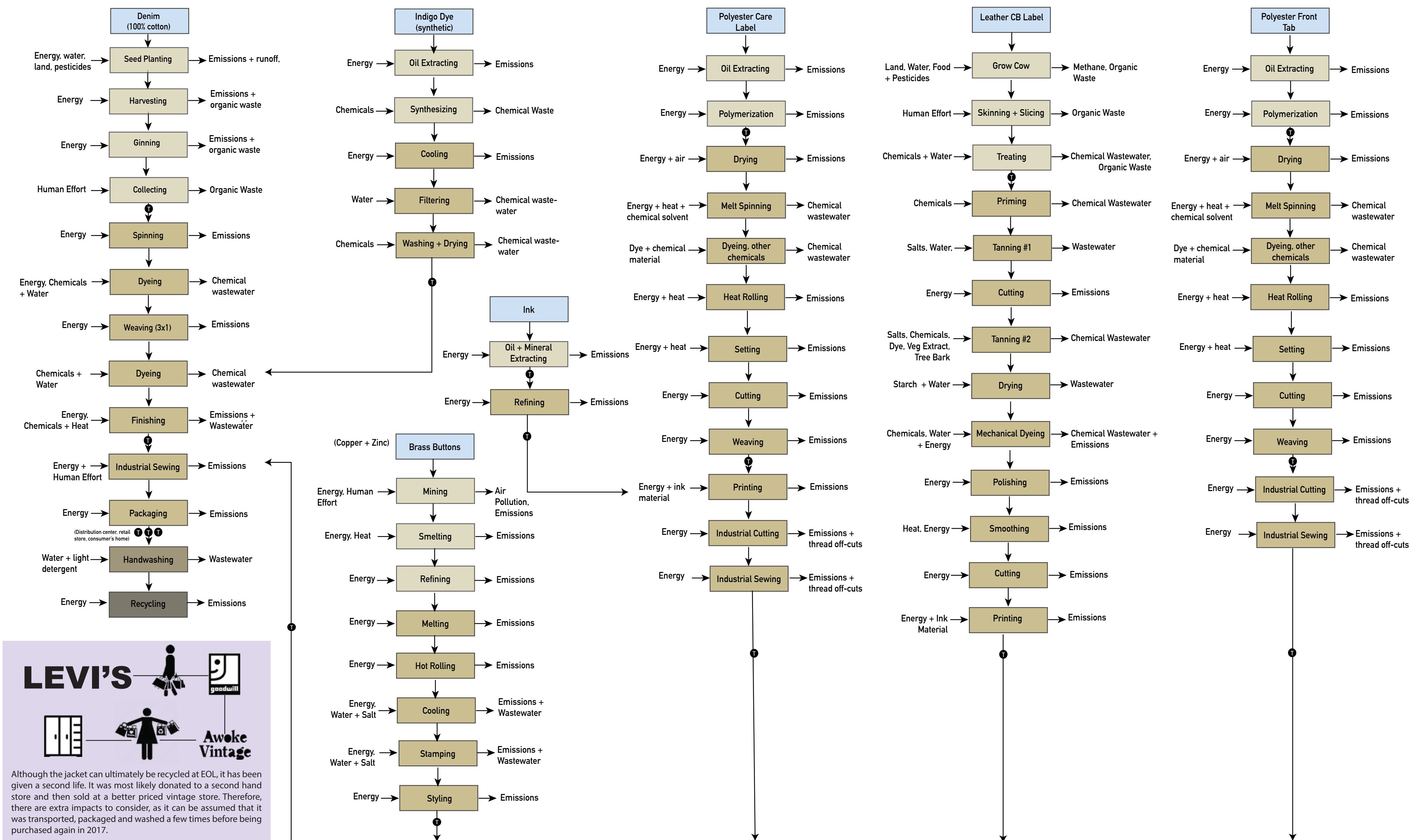
## Key words

- Levi's
- Cotton
- Grown
- Source
- Better Cotton Initiative
- Sustainable
- Yields
- Natural fibers
- Farms and Farmers
- Water
- Chemicals: Fertilizers + Pesticides
- Hazardous
- Supply-Chain
- Evernu and Recycled cotton
- Assembly Line
- Top Stitching and Core-Spun Thread
- Cotton wrapped Polyester Core
- Poly Wrapped Polyester Core: (70% poly, 30% cotton)
- Sulfidic Zinc Ores + Sulfur Dioxide
- Acid rain + Cadmium Vapour
- Ozone Bleaching + Tonello
- BlueSign Certification + Enzymes
- Zero Discharge Hazardous Chemicals (ZDHC)
- Bronze + Age
- Copper + Tin
- Foundries
- Indigo
- Artisan
- Natural
- Indican
- Blue Dye
- Colorless
- Water-soluble
- Chemistry
- Anthranilic acid + Aniline
- Indoxyl: (sodamide with alkali)
- Leather
- Strength
- Environmental Impact
- Tanning
- Jacrons
- Brand Recognition
- Genuine Leather
- Ribra, Lyocell, Tencel
- Warp + Weft
- 3rd Party Auditing + Intertek

## IMPACTS BY SBOM INPUTS

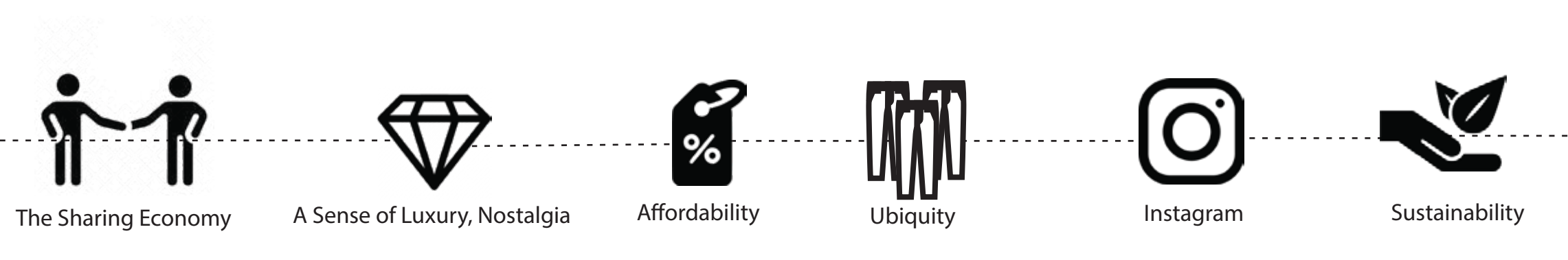


# TRACING VINTAGE DENIM: PROCESS TREE

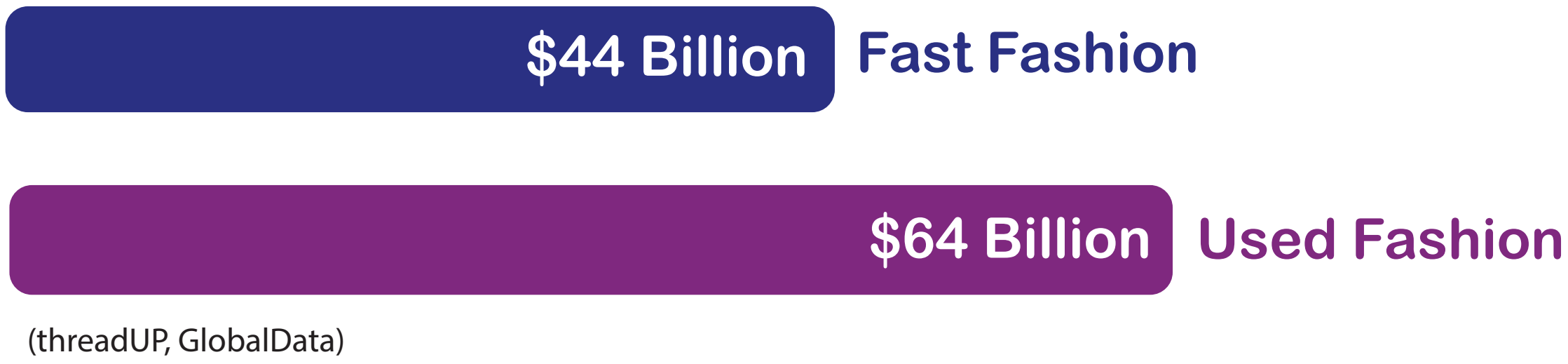


Although the jacket can ultimately be recycled at EOL, it has been given a second life. It was most likely donated to a second hand store and then sold at a better priced vintage store. Therefore, there are extra impacts to consider, as it can be assumed that it was transported, packaged and washed a few times before being purchased again in 2017.

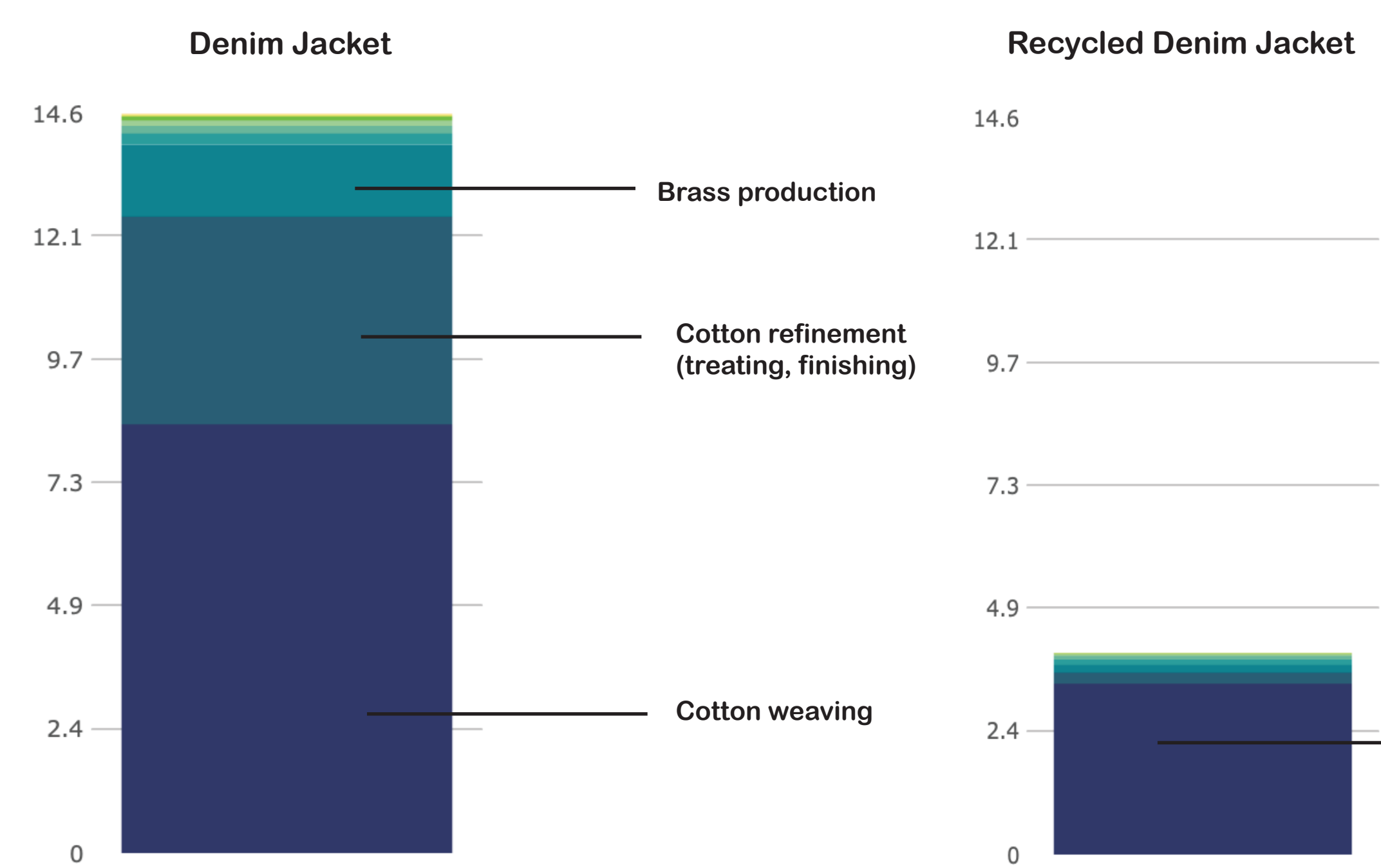
## FACTORS DRIVING THE SECONDHAND DENIM MARKET



## 2028 US MARKET \$ PROJECTIONS



## IMPACTS BY SBOM INPUTS



## EXPERT INTERVIEW WITH JORDAN NORDARSE OF BOYISH JEANS - KEY POINTS

*Boyish Jeans specializes in vintage-inspired denim garments for women. The brand aims to set the standard for best production practices by following a closed-loop model, utilizing organic + recycled fibers, low-tox finishing processes, along with ethical + safe work environments.*

- Mostly uses recycled cotton, organic cotton w/ tencel or Refibra (blend of pre-consumer cotton waste + sustainably grown beech wood/tencel) + 20% deadstock fabric - goal to be zero waste
- "BCI Cotton" does not always mean organic - mostly uses GMO, even though less water is used - minimal supply-chain oversight
- Regenerative soil practices are very important for sustainable cotton growth, including drip irrigation
- At Boyish: cotton cleverly recycled in the warp yarns - doesn't require dyeing again. Other brands recycle in the weft yarn (white), so dyeing/bleaching is required
- Their fabrics are thicker and dipped in the dye less = higher quality garment.
- Fewer dips also means less baths. This reduces chemicals and water usage drastically
- Uses post-industrial scraps for hardware
- GOTS only expects 90% or less of the garment to be organic
- Ozone bleaching still uses chemicals, "aniline-free" dye still has traces of aniline - lots of greenwashing
- Boyish gives their denim a vintage look by treating it with water-vapour finishing system, Tonello, and BlueSign enzymes (safe chemicals)
- Overall, their processes use 1/3 of the amount of water needed in conventional denim processing
- 40% of their wastewater is recycled back into the system and 60% goes to a wastewater treatment center - plans to join the Zero Discharge of Hazardous Chemicals (ZDHC) program
- Engages in 3rd party auditing to ensure their supply-chain complies with their sustainability and ethical standards
- Fabrics are specially made for Boyish - able to keep retail prices competitive with bigger players, like Levi's, as they have good relationships with their mills and suppliers

# TRACING VINTAGE DENIM: SUSTAINABLE ALTERNATIVES & STRATEGIES



## RECYCLED COTTON

### Benefits:

Reduces climate and water impacts by up to 90% (just to grow a cotton for a pair of jeans uses 2,570 liters of water)

Garments are saved from the landfill and possible incineration, creating circularity

If enforced with cellulosic fibers, recycled cotton can become stronger and more durable

### Limitations:

Only 20% of a garment can be produced with post-consumer cotton

Many brands rely on virgin polyester for reinforcement - leaning on fossil fuels

Used denim may not be in adequate condition for recycling, better to use pre-consumer waste as it's more standardized



## ORGANIC COTTON

### Benefits:

Avoids harmful toxins used on cotton crops - improves ecology and soil quality

Better environmental conditions for cotton farmers

Cheaper production costs

Better for wearer - avoids skin allergies, toxin inhalation

### Limitations:

Not as widely available as conventional cotton

Standards are not clear - GOTS certifies items that are 90% organic, or more

May need to use more water to grow



## LOW-TOX DYE

### Benefits:

Decreased chemicals and in turn, chemical wastewater (e.g. "aniline-free" dye, or dye that has 80% less sulphates and caustic soda)

Healthier waters and aquatic life

Healthier garment workers

Less reliant on petrochemicals / fossil-fuels

### Limitations:

Still has to use some chemicals, dye remains synthetic and naturally-derived indigo may not be sustainable due to water and pesticide use

May be more expensive than conventional dye



## MUSHROOM LEATHER

### Benefits:

A cow-sized sample of mycelium "leather" takes a couple of weeks to grow, while growing a cow takes three years

Uses a fraction of the water and land needed for cow hide production

Finished with an eco-wax treatment, allowing biodegradation (chemically-treated tanned leather cannot biodegrade)

A sustainable renewable resources that can be cultivated regeneratively

### Limitations:

Quality may not match leather (feel and longevity)

Production has been slow to scale-up (why is this?)



## RECYCLED HARDWARE

### Benefits:

Avoids mining new metals (process tends to be water and chemically intensive) and excess greenhouse gas emissions from extraction and production

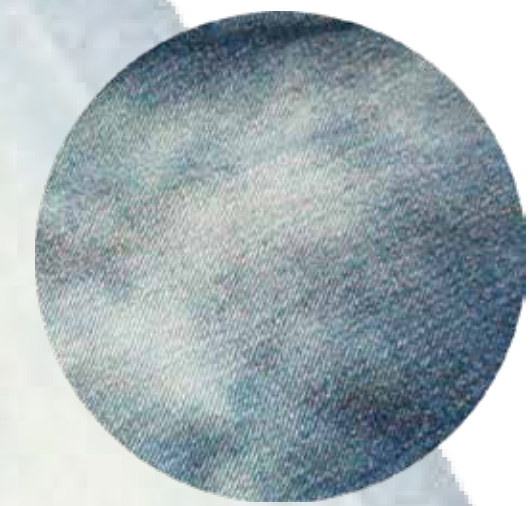
Avoids unsafe working conditions that can come with mining

Reusing what already exists and what could have been thrown away (i.e. industrial off-cuts)

### Limitations:

Supply may vary if off-cuts are the primary source

Depending on post-industrial or post-consumer waste - may be unreliable and collection unstandardized



## OZONE BLEACHING

### Benefits:

Uses 62% less water, 20% less energy and 80% less chemicals (the average pair of jeans uses 42 L of water in the finishing process)

Has become a widespread process that many brands are adopting

### Limitations:

Not chemical-free

Some brands claiming to use ozone bleaching, but relying on old machines and processes that do not function optimally. Also making false claims that the denim item is toxic-free. Both of these actions lead to greenwashing



## FEWER DIPS

### Benefits:

Yarn dipped in dye less = fewer baths = less chemicals and water used

Less chemical wastewater = better water quality, safer for aquatic

Lighter fabric

### Limitations:

Process is not as widespread / widely adopted by the industry

Limits design and fabric finish



## HANDWASH, LINE DRY

### Benefits:

Less detergent + water used (e.g. 985 L per year if machine washed, or 56 L per year if hand washed)

Reduces emissions significantly if washing machine and dryer are avoided

Avoids excess microfiber pollution

### Limitations:

Not everyone has time to hand wash or space to line dry



## REPAIR + REUSE

### Benefits:

Keep garments in circulation for longer - avoids landfill and incineration

Decreases reliance on raw materials and high impact production processes

Avoids the convoluted supply-chain and excess transportation emissions

Promotes minimalism and saves user money

### Limitations:

Not everyone has skills to repair themselves

Repair places (i.e. Patagonia) may not be accessible

Chance the garment continues to break repeatedly over time

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