



THE LIFE CYCLE OF A JEAN

Understanding the environmental impact
of a pair of Levi's® 501® jeans

LEVI STRAUSS & CO.

BACKGROUND

Levi Strauss & Co. (LS&Co.) conducted the apparel industry's first lifecycle assessment (LCA) study in 2007 to assess the entire lifecycle impact of a core set of products. The study focused primarily on the company's U.S. operations and uncovered that the greatest water and energy impact was in two areas: cotton cultivation and consumer care.

Since then, LS&Co. has made tremendous progress addressing areas within its control, leading to more than **one billion liters of water saved to date** through the [Levi's® Water<Less™](#) process and implementation of the apparel industry's first [water recycle/reuse](#) standard in its supply chain. The company has also taken bold steps to reduce the environmental impact of its products in the areas outside its direct control. This includes educating consumers through its [Care Tag for the Planet](#) initiative that encourages consumers to adopt care methods that use less energy and water. LS&Co. also joined the [Better Cotton Initiative®](#) to invest in cotton that uses less water and chemicals and improves farmer livelihoods.

In an effort to dig even deeper into the ways it can reduce its global impact, LS&Co. conducted a new global lifecycle assessment study to understand consumer behaviors by market and cotton agriculture globally.

BACKGROUND

The new study, initiated in 2013, looked at three LS&Co. products: a pair of Levi's® 501® jeans, a pair of Levi's® Women's jeans, and a pair of Dockers® Signature Khakis. This latest study benefited from the latest advancements in LCA scientific methods, tools and data collection processes and gives greater insight into the two biggest impact areas by expanding the scope of data collected.

This presentation dives deeply into the findings related to a pair of Levi's® 501® medium stone wash jeans. The goal is that these findings will help LS&Co. and others in the apparel sector take more effective and holistic approaches to our industry's environmental impact.

A top-down photograph of a wooden surface. In the center is a pile of raw cotton bolls. To the left is a pair of dark-handled scissors. To the right is a single strand of white thread. In the top left corner, there is a piece of white fabric. The text 'WHAT IS AN ENVIRONMENTAL LIFE CYCLE ASSESSEMENT?' is overlaid on the right side of the image in white, bold, sans-serif font.

**WHAT IS
AN ENVIRONMENTAL
LIFE CYCLE ASSESSEMENT?**

LIFECYCLE ASSESSMENT DEFINITION

- **An LCA** is a systems-based, quantitative method for evaluating the environmental impact of a product.*
- **It is a tool** used to assess the stages and impact of a product's entire life, from raw material extraction (cradle) to waste treatment (grave).
- An LCA typically does **not include**:
 - Social impacts
 - Economic impacts

*LS&Co. used the ISO 14040 Series as a basis for its LCA which details the requirements for conducting and administering a Life Cycle Assessment

LIFECYCLE ASSESSMENT BENEFITS

- **Allows us to focus on the most significant environmental impacts** as we develop and evaluate sustainability programs and policies
- **Informs product decisions** to reduce the environmental impact from design, materials, and manufacturing
- **Supports engagement** with external stakeholders to reduce the impact of materials and consumer care



NEW AREAS STUDIED: GLOBAL COTTON CULTIVATION AND NEW CONSUMER MARKETS

FUNCTIONAL UNIT

Levi's® 501® jeans & other core LS&Co. products

MULTIPLE CONSUMER MARKETS INCLUDED

- United States
- United Kingdom
- France
- China

STUDY BASED ON

LS&Co.'s product lifecycle categories and the required impact categories of the Sustainable Apparel Coalition's Product Category Rule guidance

WORLD'S PRIMARY COTTON PRODUCING COUNTRIES STUDIED

- United States
- India
- Pakistan
- Brazil
- China
- Australia

PRIMARY DATA SOURCES

- LS&Co.
- 11 supplier factories
- 6 fabric mills



LEVI'S® 501® PRODUCT ATTRIBUTES STUDIED

- 5 fabrics
- 8 finishes (low to high complexity; highest volume)
- 2012 production year

EVERY ASPECT ANALYZED

- Cotton production
- Fabric production
- Garment manufacturing
- Packaging
- Sundries
- Transportation & distribution
- Consumer care
- End of life



THE LEVI'S® 501® LIFECYCLE



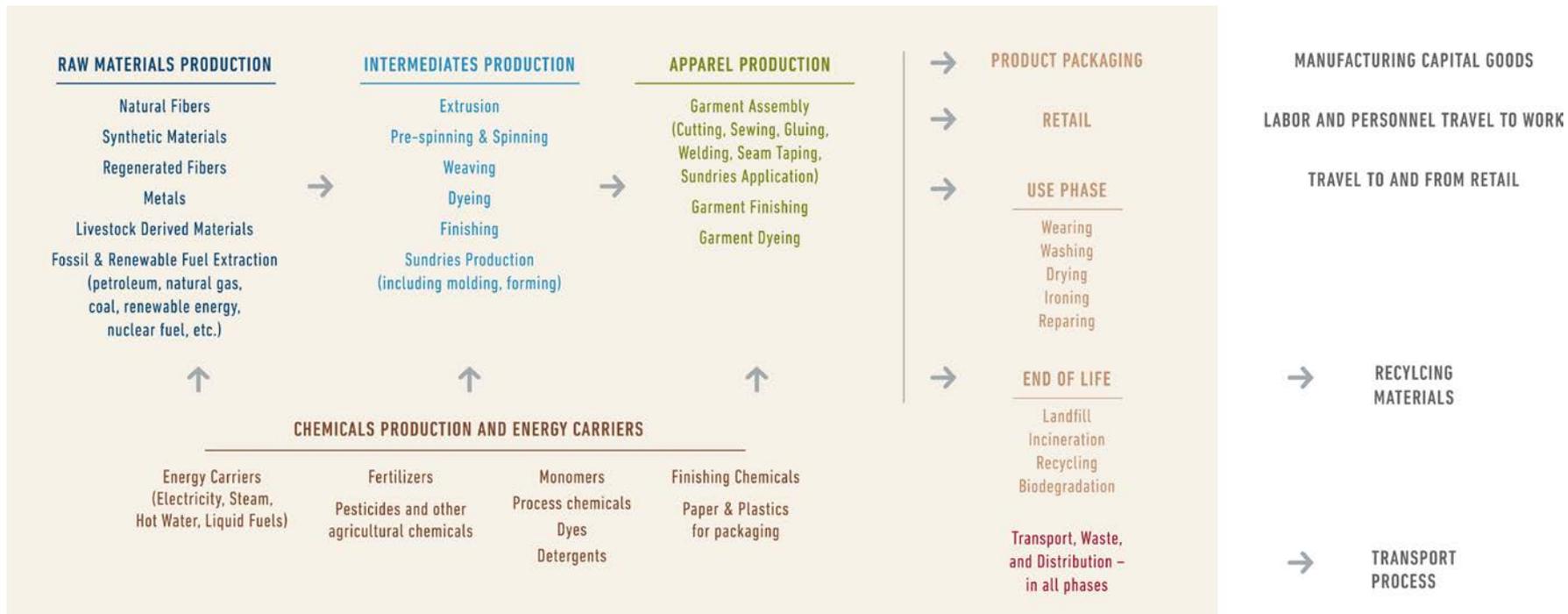
THE LIFECYCLE OF A LEVI'S® 501® JEAN



SEVERAL IMPACT CATEGORIES RELEVANT TO APPAREL WERE ANALYZED

CATEGORY	DESCRIPTION	UNITS
CLIMATE CHANGE	Global warming potential of greenhouse gases released to the environment	kg CO ₂ -e
WATER INTAKE	Freshwater taken from the environment	liters
WATER CONSUMPTION	Net freshwater taken from the environment minus water returned to the same watershed at the same quality or better	liters
EUTROPHICATION	Oxygen depletion as a result of nitrogen and phosphorous deposit into freshwater or marine environments	g PO ₄ -e
LAND OCCUPATION	Total land occupied to support the product system assessed	m ² -yr
ABIOTIC DEPLETION	A measure of the depletion of non-renewable resources that includes fossil energy, metals and minerals	mg Sb-e

IMPACT PHASE ANALYSIS SPANNED AREAS INSIDE AND OUTSIDE OUR DIRECT CONTROL





EXECUTIVE SUMMARY

OF OUR FINDINGS

CONSUMER CARE AND COTTON CULTIVATION REMAIN THE MOST SIGNIFICANT IMPACT AREAS

CONSUMER CARE



COTTON CULTIVATION



COTTON AND CONSUMER HABITS HAVE A BIG IMPACT ON WATER AND ENERGY USE

General Findings:

- **Water Consumption:** Fiber production, predominantly cotton, contributes by a wide margin to water consumption.
- **Climate Change:** Consumer care and fabric production are the most significant phases for climate change impact and energy.
- **Expanded Scope:** By expanding our scope to include the leading cotton-producing countries, we've seen the water consumption from cotton cultivation increase to 68% of the total impact.

Consumer Use Findings:

- **Washing every 10 times** a product is worn instead of every 2 times reduces energy use, climate change impact, and water intake by up to 80%.
- **Significant differences between regions:**
 - **Consumers in China are leading the pack:** when it comes to laundering their jeans, they mostly wash in cold water and air dry
 - **American consumers had the highest water intake and use of non-renewable energy.** The good news is that Americans more prevalently use cold water
 - **Consumers in the UK and France mostly air dry their jeans but they use more hot water** than American or Chinese consumers
 - Consumers in the USA, UK and France wash their jeans more frequently than in China

OTHER STAGES STILL HAVE AN IMPACT, BUT TO LESSER DEGREES

Materials, Production and other findings:

- **Fabric assembly**, which includes yarn spinning, dyeing, weaving, and fabric finishing had notable contributions related to climate change impact and non-renewable energy consumption.
- **Life cycle stages that had minimal contribution** to impact include: fabric transport, product transport, packaging, production wastes, distribution, retail, and end of life waste.

A close-up photograph of blue denim jeans. The image shows the waistband area with several brass buttons. One button is prominently featured in the center, with the words "LEVI'S" and "MADE IN U.S.A." visible on its surface. The denim fabric has a distinct texture and is accented with yellowish-gold stitching. A small portion of a white pocket is visible on the right side. The lighting is bright, creating shadows that emphasize the texture of the fabric.

**ON 'AUTO PILOT' WHEN IT COMES TO
WASHING YOUR JEANS?
IT'S TIME TO WASH LESS AND LINE DRY.**

LEVI'S® 501® JEAN LIFECYCLE IMPACT

The entire lifecycle of one pair of Levi's® 501® jeans equates to:

Climate Change:
33.4 kg CO₂-e...

Water Consumed:
3,781 liters...

Eutrophication:
48.9 g PO₄-e...

Land Occupation:
12 m²/year...



- 69 miles driven by the average US car
- 246 hours of TV on a plasma big-screen

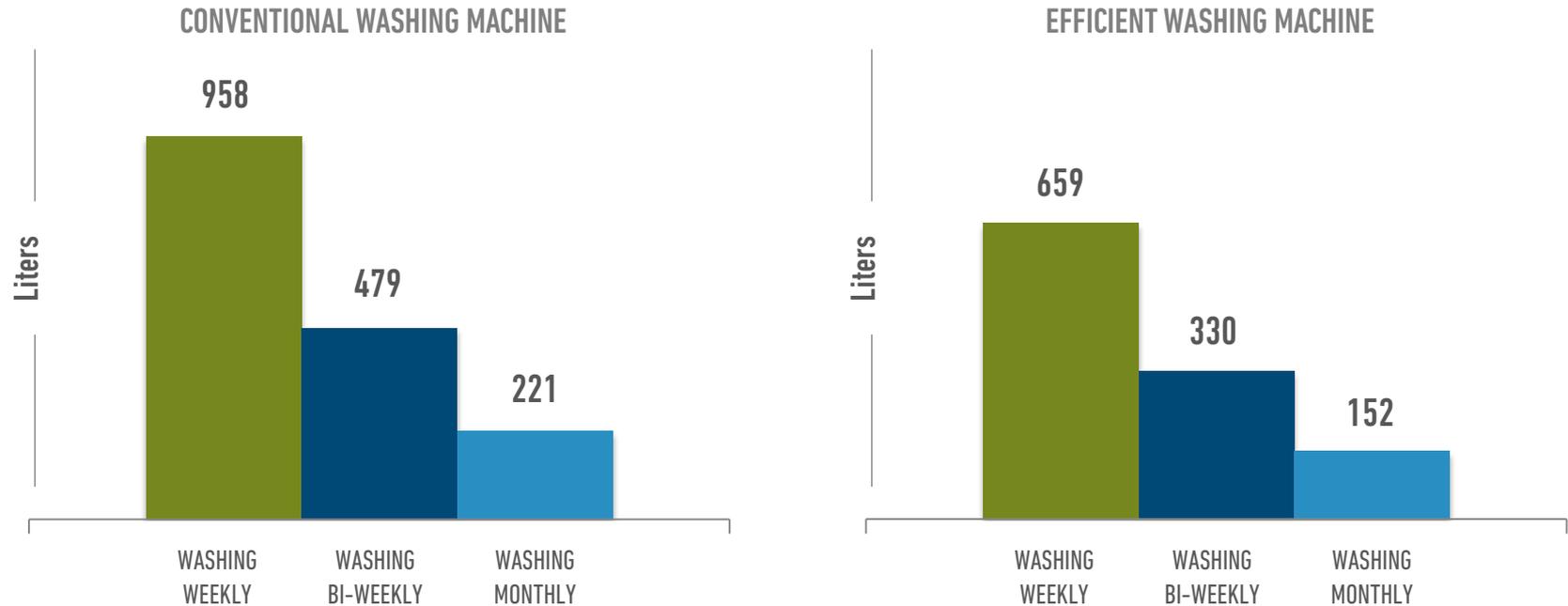
3 days worth of one US household's total water needs

The total amount of phosphorous found in 1,700 tomatoes

Seven people standing with arms outstretched, fingertips touching, would form one side of a square this size

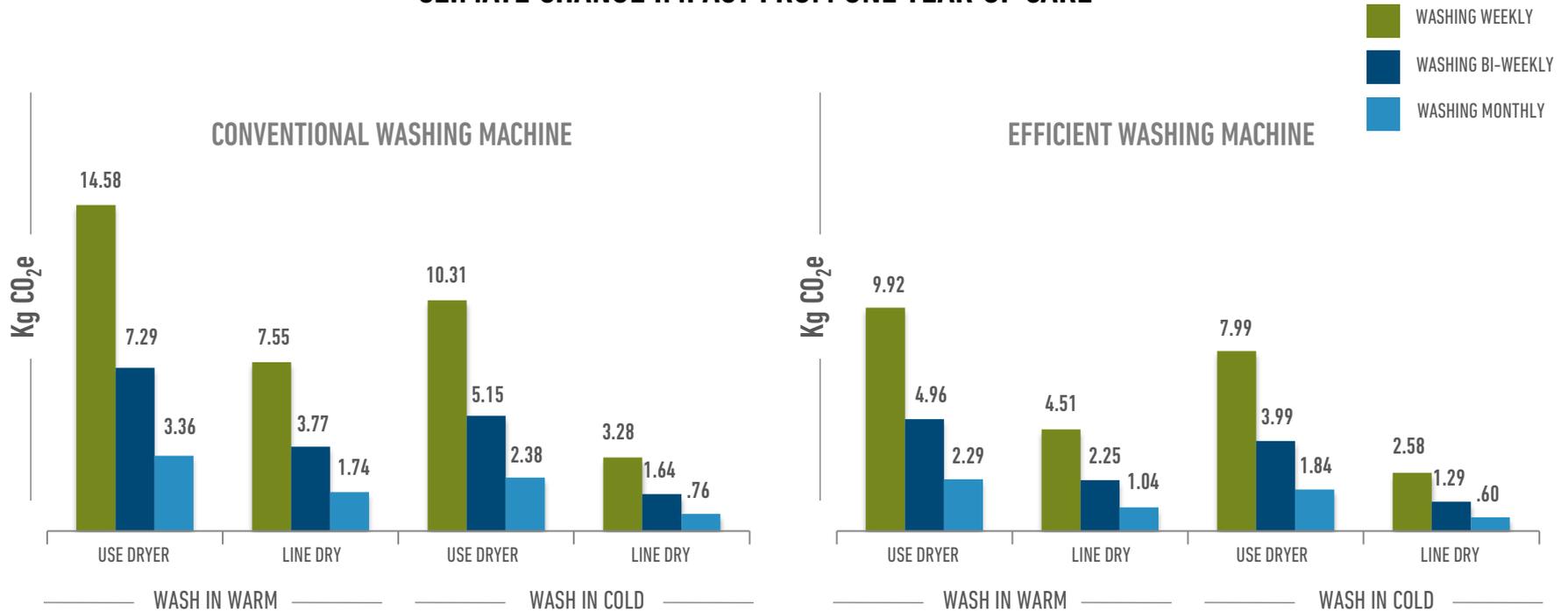
CONSUMER WATER CONSUMPTION VARIES DEPENDING ON WASHING FREQUENCY AND EQUIPMENT

WATER INTAKE OVER ONE YEAR OF CARE



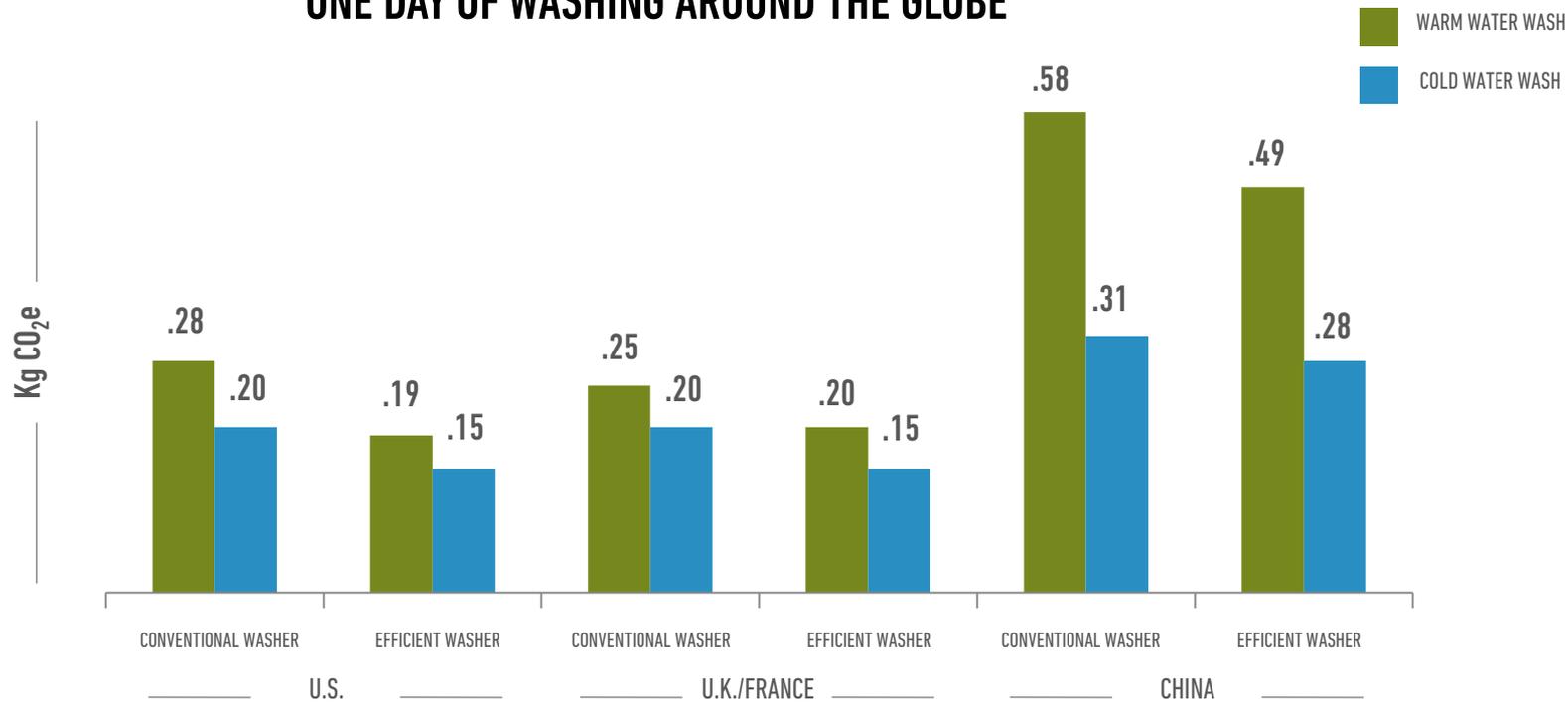
THE CLIMATE CHANGE IMPACT OF CONSUMERS WASHING AND DRYING THEIR JEANS VARIES GREATLY DEPENDING ON WASHING FREQUENCY, METHODS, AND EQUIPMENT

CLIMATE CHANGE IMPACT FROM ONE YEAR OF CARE



CONSUMER CLIMATE CHANGE IMPACT VARIES DEPENDING ON WATER TEMPERATURE AND MACHINE EFFICIENCY

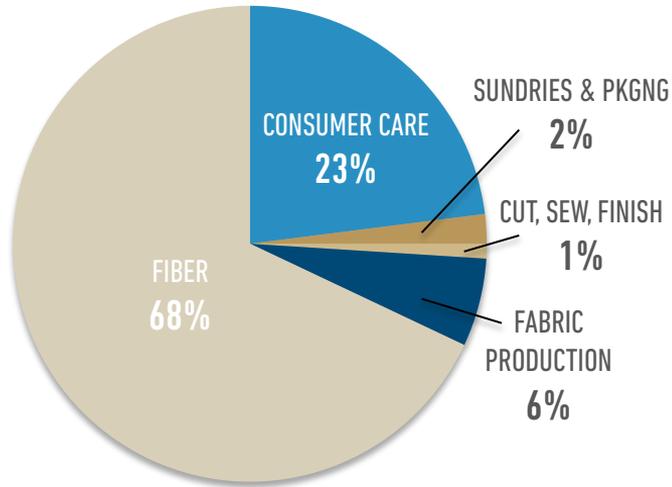
ONE DAY OF WASHING AROUND THE GLOBE



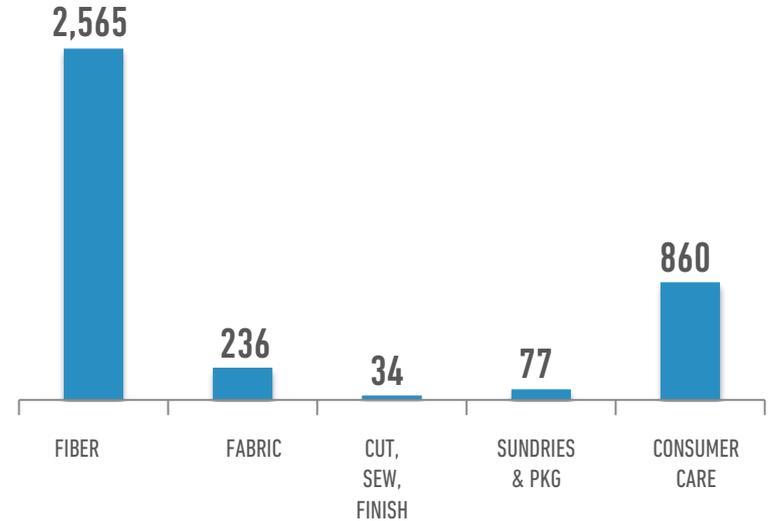
LEVI'S® 501® JEANS: WATER CONSUMPTION

Fiber production, predominantly cotton, contributes by a wide margin to water consumption.

CRADLE TO GRAVE WATER CONSUMPTION
PERCENTAGE BY PHASE



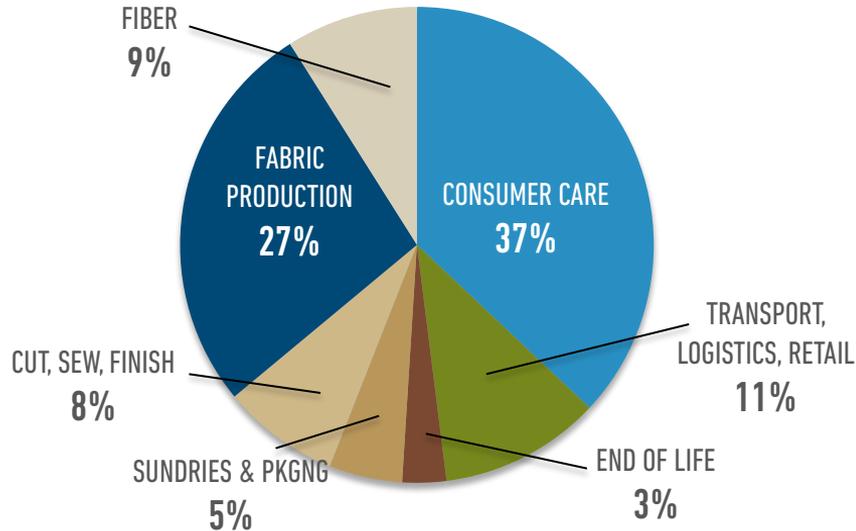
CRADLE TO GRAVE WATER CONSUMPTION
AMOUNT BY PHASE (LITERS)



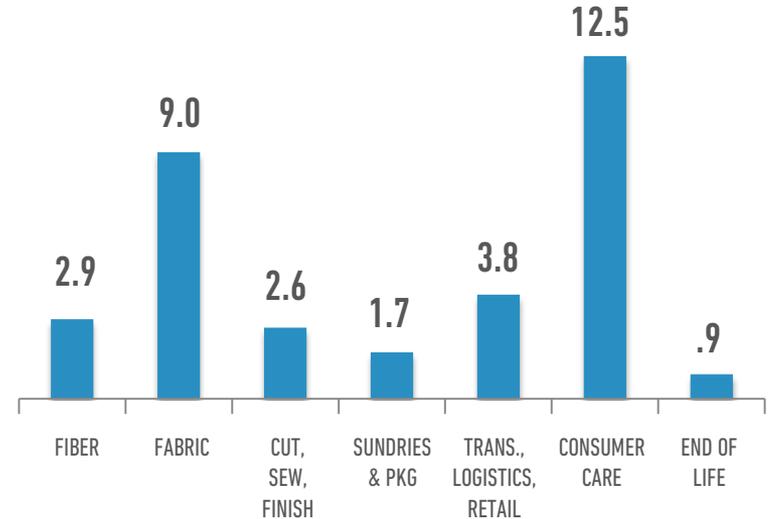
LEVI'S® 501® JEANS: CLIMATE CHANGE IMPACT

Consumer Care phase dominates the climate change impact area (driven by high use of non-renewable energy).

CRADLE TO GRAVE CLIMATE CHANGE IMPACT
PERCENTAGE BY PHASE



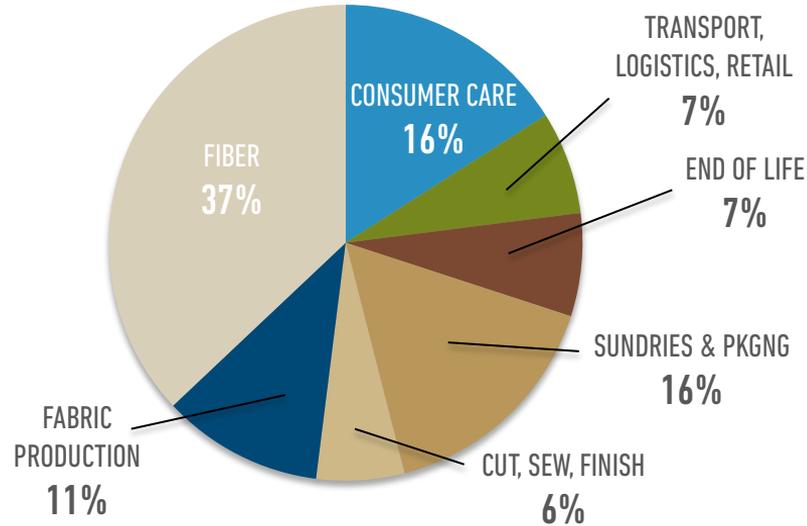
CRADLE TO GRAVE CLIMATE CHANGE IMPACTS
AMOUNT BY PHASE (kg CO₂-e)



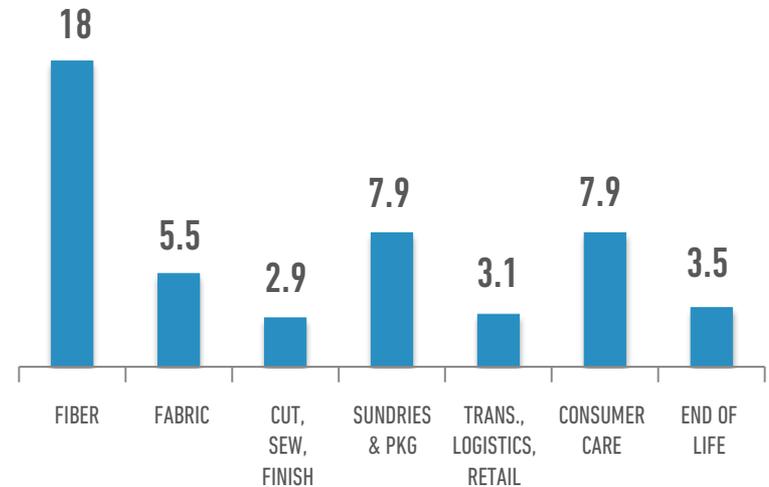
LEVI'S® 501® JEANS: EUTROPHICATION (NITROGEN AND PHOSPHOROUS DEPOSIT)

Fiber production, predominantly cotton, contributes by a wide margin to eutrophication impact.

CRADLE TO GRAVE EUTROPHICATION
PERCENTAGE BY PHASE



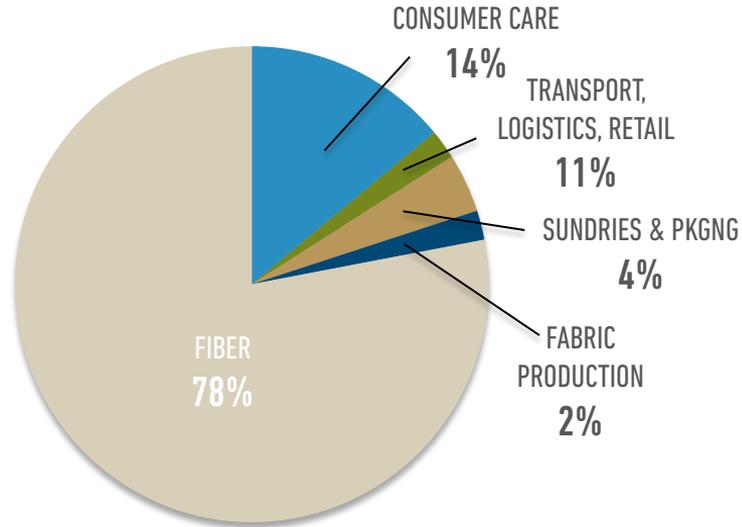
CRADLE TO GRAVE EUTROPHICATION
AMOUNT BY PHASE (g PO₄-e)



LEVI'S® 501® JEANS: LAND OCCUPATION

Fiber production, predominantly cotton, contributes by a wide margin to land occupation impact.

CRADLE TO GRAVE LAND OCCUPATION
PERCENTAGE BY PHASE



CRADLE TO GRAVE LAND OCCUPATION
AMOUNT BY PHASE (m2/year)



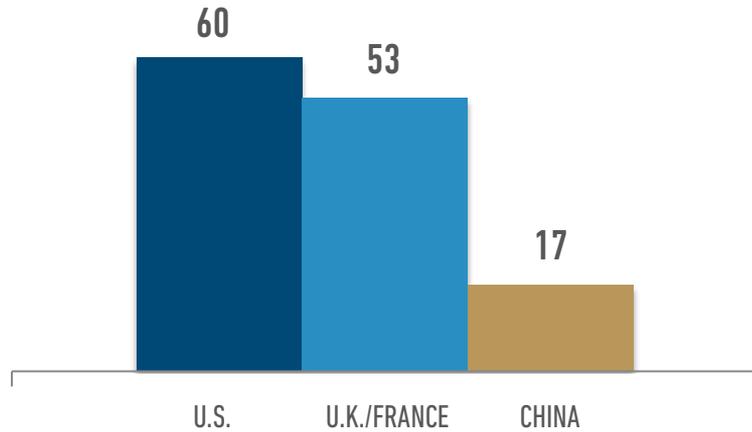


CONSUMER HABITS VARY BY COUNTRY

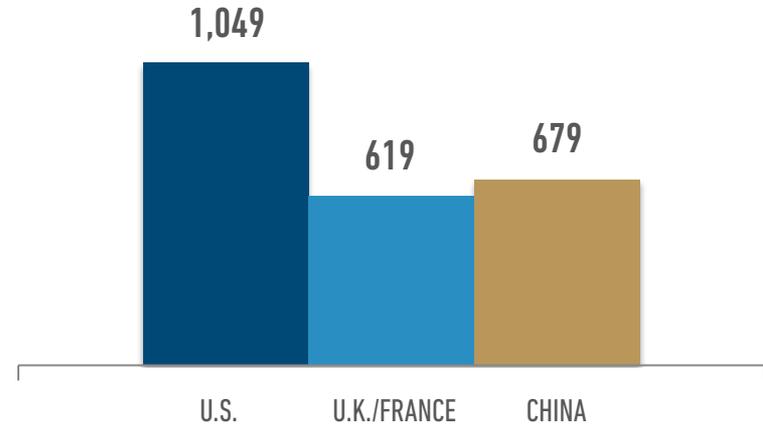
ON AVERAGE, AMERICANS USE MORE WATER AND ENERGY TO WASH THEIR JEANS



LIFETIME CONSUMER USE
NON-RENEWABLE ENERGY (kwh)



LIFETIME CONSUMER USE
WATER INTAKE (liters)

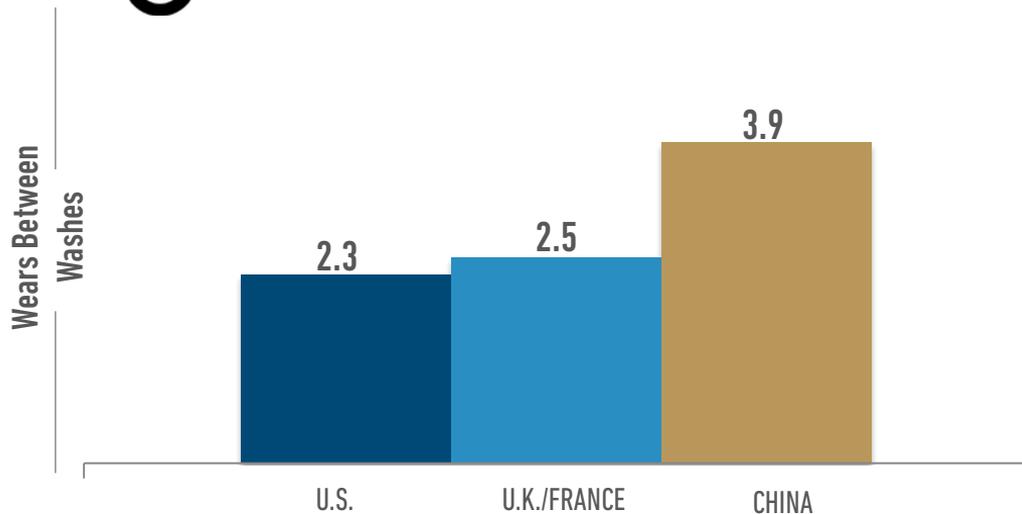


For sources and additional consumer use data, please see the Appendix.

ON AVERAGE, CONSUMERS IN CHINA WASH LESS FREQUENTLY

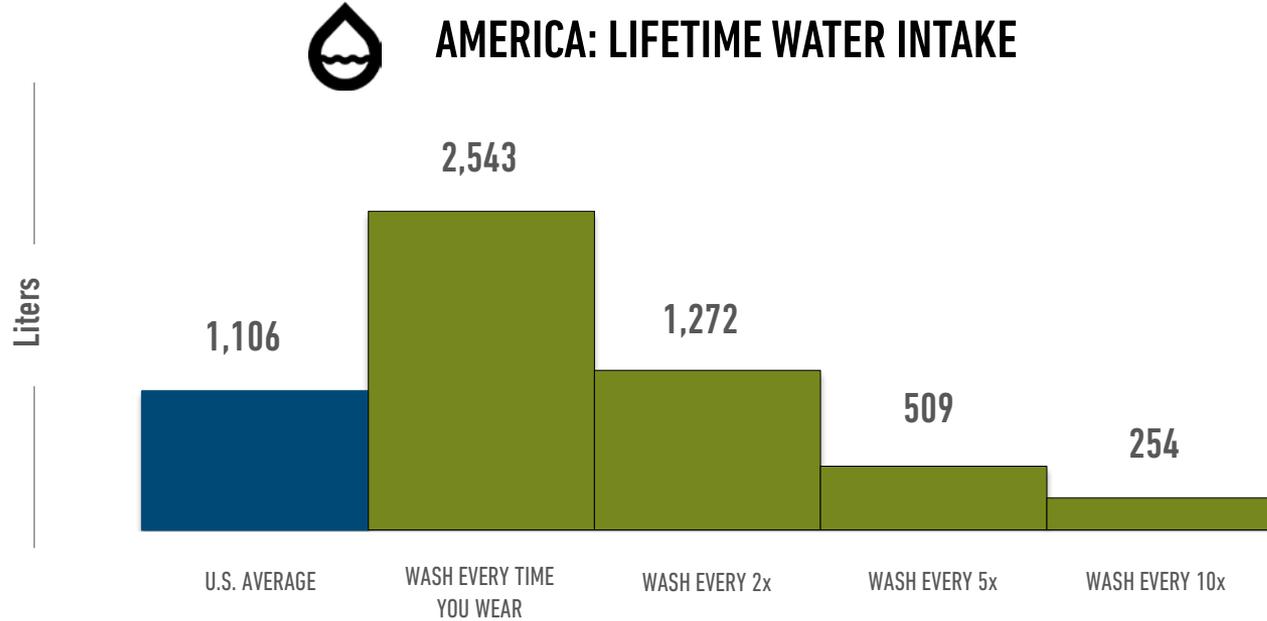


AVERAGE WASH FREQUENCY BY COUNTRY



IN AMERICA:

WEARING JEANS 10X BEFORE WASHING COULD REDUCE WATER USAGE BY 77%

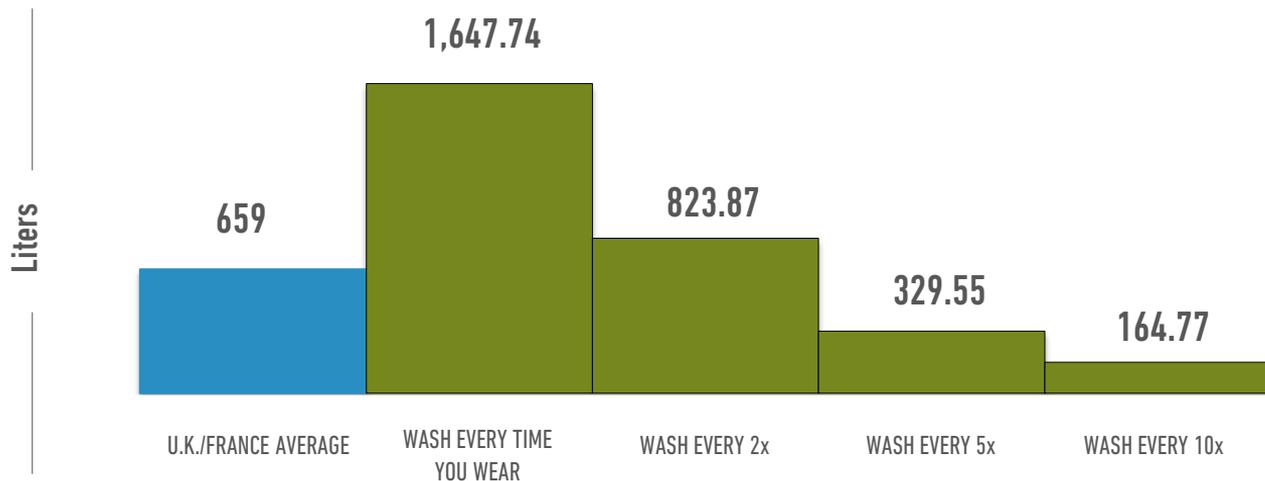


IN THE UK/FRANCE:

WEARING JEANS 10X BEFORE WASHING COULD REDUCE WATER USAGE BY 75%



UK/FRANCE: LIFETIME WATER INTAKE

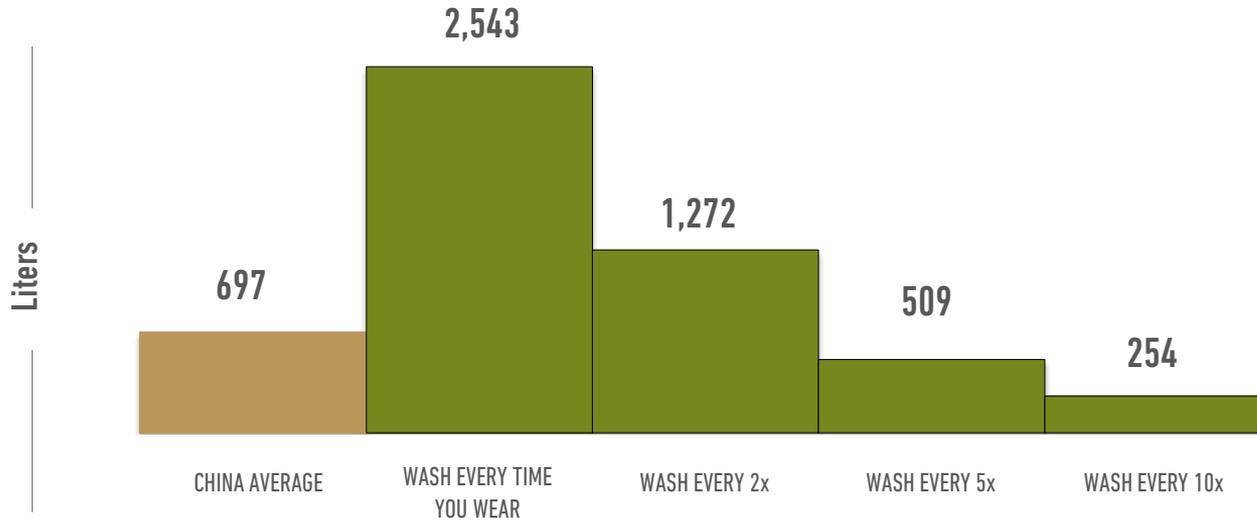


IN CHINA:

WEARING JEANS 10X BEFORE WASHING COULD REDUCE WATER USAGE BY 61%



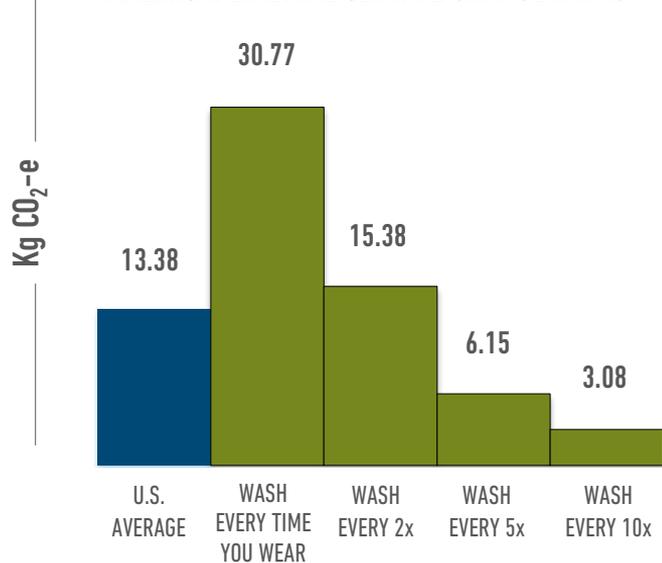
CHINA: LIFETIME WATER INTAKE



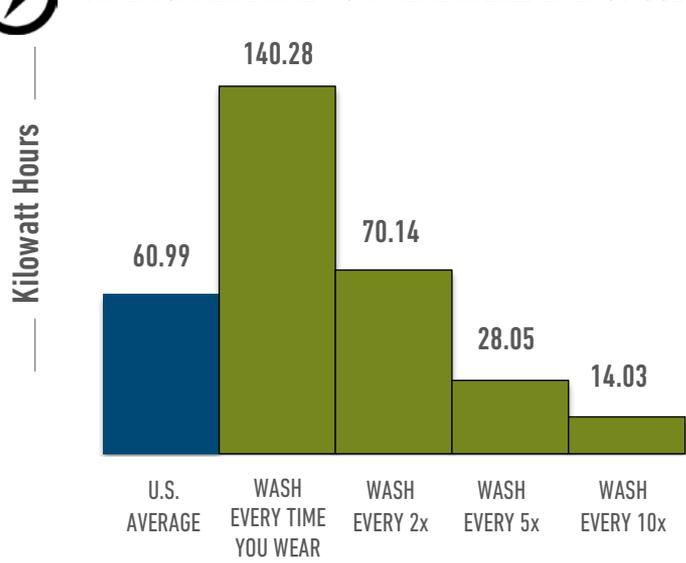
IN AMERICA:

WEARING JEANS 10X BEFORE WASHING COULD REDUCE ENERGY USAGE BY 77%

AMERICA: LIFETIME CLIMATE CHANGE IMPACT



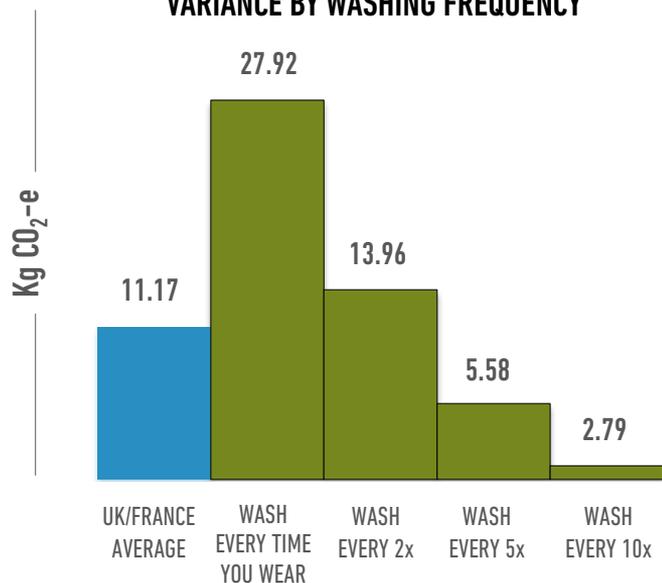
AMERICA: LIFETIME NON-RENEWABLE ENERGY USE



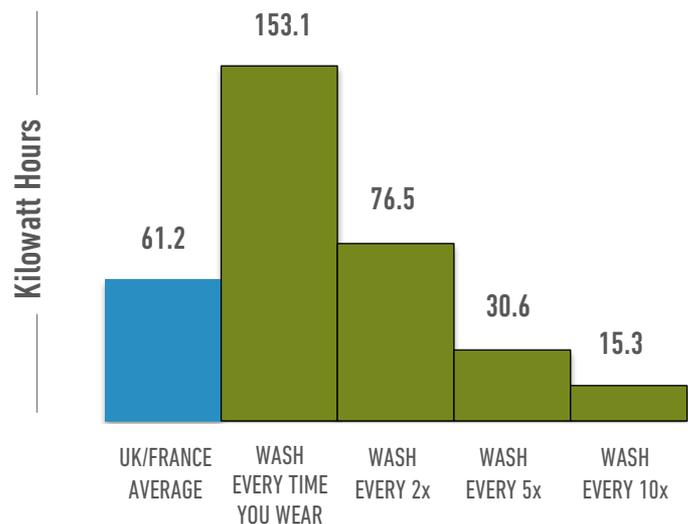
IN UK/FRANCE:

WEARING JEANS 10X BEFORE WASHING COULD REDUCE ENERGY USAGE BY 75%

UK/FRANCE: LIFETIME CLIMATE CHANGE IMPACT
VARIANCE BY WASHING FREQUENCY



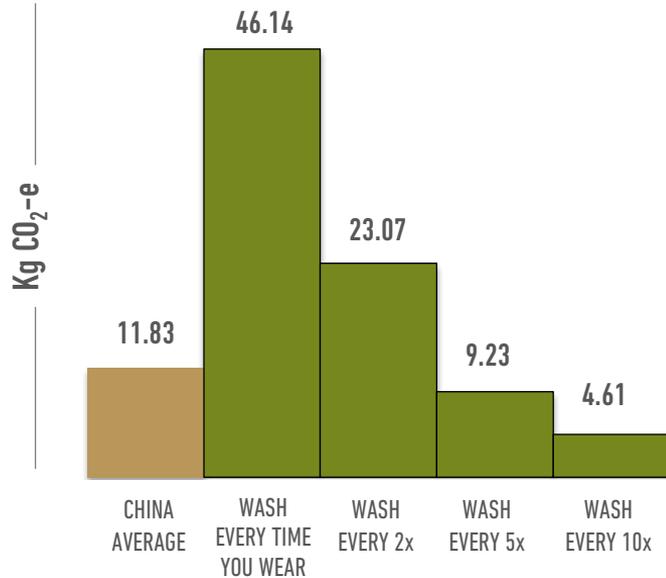
UK/FRANCE: LIFETIME NON-RENEWABLE ENERGY USE
VARIANCE BY WASHING FREQUENCY



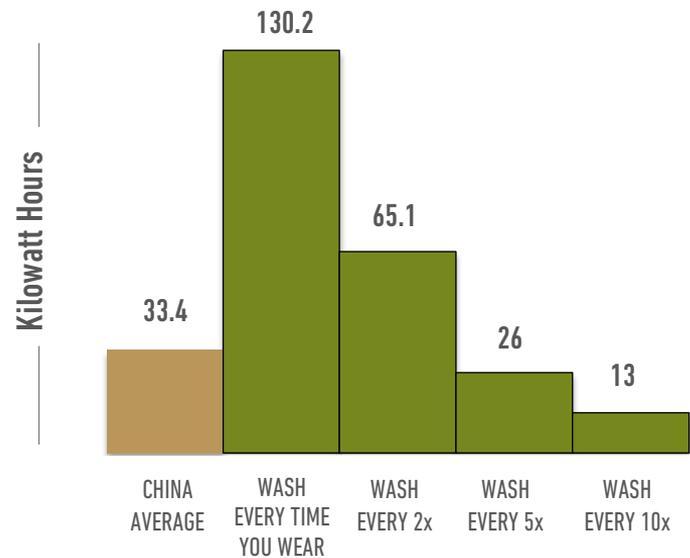
IN CHINA:

WEARING JEANS 10X BEFORE WASHING COULD REDUCE ENERGY USAGE BY 61%

CHINA: LIFETIME CLIMATE CHANGE IMPACT
VARIANCE BY WASHING FREQUENCY



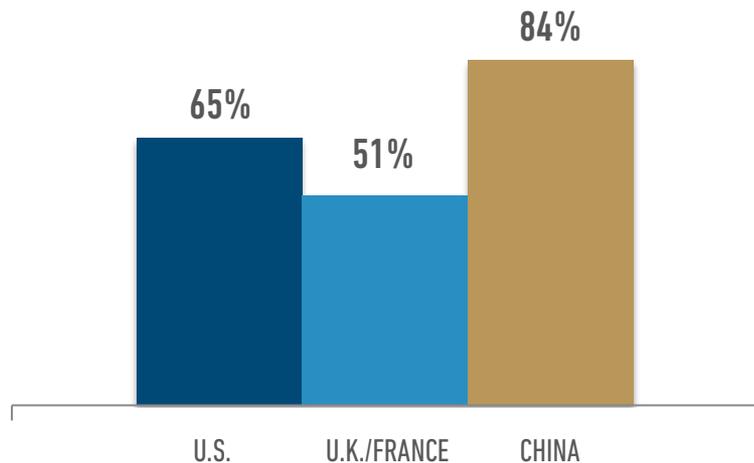
CHINA: LIFETIME NON-RENEWABLE ENERGY USE
BY WASHING FREQUENCY



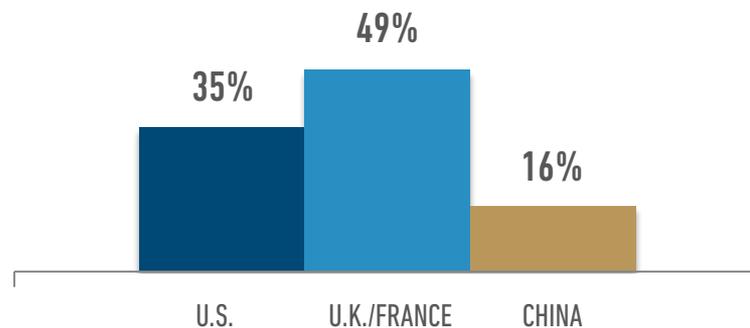
WASH IN COLD VS. WARM BY COUNTRY



CONSUMERS WHO WASH IN COLD



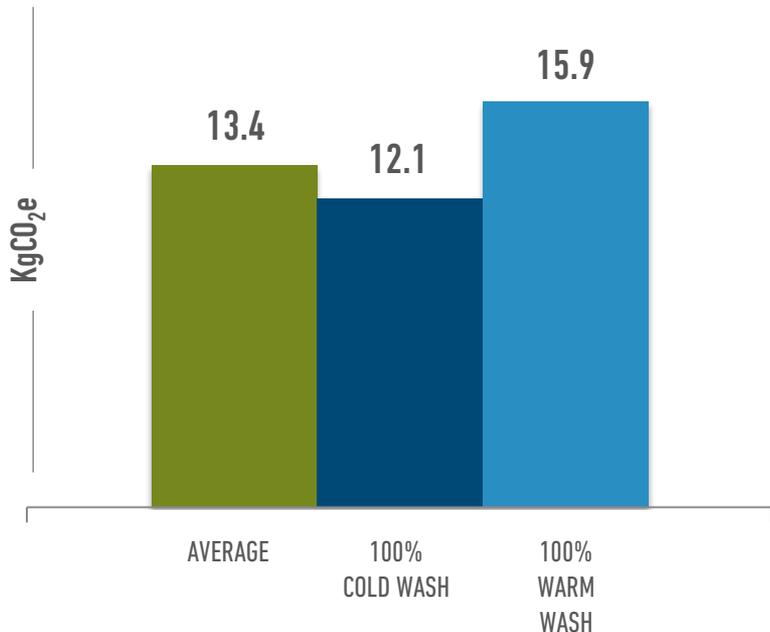
CONSUMERS WHO WASH IN WARM



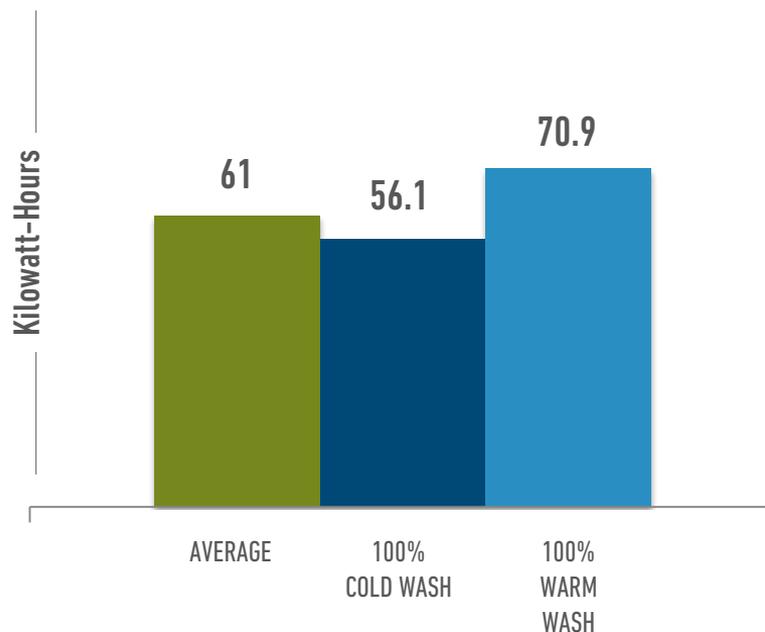
For sources and additional consumer use data, please see the Appendix.

IN AMERICA: WASHING IN COLD INSTEAD OF WARM REDUCES NON-RENEWABLE ENERGY USE BY 21% AND CLIMATE IMPACT BY 24%

AMERICA: LIFETIME CLIMATE CHANGE IMPACT

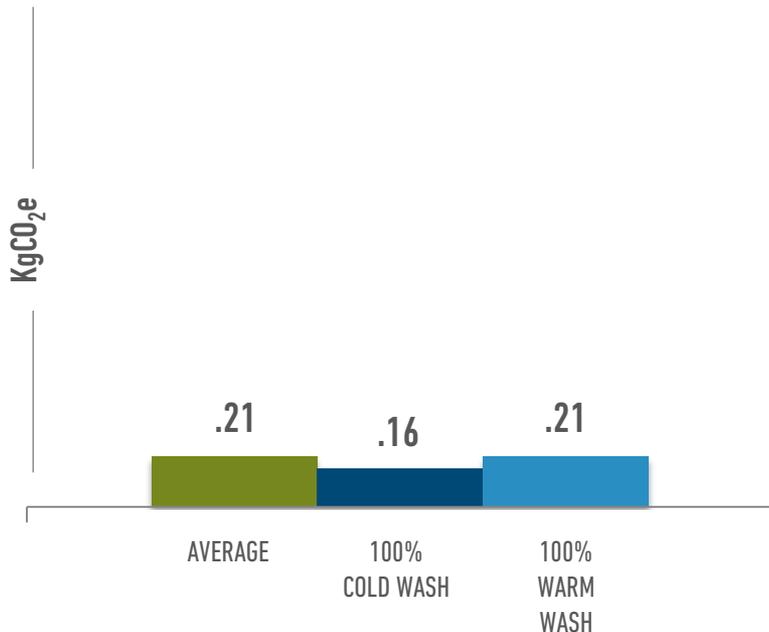


AMERICA: LIFETIME NON-RENEWABLE ENERGY USE

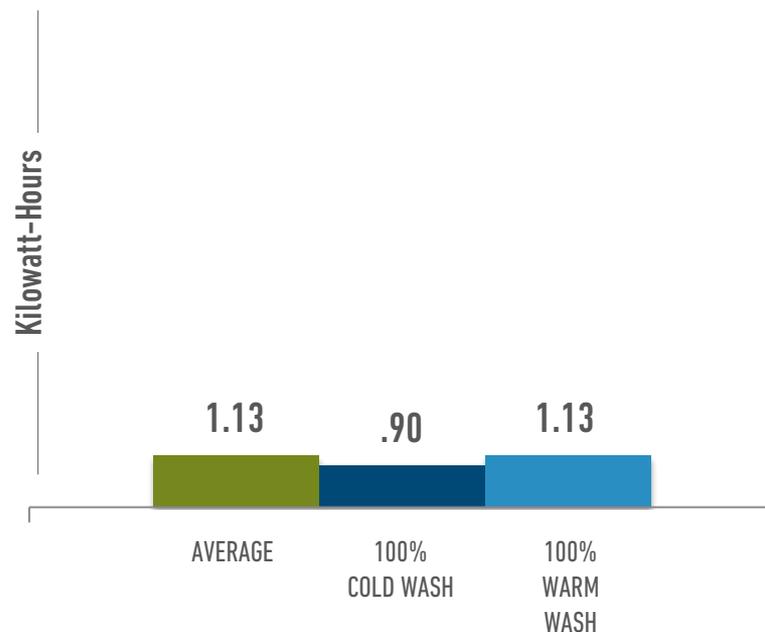


IN U.K./FRANCE: WASHING IN COLD INSTEAD OF WARM REDUCES NON-RENEWABLE ENERGY USE BY 20% AND CLIMATE IMPACT BY 21%

UK/FRANCE: LIFETIME CLIMATE CHANGE IMPACT

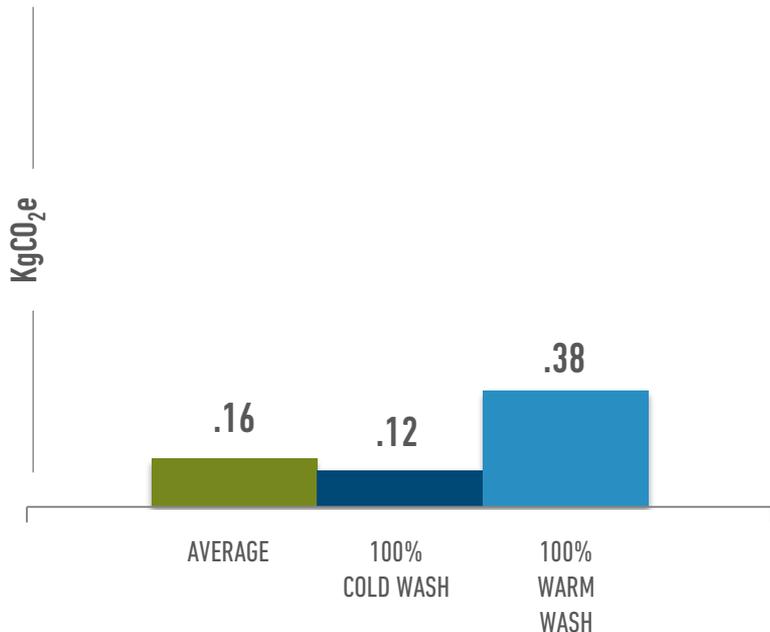


UK/FRANCE: LIFETIME NON-RENEWABLE ENERGY USE

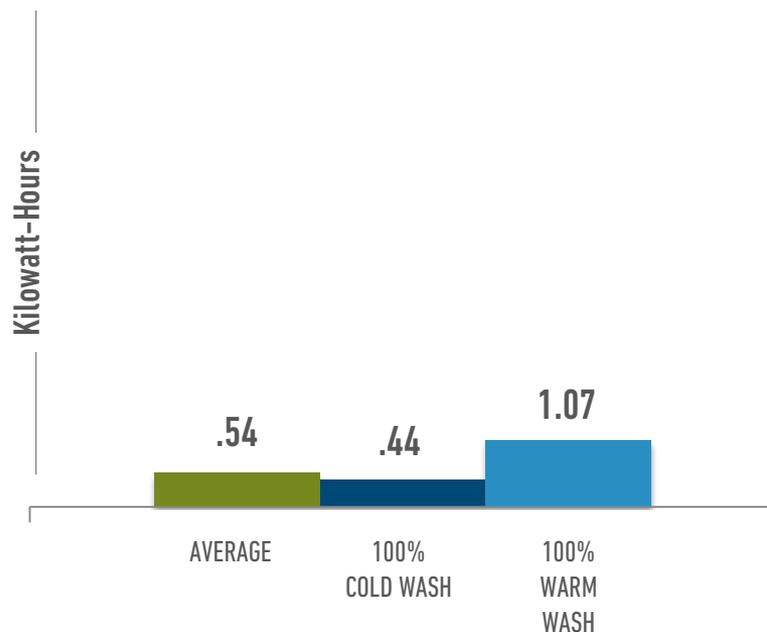


IN CHINA: WASHING IN COLD INSTEAD OF WARM REDUCES NON-RENEWABLE ENERGY USE BY 59% AND CLIMATE IMPACT BY 69%

CHINA: LIFETIME CLIMATE CHANGE IMPACT



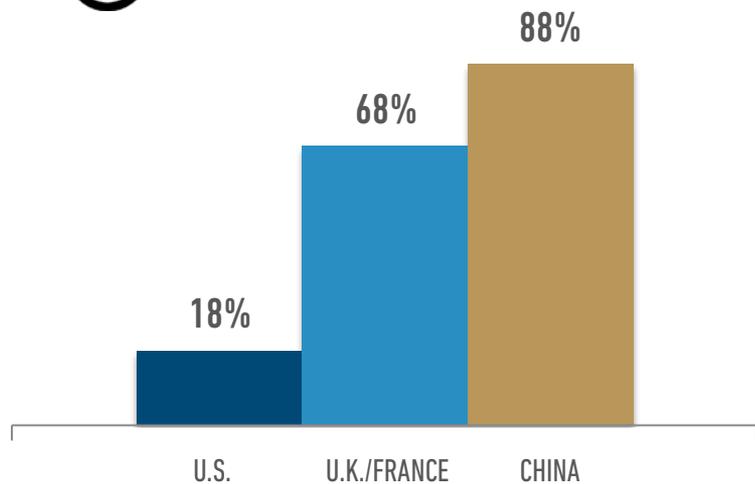
CHINA: LIFETIME NON-RENEWABLE ENERGY USE



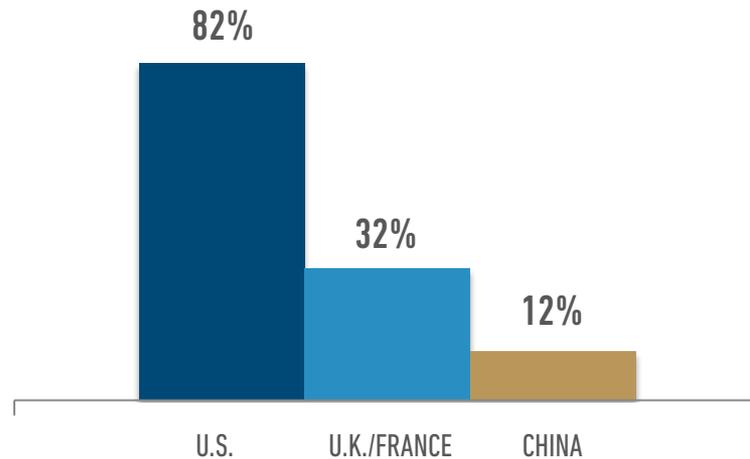
LINE DRY VS. DRYER BY COUNTRY



CONSUMERS WHO LINE DRY

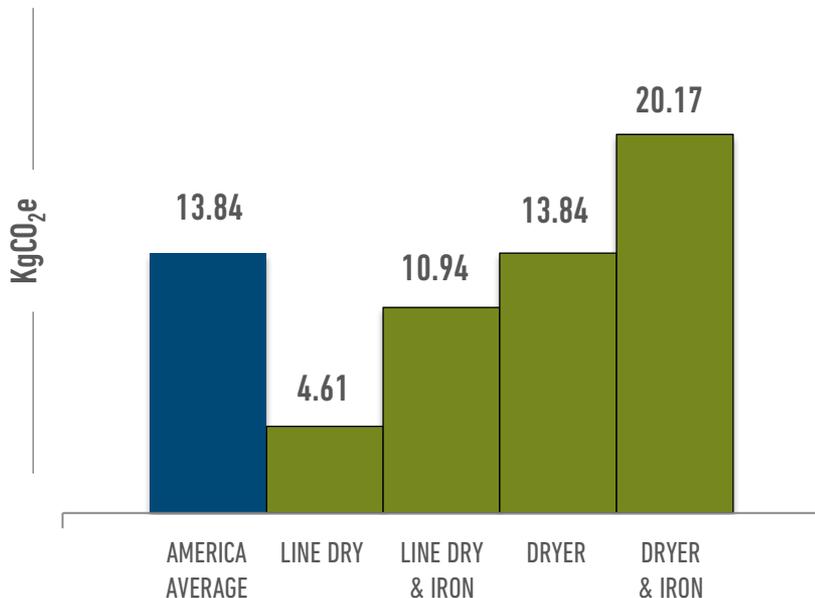


CONSUMERS WHO USE A DRYER

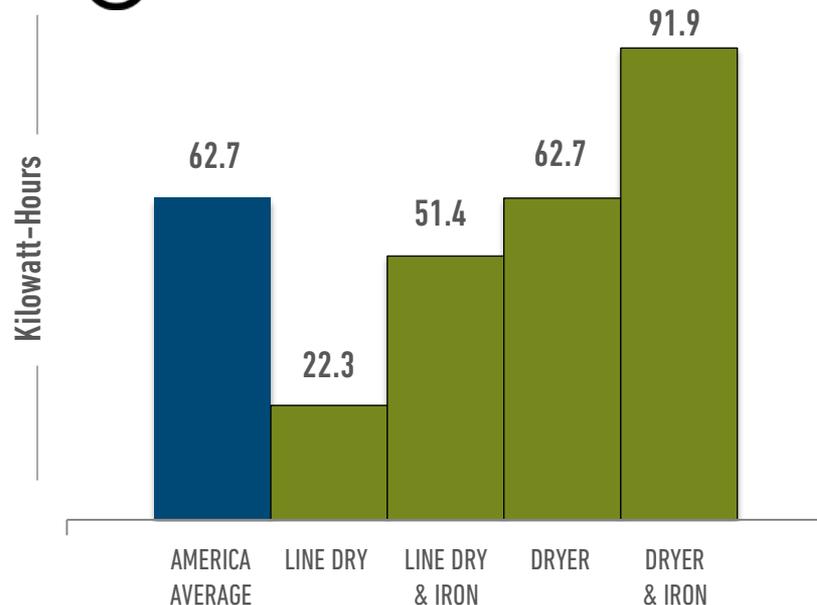


IN AMERICA: LINE DRYING INSTEAD OF USING A DRYER REDUCES NON-RENEWABLE ENERGY USE BY 64% AND CLIMATE IMPACT BY 67%

AMERICA: LIFETIME CLIMATE CHANGE IMPACT

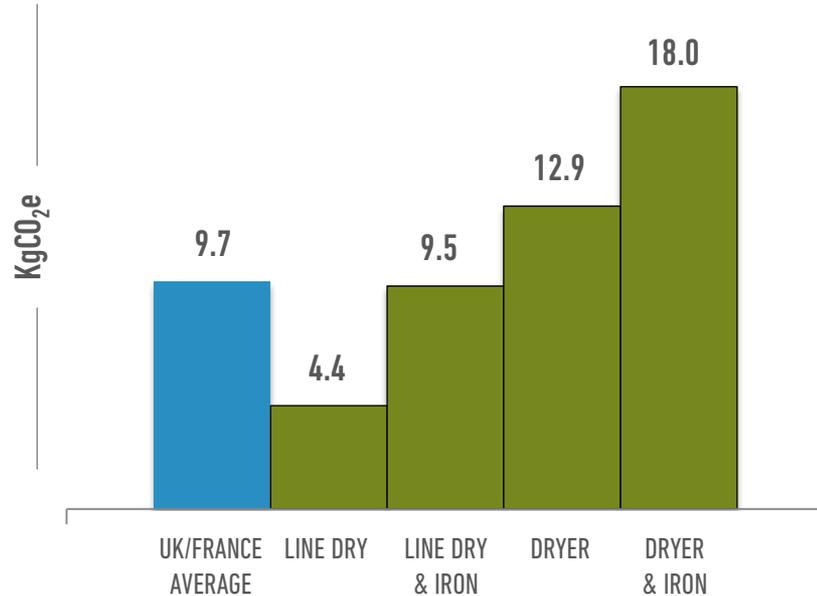


AMERICA: LIFETIME NON-RENEWABLE ENERGY USE

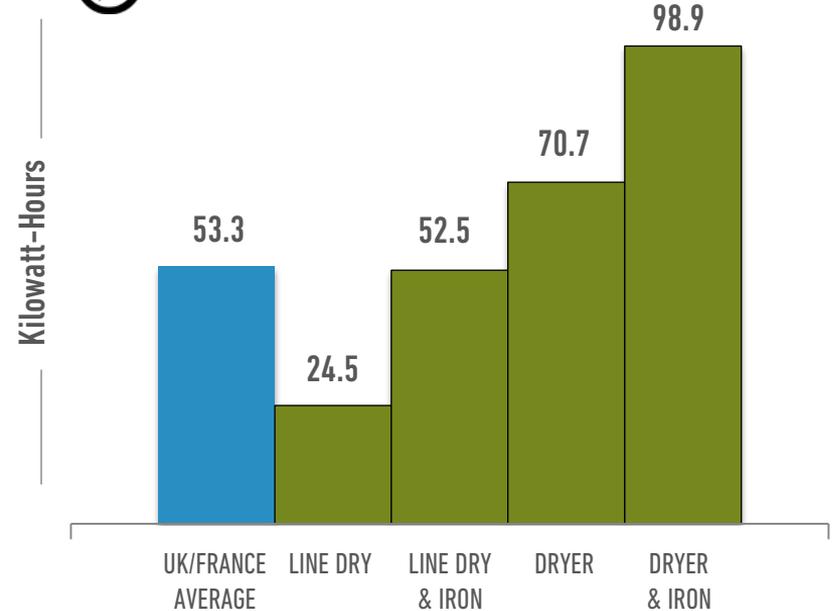


IN UK/FRANCE: LINE DRYING INSTEAD OF USING A DRYER REDUCES NON-RENEWABLE ENERGY USE BY 65% AND CLIMATE IMPACT BY 66%

UK/FRANCE: LIFETIME CLIMATE CHANGE IMPACT

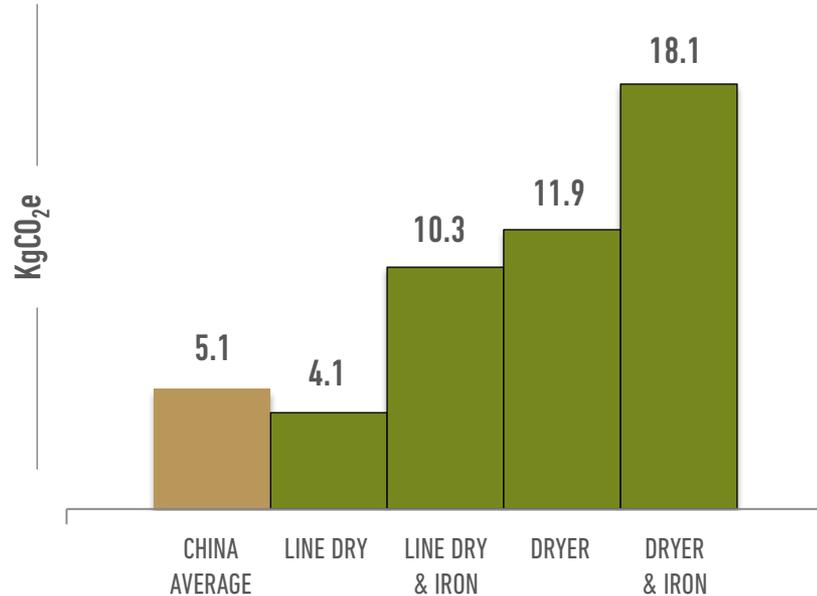


UK/FRANCE: LIFETIME NON-RENEWABLE ENERGY USE

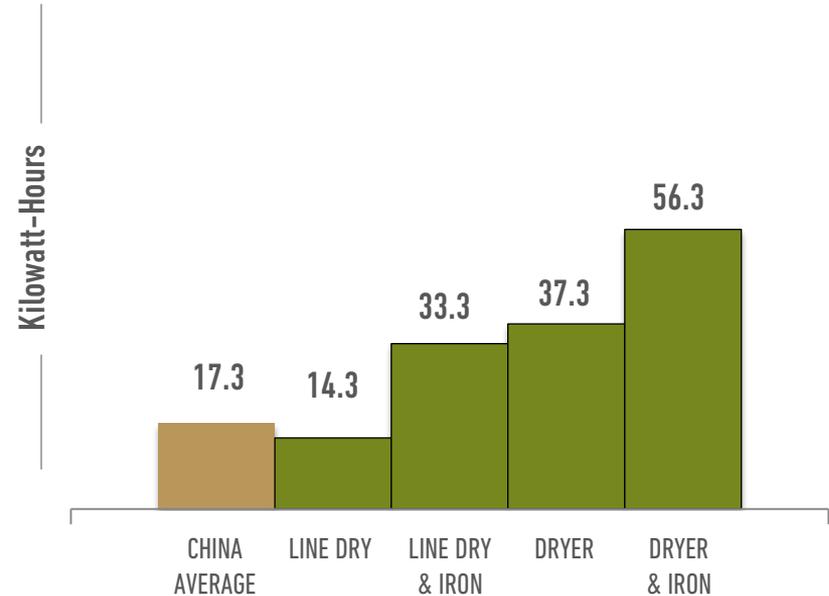


IN CHINA: LINE DRYING INSTEAD OF USING A DRYER REDUCES NON-RENEWABLE ENERGY USE BY 62% AND CLIMATE IMPACT BY 65%

CHINA: LIFETIME CLIMATE CHANGE IMPACT



CHINA: LIFETIME NON-RENEWABLE ENERGY USE



A close-up photograph of a garment's interior. A metal grommet is visible at the top left. The fabric is light-colored with faint orange markings. The garment is layered, showing a dark blue or black textured material. The background is blurred, showing more of the garment and some yellowish light.

OUR NEXT STEPS

CONTINUE TO LEAD, EDUCATE CONSUMERS & EXPAND THE BETTER COTTON INITIATIVE



CONTINUE TO LEAD, EDUCATE CONSUMERS & EXPAND THE BETTER COTTON INITIATIVE

Call to action to Levi's® fans around the world:

1. [Take the quiz](#) to understand your impact and pledge to wash less
2. If you have to wash, use cold water and [try our tips](#)
3. Line dry
4. Donate your old jeans to give them a new life

Call to action to our global apparel industry peers:

1. Understand your impact and take actions to reduce your impact on the environment
2. Use your marketing muscle to educate consumers on how they can reduce their impact by washing less, line drying and donating
3. Influence your global supply chain partners to procure Better Cotton Initiative cotton and adopt [water recycling and reuse standards](#)



WHEN LS&CO. LEADS, OTHERS FOLLOW

LS&Co. water stewardship programs:

1. [Water<Less™](#)
2. [Water Recycling & Reuse Standard](#)
3. [Global Effluent Guidelines](#)
4. [Better Cotton Initiative](#)
5. [CEO Water Mandate](#)

LS&Co. sustainable product development:

1. [Terms of Engagement](#)
2. [Chemical Management Programs](#)
3. [Responsible Sourcing Initiative](#)
4. [Wellthread™](#): Holistic approach to sustainable product design & manufacturing
5. [Waste<Less™](#): Uses at least 20% post-consumer waste in each product



APPENDIX

A close-up photograph of a person's arms and hands. The person has extensive black and grey tattoos covering their forearms and hands. A brown leather watch with a metal buckle is visible on their left wrist. They are holding a stack of folded, light-colored fabric, possibly clothing, with their hands. The background is blurred, showing more of the fabric and a hint of a blue and white striped garment.

LEVI'S® 501® JEAN LIFECYCLE IMPACT

	FIBER	FABRIC ASSEMBLY	CUT, SEW, FINISH	SUNDRIES & PACKAGING	TRANSPORT, LOGISTICS, RETAIL	CONSUMER CARE	END OF LIFE	TOTAL
CLIMATE CHANGE (kg CO ₂ -e)	2.9	9.0	2.6	1.7	3.8	12.5	0.9	33.4
	9%	27%	8%	5%	11%	37%	3%	100%
WATER CONSUMPTION (liters)	2,565	236	34	77	10	860	0	3,781
	68%	6%	1%	2%	0%	23%	0%	100%
EUTROPHICATION (g PO ₄ -e)	18.0	5.5	2.9	7.9	3.1	7.9	3.5	48.9
	37%	11%	6%	16%	6%	16%	7%	100%
LAND OCCUPATION (m ² /year)	9.3	0.2	0.0	0.5	0.3	1.7	0.0	12.0
	78%	1%	0%	4%	2%	14%	0%	100%
ABIOTIC DEPLETION (mg Sb-e)	19.9	7.2	1.9	118.5	4.4	17.9	0.1	29.1
	12%	4%	1%	70%	3%	11%	0%	100%

DATA WAS COLLECTED FROM SEVERAL SOURCES IN THE SUPPLY CHAIN

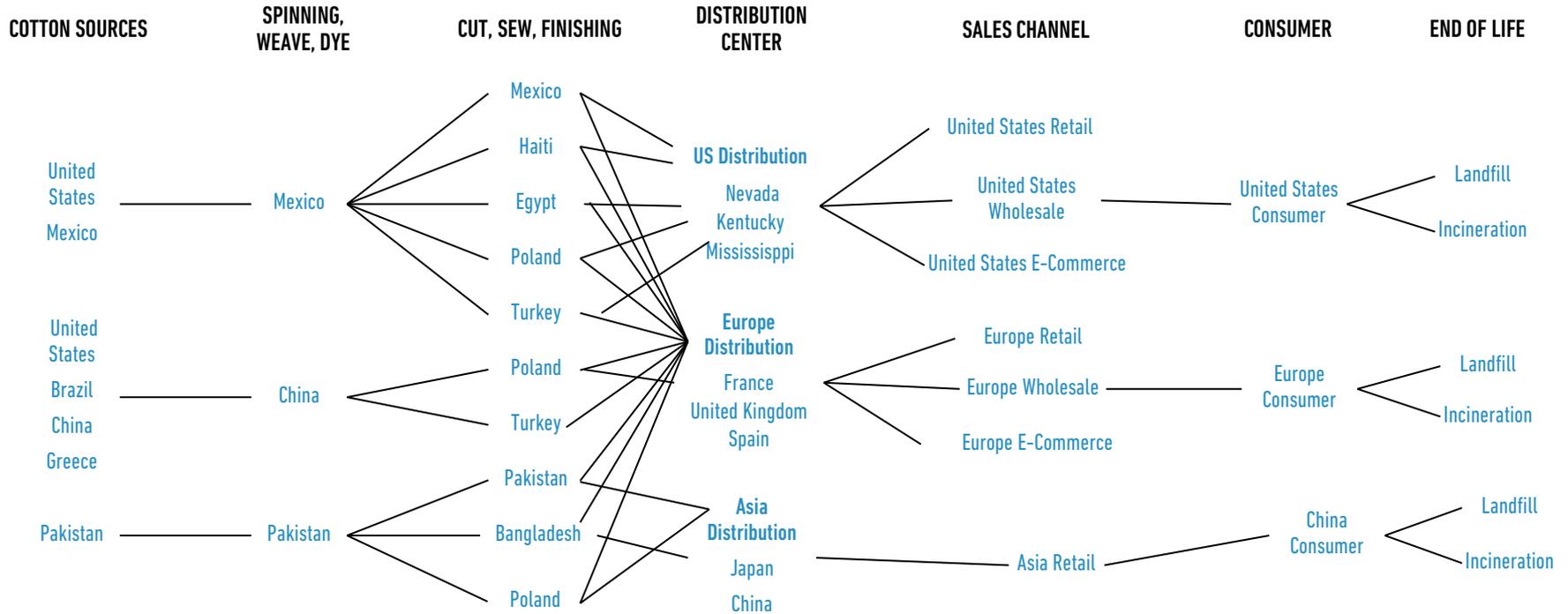
PHASE	PRODUCT DATA	FACILITY OR GENERAL DATA
SPINNING	Fiber Type Fiber Country of Origin Transport Mode and Distance Fiber Loss	Energy Water Packaging Waste
DYE, WEAVE, FINISH	Fiber Loss Chemical Use & Transport Mode & Distance	
CUT & SEW	Transport Mode & Distance Cutting Efficiency Material Use Sundry Material and Weight Packaging Material and Weight	
GARMENT FINISH	Chemical Use Transport Mode & Distance	
DISTRIBUTION CENTERS	N/A	
PRODUCT TRANSPORT	Transport Mode & Distance	
RETAIL	N/A	Energy
CONSUMER CARE	N/A	Consumer washing habits

SENSITIVITY: FABRIC LOSS, FIBER LOSS, AND WASH AND DRY FREQUENCY ARE IMPORTANT TO THE FINAL RESULTS

	CHANGE MEASURED	IMPACT ON CLIMATE CHANGE	IMPACT ON WATER CONSUMPTION
FABRIC LOSS	± 10%	± 3.8%	± 7.4%
FIBER LOSS	± 10%	± 2.6%	± 6.7%
FREQUENCY OF CARE	± 10%	± 3.8%	± 2.3%
PRODUCT TRANSPORT	± 50%	± 1.0%	± 0.0%
CARE TRANSPORT	± 50%	± 0.3%	± 0.0%

- Fabric loss and fiber loss are both very important to measure because they have a significant impact on the final results
- Differences in transport distances have very little impact on the overall product results

LEVI'S® 501® JEAN GLOBAL PRODUCTION FOOTPRINT



LCA SOURCE DATA

References for consumer use habits:

- Cotton Council International (2013) Survey of US Laundry Practices, unpublished document, Washington, DC.
- Cotton Council International (2013) Survey of Chinese Laundry Practices, unpublished document, Washington, DC.
- LS&Co. Consumer Surveys (2012)

References for Wash, Dry, and Ironing Impacts:

- Biermayer, P.J., J. Lin (2004) Clothes Washer Standards in China: The Problem of Water and Energy Trade-offs in Establishing Efficiency Standards, Doc. LBNL-5515. Lawrence Berkeley National Laboratory, Berkeley California. Proceedings of the American Council for an Energy Efficient Economy (ACEEE) 2004 ACEEE Summer Study, May 19th. <http://eaei.lbl.gov/publications/clothes-washer-standards-china-proble>
- European Committee of Domestic Equipment Manufacturers (CECED) (2013) I prefer 30 degrees - Substantiation Dossier. Chesire, UK. <http://www.iprefer30.eu/en>
- Denkenberger, D., C. Calwell, N. Beck, B. Trimboli, D. Driscoll, C. Wold (2013) Analysis of Potential Energy Savings from Heat Pump Clothes Dryers in North America, CLASP, Washington DC. <http://clasponline.org/en.aspx>
- Department of Energy (DOE) "Energy Star Savings Calculator" (EPA & DOE 2010) and supplemented with data from the 2010 DOE Energy Conservation Program for Consumer Products (75 Federal Register 182) and AATCC standards (AATCC 2011). Clothes Washer Update 6.1, February 1, 2013. <http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/save-energy/purchase-energy-saving-products>
- Department of Energy, consumer energy conservation. Accessed June 14, 2014. <http://energy.gov/energysaver/articles/estimating-appliance-and-home-electronic-energy-use>